



Experiences in Designing and Implementing a Whole Brain Creativity and Thinking Programme for Pre-service Teachers: A Narrative Action Research

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An abstract

Experiences in Designing and Implementing a Whole Brain Creativity and Thinking Programme for Pre-service Teachers: A Narrative Action Research

The Whole Brain Creativity and Thinking Programme and Model are innovative and creative, designed for pre-service teachers and undergraduates as an intervention in bridging the gaps in professional development and pedagogy and methodology. It is designed using Design Thinking as a short programme for bridging gaps between school and university and between university and professional development. The foundation of the study is based on Sustainable Development Goals, SDG 4 for inclusive education and SDG 11 for sustainable cities. The WBCTP is based on Ned Herrmann's seminal book, *The Whole Brain Business Book* (1996). The conceptual framework, together with the Whole Brain Creativity and Thinking model (Herman, 1996), includes Emotional Intelligence (EQ), Imagination, Mindfulness, cognition and metacognition, visual literacy and the five (5) senses. It is the lens for analysis of my designing and implementing the programme.

The questions for the qualitative research: What was the Whole Brain Creativity and Thinking programme about? How was the programme and model designed and implemented? Why was it designed and implemented in that way? I used an interpretive, qualitative, narrative action research design in this study based on my experiences designing and implementing the WBCT programme and model. Data gathering entailed document analysis (reflective journal, student work) and visual methodology (videos and drawings). The data was analysed using content analysis to analyse and interpret the content of textual data. In four interactive and profound workshops I created (the four action research cycles used for the presentation of the finding), I created, designed and implemented four concepts for the future of tertiary institutions or higher education and schools embracing technology and hybrid teaching and learning, launching us into the 21st Century of multiverse teaching and learning. Pre-service teachers are encouraged to use their whole brain rather than their right or left- brain for thinking and learning. Subsequently, they can enjoy an enhanced teaching and learning experience and provide the same experience in their classrooms. Cycle One

focused on **Sustainability**: Examining Environmental Sustainable Development, Sustainability, and Sustainable Development. Cycle two focused on **Imagineering**: A portmanteau for Imagination and Engineering. Cycle three focused on **Business Model**: Encouraging Teacherpreneurship and the Profitability of Teaching and Learning as a global citizen. Cycle four focused on **STEAM**: A holistic model for teaching and learning by including the Arts in STEM education, Science, Technology and Mathematics. In each cycle, Step One is on the Introduction and Focus, Step Two is on the designing, step three is implementation, and Step 4 is on the reflection and recommendation.

For whole and holistic pre-service teachers with self-worth and reliance, I, in the programme, sought to enhance their comprehension of leadership and success unequalled to mediocrity and complacency and that teaching and learning would only change by applying mentally and emotionally strong executive functioning skills and socio-emotional learning, including the difference between right-brained thinking (creative thinking) and left-brain thinking (cognitive and logical). Teaching is entrepreneurial and has the holistic opportunity to shape lives, creating a cohort of visioners and Imagineers and driving the change in education as agitators and teacherpreneurs. We do not speak of school as the “plant” and teaching as a “machine churning out matriculants.” Now we speak of change-makers and global citizens who are the nucleus of society and, in the spirit of Ubuntu, assist with social cohesion and moral regeneration. Introducing visual literacy as a methodology is most significant as pre-service teachers speak the indigenous home language, and English is an additional language. Because of the language barriers and in the spirit of inclusivity, I used visual methodology. As the future of language is coding in robotics, I combined school knowledge with the skill and expertise in using technology to enhance their experience in creating projects. They discussed the need for more skill and classroom experience when they embrace employment as new teachers. The holistic pre-service teacher could, through the WBCTP, executive functioning skills, socio-emotional maturity, and whole brain cognition transcend into role models and mentors for future techno-drivers of change.

Historically and socially disadvantaged in the past informs their passion, drive and inspiration to aspire and take risks to be entrepreneurial as teacherpreneurs and role models for leadership and inspiration rather than instructing and conforming. The WBCTP highlights the urgent need for technology and hybrid teaching as a whole-brained programme and model for teaching and learning. The tools used in the design to implement the WBCTP were significant drivers of change in robotics and coding. The WBCTP motivates an attitude of

lifelong learning and being at the peak of the knowledge economy. If one is passionate about one's profession, the thirst for knowledge can never be quenched and for pre-service teachers to be more aware of their thinking patterns and how much can be achieved if they diversify their thinking styles and embrace the future with technology.

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All praises are due to the Almighty guiding my heart, head and hand, in writing my dissertation. This has been a remarkable journey with all who have entered my life and left an indelible impression. Writing and compiling a labour of love over the years has brought me immense joy and reminded me of the sacrifices and the painstaking time invested in crafting the project.

My heartfelt gratitude to Professor Angela James, who invested her hope, time and aspiration with me in the Whole Brain Creativity and Thinking Programme through Community Engagement. 2019 - I introduced the whole-brain project because I believed in whole-brain creativity and thinking. With both of us not knowing what the journey would entail, I articulated the urgent need for change in teaching and learning from a room at the, E.G. Malherbe Library, University of Kwa-Zulu Natal, late on an Autumn evening. Mind mapping, doodling my lofty ideas, and stretching my imagination to Professor James, we channelled those thoughts into a coherent and cohesive structure. The Whole Brain Creativity and Thinking Programme was born in the library, surrounded by many erudite thought leaders and writers perched on the shelves. In Professor James, I found a friend, a colleague, a brilliant mind and a companion. She invested in my knowledge and pushed my boundaries to see the project to fruition because she believed in my vision, my potential and the WBCT programme. Similarly, in presenting the programme, I invested in the potential and leadership of the pre-service teachers knowing that change was imminent and we were the visioners. Unfortunately, COVID was the smudge in delivering our programme further. With an indefatigable spirit I overcame that challenge and hope to resume this year (2023).

The WBCT programme has been blazing a path to many institutions in South Africa and abroad, and I take this opportunity to thank the organisers who supported me in my presentations.

My family were unwavering in their love, care and support. I am blessed to be so loved, and may the Almighty's choicest blessings be showered upon them.

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ACRONYMS

Acronym	Terminology
WBCT	Whole Brain Creativity and Thinking
WBCTP	Whole Brain Creativity and Thinking
CAPS	Curriculum Assessment Policy Statements
<u>SDG</u>	Sustainable Development Goals
<u>UNESCO</u>	United Nations Educational, Scientific and Cultural Organization
<u>SAQA</u>	South African Qualifications Authority
<u>DoE</u>	Department of Education
<u>PCK</u>	Pedagogical Content Knowledge
<u>STEAM</u>	Science, Technology, Engineering, Arts, Mathematics
<u>STEM</u>	Science, Technology, Engineering, Mathematics
<u>IKS</u>	Indigenous Knowledge Systems
<u>IQMS</u>	Integrated Quality Management System
<u>CPD</u>	Continuous Professional Development
<u>SEND</u>	Special Educational Needs and Disabilities
<u>CSI</u>	Corporate Social Investment

<u>CSR</u>	Corporate Social Responsibility
<u>HBDI</u>	Herrmann Brain Dominance Instrument/ Indicators
<u>LLL</u>	Lifelong Learning
<u>GMO</u>	Genetically Modified Organism
<u>DNA</u>	Deoxyribonucleic Acid
<u>RNA</u>	Ribonucleic Acid
<u>ICT</u>	Information and Communications Technology
IT	Information Technology
<u>MTN</u>	Mobile Telephone Network
<u>KZN</u>	Kwa-Zulu Natal
<u>4IR</u>	Fourth Industrial Revolution
<u>EQ</u>	Emotional Quotient
<u>IQ</u>	Intelligence Quotient
<u>ALCOA</u>	Aluminium Company of America
<u>IDEO</u>	Innovation Design Engineering Organization
<u>MOOC</u>	Massive Open Online Courses
<u>SD</u>	Sustainable Development
<u>SMT</u>	Senior Management Teams
<u>SMART</u>	Specific, measurable, achievable, relevant, time
<u>PD</u>	Professional Development

Chapter 1

Experiences in Designing and Implementing a Whole Brain Creativity and Thinking Programme for Pre-service Teachers: A Narrative Action Research.

1. The Whole Brain Creativity and Thinking Programme

1.1 Introduction

The task of tertiary institutions in being game changers of the future of education is derived from the human potential in thinking and creativity for sustainability, not only the sustainability of the planet but also of education in lifelong learning. Pre-service teachers are on a journey of intrinsic and extrinsic experiences and possibilities. Education means “development from within for every individual. The word educate’ ..., meaning induces us to draw out, to develop from the inside. Instruction is not education because instruction does not always lead the human brain to develop from within.” (Hill, 2016, p 63).

In his book *‘Think and Grow Rich’*, Hill (1937) indicates that education and knowledge do not necessitate success. He expounds that the knowledge acquired depends entirely on how it is expended and manipulated to create and escalate success by absorbing and applying knowledge gained. He proposes that education and knowledge are the foundation of success and start with the idea that sprouts into a vision, a mental image, and eventually accomplishing a goal. "Success comes to those who become success conscious. Any idea, plan, or purpose may be placed in the mind through repetition of your desires are strong enough, you will appear to possess superhuman powers to achieve". Success and the use of potential within the human brain indicate the capacity of the human brain as insurmountable. However, in its capacity, the brain is tireless and limitless in redefining its potential. It is exponential. Hill (2016) and Hermann (1999) further explain that the mind can conceive, believe, and achieve with imagination, creativity and motivation. “Results are what count” and “*Success through a Positive Mental Attitude*” (Hill & Stone, 2016, p. 7) are reminders of what can be achieved with the human brain. In this regard, research on the Whole Brain Model by Herrmann (1996) engaged with professionals to raise their productivity and profitability through innovative creativity and thinking. High-performing individuals use

whole-brain thinking to achieve and find success. “Mental processes have a great deal to do with how we interact with everyday aspects of life.” (Herrmann, 1996, p. 91). He reveals that not everybody is aligned to be perfect. Everybody has imperfections, i.e., even our brain that may work synchronously or asynchronously depends entirely on the most prominent domain. A brain that works in its entirety allows for mental diversity because creativity creates solutions, enhances leadership, finds resolutions and affects change. I found this was the gap in pre-service teachers’ competencies. Creativity is original, but innovation builds on previous knowledge or what has already been created unless the idea or invention is unique. Similarly, pre-service teachers can vacillate between being mediocre or being outstanding. Pre-service must choose between visioners and leaders who are agitators and drivers of change or ordinary employees who follow the norm.

1.2 Focus

My research focused on creating and developing a programme as a combined concept in teaching and learning in Education. The combination of creativity and learning has yet to be studied or researched within a model and programme. I focused on creating a model and programme, the Whole Brain Creativity and Thinking Programme (WBCTP), including pre-service teachers’ experiences (understanding and actions) of a contact four-session programme.

1.3 Purpose

Using a Narrative Action Research strategy, I explored the design and implementation of a programme and model for pre-service teachers and their experiences of a Whole Brain Creativity and Thinking Programme. The research setting was at a Higher Education Institution where pre-service teachers were being professionally developed. The pre-service teachers were expected to participate in exploring holistically, as whole interconnected individuals, using all social and mental faculties, which could contribute to creative and innovative classroom practice. Pre-service teachers were also introduced to new technology, new teaching styles and new knowledge for use presently and in the future. The study included inclusivity within the progression of knowledge acquisition and Design Thinking in a culture of woke individuals of heightened awareness, through social media and as global citizens. The Whole Brain Creativity and Thinking Programme (WBCTP) encompasses various world views of ethnic, cultural, aesthetic and historical knowledge and wisdom for a value-based integral educational experience.

1.4 Rationale - Why was the research conducted?

Professor Angela James presented me with a proposal for community engagement. The brief was sketchy, but the idea of the programme had to be mind-blowing, address the needs of the students and be successful so that the programme could be executed every year as an enhancement programme for pre-service teachers. She was unsure what the programme would be or how we would present it, but we agreed on one crucial element: tertiary education must change. At that meeting, I doodled an idea and mind map of a plan with new concepts I had imbibed in my career. I poured over the concept of whole brain use, which was intrinsic knowledge from my work in education and literacy over the years. I had no idea why I believed so strongly in whole-brain thinking and creativity, as I had never read anything about the subject. I did know that what was being presented at schools and tertiary institutions was outdated and had not embraced technology needing a fresh look at a new generation. In most instances at schools, learners are prompted to choose careers based on marks attained from standardised testing and those marks are based on right-brain or left-brain activity. I was clueless about the limited research that included whole-brain creativity and thinking. I found that research had been done by Ned Herrmann (1996). However, *Whole Brain Creativity and Thinking* had not been explored to their full potential as a practice in teaching, and only two researchers in South Africa attempted the subject. Ned Herrmann's book was written for business professionals. My quest opened a treasure hunt and chase for information for pre-service teachers. Reading the *Whole Brain Business Book* (1996), after 37 years, I found knowledge within the covers that would be useful to future thought leaders and visioners.

When teaching and assessing, educationists continue to focus and base their thinking and practice on learner performance on the dominance of left-brain cognitive competencies over right-brain creative competencies. This is apparent in that "Students with learning styles favouring an emphasis on deductive thinking rated themselves higher academically than their peers with other learning styles. Students who were people-oriented in their approach to learning had the lowest overall academic rate" (Mathews1996, p. 250). Mathews (1996) claimed brain dominance rather than whole-brain creativity and thinking. Deductive thinking would be from the left side of the brain, whereas the creative brain with divergent thinking would be the right side. The ideation of discovering, defining, developing, and delivering the

WBCT programme granted me the opportunity of curiosity and a beginner's mind by seeing things through fresh eyes, unexpected possibilities, and endless ideas. Professor James encouraged and motivated me further as the WBCT was a new concept, and we were excited as I delved further into designing and planning.

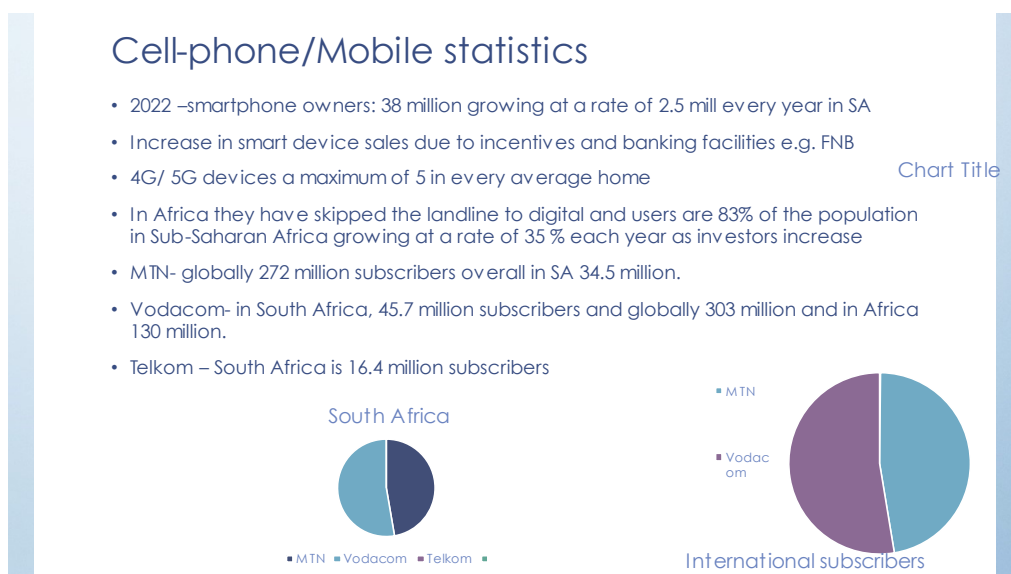
The WBCT programme functioned as a teaching and learning model through the interconnectivity of functions in methodology and pedagogy, simultaneously integrating a new paradigm through the CAPS curriculum. The WBCT programme was designed and implemented with the purpose of it being able to fill the gaps for pre-service teachers in their experience (understanding and practices) of effective teaching. The programme empowers pre-service teachers to maximise their potential and shape socio-emotional leaders within education. The experience must be multi-modal and enriching, enjoyable and productive.

Teaching requires high-quality experience (understanding and practice), skill, attitude, attributes, and values (SKAVS). Teachers are challenged to deliver content in the classroom due to time constraints and exorbitant administration tasks to the detriment of classroom practice. The *Curriculum and Assessment Policy Statements (CAPS)* (Department of Basic Education, 2011) combine previous models of curriculum statements in an in-depth paradigm of strengthening the foundation of knowledge acquisition.

My instincts were based on Africa and South Africa as the highest users of mobiles, which would add significantly to reaching our learners and children.

Table 1.

Statistics from MTN and Vodacom, Suppliers of Mobile Technology (2022)



The use of mobile devices, based on research by Vodacom and MTN, was predominant in semi-urban and rural areas and was used for communication, social media and indirectly and directly for literacy. Knowing the challenges faced with literacy in South Africa, it was imperative to find a path that would not only improve the literacy levels and raise the standards of teaching practice and methodology but also change the thinking styles of pre-service teachers constructively to suit the change in the thinking styles of learners. Therefore, the programme assists teachers in being versatile and flexible in their practice and skill. The literature on Whole Brain Theories was limited. The only book available at the time of my research was from Herrmann (1996) and two research papers from de Boer (2001) and Potgieter (1999). For pre-service teachers, there was a niche for advancement and change in pedagogy and methodology. It was a brilliant opportunity to be a creative design thinker. Creativity requires facilitation, as mentioned by Herrmann (1996). “Through skilled facilitation, a person with natural capability can have that ability released in very effective ways.” (Herrmann, 1996, p. 277). I unleashed creativity in Design Thinking and Imagineering as I created the programme as the most effective and affective project management in Designing and Implementing the WBCTP for tertiary institutions.

Thus, the task of tertiary institutions to be game-changers in the future of education enhance the human potential in thinking and creativity for the sustainability of teaching and learning and the tireless spirit of lifelong learning. I invested in human capital rather than transferring skills and knowledge. Our pre-service teachers are the future of skills and knowledge in human capital; therefore, any investment in the knowledge economy with them is profitable and sustainable. It was imperative to evolve from the indoctrination of norms and standards in pre-service teaching and avoid the repetition of exploitive methodology and pedagogy that segregates based on social lines. The WBCTP was designed to address the gaps in tertiary institutions and schools and examine creative and innovative methods of bringing positivity and creativity back into pre-service teachers and, ultimately, the classroom. Tertiary institutions had yet to aggressively address the gaps from school to undergraduate studies, from tertiary institutions to classrooms. The chasm has grown each year as pre-service teachers within the cycle of institutional automatons are fed into schools, in what is metaphorically addressed as the ‘Plant’. The machinations must be stopped, and investment must be made in Human Capital and its potential. The only way it can be addressed is through the knowledge economy of the Whole Brain Creativity and Thinking Programme. Everybody wants to be heard in the circle of life, believing their voice could make a difference, but few

actively listen. Moreover, speaking after everyone has spoken is speaking the loudest. I chose to listen over the years to multiple perspectives. To communicate is to engage in thought leadership and empowerment. Now, it is my time to make a difference and raise the shackles on leadership and change drivers for pre-service teachers and undergraduates.

1.5 Problem Statement

What are the issues being researched?

A crucial pedagogical aspect within the Whole Brain Creativity and Thinking Programme is that teachers must learn how to teach so that learners can learn how to learn. The Whole Brain Creativity and Thinking Programme and model mainly introduced pre-service teachers to a mindset of leadership, innovation, and creativity, particularly in delivering effective curriculum and affective methodology in education. I developed a programme within this framework, which has never been done before. Therefore, the issue that needed researching was how to develop a programme and a model and document, including the pre-service teachers' experiences, within the programme. The content on development was limited and fragmented and scattered in different resources. I could not find a single resource that stated a step-by-step approach to creating a model and programme in its design. In the WBCTP, I collated all the suggestions and brought them together in one cohesive template to design a model and programme.

The research context is based mainly on Herrmann's (1996), *The Whole Brain Business Book*. Herrmann's seminal and metaphorical work focused extensively on the brain, the four quadrants of the brain and the different learning styles within each quadrant. The book and the content and context are highly influential and successful. However, the four quadrants working together as a whole brain revealed new information and data in different environments. I examined the details of the advantages of such knowledge to pre-service teachers and how it enhances the teaching and learning experience, which includes research and the genesis of the theory done by Potgieter (1999), *The Whole Brain Creativity Model: Implications for Nursing Education and Practice* who researched creativity and De Boer (2001), *A Whole Brain approach to teaching and learning in Higher Education*, who have examined the Whole Brain thinking concept. They contributed further by developing an effective, efficient programme that yields excellent results both in teaching and learning. It

must be noted that the combination of creativity and thinking together has not been studied before.

I have included Design Thinking as the basis of all creativity and brain activity. It was the template I used in designing the programme and model, and I promoted the understanding and practice of Design Thinking with pre-service teachers. Education innovation through technology and the Fourth Industrial Revolution has filled a gap in methodology and pedagogy by introducing technology and the Internet of Things within the classroom. Education is evolving quickly to meet the challenges of a fast-changing and unpredictable globalised world. The WBCT programme introduced technology as a resource in classroom practice in mixed method teaching and learning by introducing pre-service teachers to technology in learning and teaching support material, distance learning in rural areas and mobile learning. I also introduced Big Data, a new tool for classroom administration and capturing results with feedback on learner performance. Imagineering is the tool for the future of technology. These concepts are explored in the latter chapters. I invested in human capital, not automatons of teaching as a profession when I created and designed the programme,

1.6 Research Questions

The research questions that informed my research are:

- 1.6.1) What is my narration about the WBCT programme and model?
- 1.6.2) How did I design and implement the programme and model in the way I did?
- 1.6.3) Why did I design and implement the programme and model in the way I did?

1.7 The WBCT Programme Overview

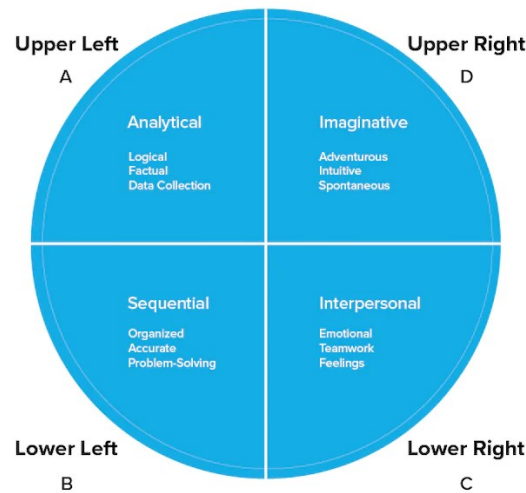


Figure 1. Herrmann's Whole Brain Model (1996)

The WBCT programme and model are inclusive in diversity and language, “A holistic view should be adopted in higher education institutions, one which place as central the staff members and their roles, and which emphasises negotiation and flexibility in response to the diversity of academic activities” (Brew & Boud, 1996, p. 17). Most of our pre-service teachers speak indigenous home languages, and English is an additional language. Challenges in the curriculum for home-based or indigenous languages, using WBCT plays a crucial role in teaching and learning. The role of the pre-service teacher is integral as a facilitator of a positive and creative learning environment sparking enthusiasm, innovativeness and exciting learning experiences. In the design and implementation of the programme with pre-service teachers, I examine the significant experiences of the programme.

Furthermore, “Interconnectedness of the four domains of the brain is the stimulant for learner-centred critical thinking, design thinking, cooperative learning, problem-solving, independent creativity and decision making. The planning, preparation, and intervention through teacher facilitation and learner participation is now a shared activity with visualisation and creativity” (Herrmann, 1996, p. 10). Herrmann (1996) emphasises inclusivity; thus, the same would apply to all pre-service teachers in classroom practice and the benefits of a Whole Brain Creativity and Thinking Programme. The WBCT between the right and left hemispheres of the brain hemispheres validates whole-brain creativity and thinking through the right and left-brain activity. e.g., one can rationalise mathematical concepts (left brain) by using colours, drawing and shapes or tools like blocks and Lego sets, counting sticks and gamification (right brain). This is a combination of right-brain and left-brain activity. However, it requires innovation and inspiration to create congruent connectivity between both

sides of the brain. It is possible to combine divergent and design thinking, which is the basis of the WBCT programme, the interconnectivity of the different quadrants of the brain for a holistic experience. The WBCTP considered pre-service teachers' various learning styles through constructive thinking patterns, socio-economic conditions, cultural backgrounds and multiple intelligences to enhance their understanding and experiences within the multidisciplinary programme to create a whole-brain experience at tertiary institutions. It was a significant game changer in the future of education, considering the digital divide within the context of the Fourth Industrial Revolution.

1.7.1 The Design of the WBCT Programme. The WBCTP was designed to address the gaps in tertiary institutions and schools and examine creative and innovative methods of bringing positivity and creativity back into pre-service teachers and, ultimately, the classroom. Tertiary institutions had yet to aggressively address the gaps from school to undergraduate studies, from tertiary institutions to classrooms. Any change and growth would have to consider an investment in Human Capital and its potential. The only way it could be addressed was through the knowledge economy of the Whole Brain Creativity and Thinking Programme.

In his human capital theory, Rosen (1989, p. 138-155) describes human capital as having skills and experience of economic value and skills and abilities from training and education. "Human capital refers to the productive capacities of human beings as income-producing agents in the economy". The emphasis is on the knowledge, skills, attitude, attributes and values in any sphere of employment. Human capital is precisely what tertiary institutions ought to be used as an investment for enhancing the future of education with unlimited potential. Often, we have teachers or pre-service teachers who have knowledge and attitude but do not have the attributes and skills of teachers as leaders and role models.

1.7.2 Implementation of the WBCT Programme: Sustainability in education contributes to sustainable patterns of existence through knowledge, skills, values (SKAVS) and critical-ethical decision-making as prompted by the Whole Brain Creativity and Thinking Programme. The pre-service teachers' lived experiences in this phenomenological research are intellection for further engagement and experimentation where world views of inclusivity embrace a whole and holistic global citizen. Pre-service teachers can evolve with change embracing futures with foresight and giftedness. Much of the giftedness and foresight come from the brain's ability to develop new pathways and create new possibilities. Implementation included four workshops with a slide presentation, activities or tasks, journaling, and focus

group discussion. Included in each workshop were the four cycles in the four concepts; Sustainability, Imagineering, Business Model and STEAM.

Pre-service teachers, schools, and the community play an interrelated role in thinking critically, developing schools and learners, innovating creatively, and providing possible solutions for sustainable living. The world is assumptive. We are at the disposal of endless possibilities and opportunities which open the chance of being visionary and filled with hope. The mind is always explorative; therefore, one is not limited to the environment, situations, challenges or society. For sustainability in education and the environment, the pre-service teacher takes risks, explores, transforms and innovates with experimentation. This experimentation allows them to explore, without limitations, their creativity and cognitive faculties in the WBCTP.

Sustainability in education has to bypass society's segregation and the education system's exploitation. We constantly believe those who are successful in education and achievement work hard in their study, progress, write exams, find success and are rewarded. Those who fail are discarded with psycho-social challenges in the hierarchy. The average requires motivation and love, passion and drive to raise themselves in the strata of opportunities. However, this system of exploitation of the mind through memorisation has segregated education from those with skills and experimentation. Incongruencies in education separate the ranks and classes in society. As much as tertiary education improves students' lives, we must never forget the global impact on families, societies and the future as everything imbibed is questioned, identity and culture are welded between the past and present and the lifelong benefits from a tertiary institution. The future changes as pre-service teachers and learners evolve from what was to what is and what shall be. Sustainability on a global platform with SDG 4 contributes to lifelong learners who can create and innovate opportunities for sustainable families and communities, SDG, by redesigning thinking and literacies so that the future is entrenched in education mobility of shifting education paradigms based on global transitions.

Through versatile leadership and lifelong learning, focus on the future and the actions taken to support a sociably interactive, interdependent and co-dependent ecosystem makes for a more viable, thriving and transformative infrastructure in education in tertiary institutions and schools. Society, Higher education bodies and schools must deviate from indoctrination, setting parameters for pre-service and in-service teachers for pedagogy and methodology to be repeated as if cast in stone. There are multiple perspectives and initiatives within the

triangulation of parent, teacher, and child and a quadrangle when government and government strategies are included. Pre-service teachers must evolve with a changing socioeconomic, socio-political and technological environment. Therefore, indigenous knowledge systems play an integral part in value-based education in the paradigm of a whole-brained thinking individual. A balance between what was in the pre-service teachers' past and the potential of what can be in the future of endless possibilities and opportunities through Whole Brain Creativity and Thinking is lighting the path to education enlightenment as we challenge education with edification presently.

The Department of Basic Education has set parameters for pre-service teachers and teaching assistants to upscale knowledge and skills. The core guidelines for every pre-service teacher or teaching assistant are to ensure they are well prepared in ontology (methodology and pedagogy), knowledgeable on policy, garner community support in all co-curricular and extra-curricular activities, and enhance their knowledge through continuous professional development. All core principles align with the SDG 4 goals and SDG 11 goals.

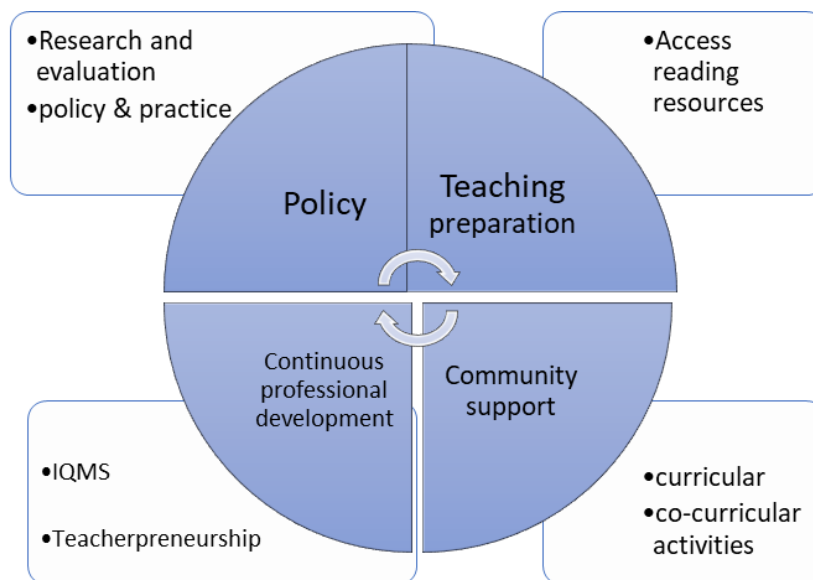


Figure 2. Focus Areas for Pre-service Teachers within the School Environment: Read to Lead Campaign, Department of Basic Education (2018).

Using the above organogram the Department of Basic Education provided, I shall change the quadrants to indicate a new, more progressive socio-organogram for pre-service and in-service teachers. Presently, sustainability and the 2030 vision of the United Nations

Educational, Scientific, Cultural Organization (UNESCO, 2017), designated the seventeen Sustainable Development Goals of the United Nations, lies entirely in the human potential to sustain an ailing planet creatively and its inhabitants and prevent the decay and disintegration through effective and affective thinking and actions. “Education is the key to a sustainable world” (UNESCO, 2017, p. 3) is the phrase that has become the nucleus of Sustainable Development. Each country adopts the goal, which means that as global citizens, every person must care for the Earth to maintain and sustain it for future generations. Each generation is responsible for saving Earth for the next by reducing its carbon footprint.

"Sustainable development is the development that meets the needs of the present without compromising the ability of the future." (Gutiérrez, 1999, p. 3). Education and edification provide the means for tertiary institutions to conscientize students, especially in developing sustainable communities and cities and eventually macro-communities by redefining thinking and creativity. Sustaining the Earth through education is possible through the value of love and love for oneself and the planet. It is a vital component of motivation, empathy and compassion.

1.7.3 Reflect and recommend

Each cycle (the four workshops) of the WBCT programme were reflected on by the discussion and the comments from each slide in each cycle. The reflection was challenging because it balanced past experiences, present challenges and a vision to change the future. I scrutinised each slide's topics or themes, creating pathways between theories, theorists and references. Some I challenged and dispelled on racism and bias; others were based on new knowledge I created. I raised the issue that most theorists discarded Africa as a dark continent when their theories were formulated. Subjects from Africa or people of colour were never a part of the theories and formulations, so how can we apply theories to African subjects and participants? The recommendations were based on changes in the socio-environmental and socioeconomic parables. Short learning skills-based programmes were some recommendations, similar to the WBCTP.

1.8 Literature Review

Sustainable Development Goal 4 (SDG 4) provides core competencies within pre-service teachers' understanding parameters by applying the Whole Brain Creativity and Thinking Programme. SDG 4 states, “Quality Education which ensures inclusive and equitable quality education and promotes lifelong learning opportunities for all.” (UNESCO,

2017, p. 19). Furthermore, SDG 11 encourages “Sustainable cities and communities where cities and human settlements are inclusive, safe, resilient and sustainable.” (UNESCO, 2017, p. 19). Therefore, it is imperative, when defining and associating the Whole Brain Creativity and Thinking Programme with the UNESCO 2030 Vision, that SDG 4 and SDG 11 be closely entwined with a wholistic and holistic individual who is an epitome of a global individual.

In **Environmental Sustainable Development**, various alternate synergies were examined, synergies in holistic individuals and classroom practice through the WBCT programme. Sustainability had to be diverted into the self, the land, the learners and the future. The WBCT programme has a humanistic and holistic approach. The programme examined the five factors of Sustainable Development, i.e., people, perspective, partnership, peace, and the planet, through its balanced and integrated global impact based on the UNESCO projection of the 2030 goal and vision. The delivery of the concept encouraged the sustenance of indigenous knowledge and its definition in terms of the knowledge gained using indigenous knowledge to enhance all other education transformations. Visvanathan (1997, p. viii) clarifies, “We need the rights of different traditions and knowledge forms to exist for science to survive.” Sustainable development includes alternate energy harvesting through renewable energy, recycling, sustainable ecosystems, and permaculture within the parameters of SDG4 through cultural, historical and traditional practices within SDG 11. Visvanathan further explains, “Every person is a scientist, and every village is a science academy”. The concept and importance of cultural affluence can only be further emphasised when memory and practice are compromised through time. He argues, “Indigenous Knowledge Systems (IKS) force science to become a part of a struggle of memory against forgetting”.

Pitika Ntuli (1997, p. ix) examines indigenous knowledge systems, “Indigenous Knowledge Systems is a hegemonic discourse”. He associates it with colonialism and describes it further as the “tabula rasa”, a plaque for “new knowledge” of the West’s culture and worldview. However, he emphasises the importance of balance between people, nature, and mutual respect. In the WBCTP, we incorporated indigenous knowledge systems (IKS) as an integral component of the entire programme for holistic pre-service teachers in a value-based, socially inclusive community. Cultural knowledge and practices were significant to South Africa’s diversity and importance in the Whole Brain Creativity and Thinking Programme. Examining socio-environmental and psycho-social issues, indigenous languages, culture, tradition and history contribute to our inherent knowledge from upbringing to personality as we link roots to the branches of the past and present. Values and ethics, skills and knowledge from childhood are the tools I encouraged in pre-service teachers to bring

forth change in thinking as global citizens prepared to weld culture and tradition with modernity.

We overcame the challenge of communicating in English as most participants said English was an additional language spoken quite fluently but dotted with indigenous phrases creating a new paradigm in a language uniquely South African. Identity and social class structures also played a role among the pre-service teachers through their lived experiences. In UNESCO, *Teaching the Sustainable Development Goals*, p16., the programme explored “Critical competencies, collaborative, self-awareness and integrated competencies” by examining sustainability's physical and psychosocial effects. As an action learning programme, WBCTP embraced the idea of a change project, bringing about change in learning environments and programmes. In UNESCO, *Sustainability Starts with Teachers*, p 5., “The future of change projects ... Sustainable development must be included in content, pedagogy and assessment practices into all education programmes, including teacher education programmes.” The authors further explain the knowledge we possess, the knowledge that is contested, and the continuous forming of new knowledge that will be contested by both teachers, pre-service teachers and learners to enhance knowledge-based systems actively.

1.9 What is a programme?

A programme includes observable and measurable action, understood and, where possible measurable. South African Qualifications Authority (SAQA) defines a short learning programme as “... designed to improve or refresh knowledge and skills in a particular field and for personal, social or professional development”. A programme meets the learning needs and enhances knowledge, contributing to mainstream education. In pre-service teachers, the WBCTP was designed to give them the knowledge, skills, values and behaviour to progress further in teaching and learning and more for employment. I used divergent thinking to explore ideas, inspiration and planning. Convergent thinking focused on deciding on the programme I desired and producing it.

1.9.1 Designing a Programme: Design Thinking

Designing the Whole Brain Creativity and Thinking Programme, I considered the **design process** of design thinking by David M. Kelly (1991) and the skills in project management. I combined the building process of Engineering, Imagineering and the programme's sustainability. It was imperative to consider change and **ideation** in the design. This design had to be unique and innovative and understand the dynamic change and needs

of higher education, schools and pre-service teachers. The programme was set on the limitations and possibilities for the future of education.

It was vital to be **iterative**, testing the programme, getting feedback and ensuring positivity and creativity were the catalysts for change. **Understanding the needs** of the pre-service teachers meant empathising with their frustrations and pre-conceived beliefs and understanding that the pre-service teachers were pedagogical change agents of the future. The WBCTP examined a creative design for a rational process. The programme looked at an innovative and unique way concepts could be connected in a **global context** for a global citizen. Random concepts were placed together to create cohesive synchronicity and harmony in a non-linear designed programme that comes together in a singular, comprehensive unit.

As a programme designer, I was compelled to view the process through **fresh eyes** and multifocal possibilities rather than the myopia of higher education institutions and basic education infrastructures. I ensured my target was not just pre-service teachers but also the facilitators who would facilitate the process of teaching and learning. The design process took many revisions. I considered in-service teachers who could use this programme to upskill and upscale their education and classroom edification, but they required strength and tenacity as visioners. My experience from my career in knowledge-based systems from the classroom, professional development, project management, engineering and science, technology and the arts were to find a new solution to the gaps in pre-service and in-service teaching. At all times, I had to remember that pre-service teachers would be admitted as in-service teachers. All of the content in the WBCTP embraced educational knowledge-based systems, collaborative and problem-solving skills, group work, and examining various resources and references, including seminal works of academics and thought influencers to create a new programme and model. However, none of the articles and books I have read could fill the gap and overcome the challenges at tertiary institutions.

The programme I created was unique and meant to inspire pre-service teachers to find their passion and inspiration and examine the world around them. They required an acquiring and inquiring mind, not cognitive dissonance. Sustainability must first be intrinsic to have the willpower to change, inspire, and shape a new generation of thought leaders. Whole Brain Creativity and Thinking dispels the myth that students are either right or left-brain thinkers and that their moves, careers, and choices are based on only one domain of brain dominance. My study argues for Whole Brain Creativity and Thinking instead of right or left-brain

dominance or split-brain theory in teaching and learning. Pre-service teachers must be whole in a holistic manner.

1.9.2 The Design Process:

The design process in the WBCTP was based on design thinking, a human-centred approach by D. Kelly. (1991, p. 89-108). He encouraged teaching design as an inspiration for teaching practice. It would redefine new learning, collect resources to function as reference points and take into context the environmental factors. “We moved from thinking of ourselves as designers to design thinkers. We have the methodology that enables us to come up with a solution that nobody has before.”

Design Thinking for pre-service teachers in the WBCTP required the following:

- **Question:** Question all previous, present and evolving knowledge for ideas
- **Inspiration:** Be inspired to be creative using the creative knowledge economy and innovation.
- **Generate ideas:** Examining various formats, designs and construction and choosing the best.
- **Tangible ideas:** Choosing the best idea inclusive of all variables and possibilities. It was holistic, flexible and workable.
- **Test to Learn:** The programme was peer-reviewed and tested to ensure it would offer the maximum benefit quickly.
- **Share:** The WBCTP was shared locally at a tertiary institution. Previously, streaming and grading in schools were based on brain dominance. Careers were chosen based on subjects one studied at school. In the WBCT programme, we engaged in whole brain input and output of thoughts, imagination, and creativity.

1.10 Theoretical Framework

Experiential learning is how we view the framework and the constructivist paradigm. Experiences and reality are socially constructed. However, we reach the Zone of Proximal Development by guiding social-emotional and vicarious learning. Vygotsky (1936), in his social-cultural theories, which I used for pre-service teachers, examined the pre-service

teachers' initial experiences and learning, planning, action, and reflections from experience and modelling by observing the facilitator. The modelling is in collaboration with peers as well. Experiential learning was most effective and best suited for the WBCT programme as pre-service teachers '... learn through the reflection of doing'. They were actively involved in the learning process, and achieving the outcomes was an excellent accomplishment for teaching and learning during their engagement in the programme. Kolb (2014) iterates the reflective model; the purpose is two-fold: To solve the problem by continued participation in a change situation and to provide effective guidelines for affective practices in professional development. The effective guidelines unpack the theory and practice of professional development and teaching through whole-brain thinking. Still, the affective practice involves the element of emotion, the senses, and the use of whole-brain creativity.

Nilsook *et al.* and Design Thinking reiterate Kolb's reflective model encouraging the creative best in individuals. They all expound that the creative process transforms the mind, body and emotions, and cognitive and affective processes when pushing boundaries. Taking risks and exploring the possibilities of human creativity allows the pre-service teacher to take the experience from one aspect of the cycle to another, allowing for variable contexts to be influenced. Any input in any experiential learning is multifaceted and allows for the evolution of the creative process. The brain's pre-frontal cortex is the seat for imagination, reasoning, and unlimited creativity. It allows the output students to try new ideas, experimenting with creativity for what is beyond existence. The output allows each individual to be unique by expanding the brain and neural processes. All experiences are recorded and collected, then stored in the brain, contributing to the brain's algorithm. This translates into data the brain repeatedly uses to assimilate, process, and output information. All of this is the creative economy for Higher Education.

Pre-service teachers faced many socio-economic and environmental challenges within the University of KwaZulu-Natal, Edgewood Campus. Hence, when they were at the workshop, they came from differing backgrounds and social constructs, including culture, tradition, history, language and economics, to shape their experiences. The first measure of being within a Whole Brain Creativity and Thinking Programme was to ensure each pre-service teacher's self-preservation such that the brain signals to the body that all is well and they are safe. Self-preservation in what we do is 'take a break' or 'timeout', which is ensured by icebreakers and creative activities. The amygdala is the tiniest part at the back of the brain and works as a flight or fright centre. Herrmann (1996) states that the amygdala is the centre for emotions, perception, motivation, fear, confusion, or emotional behaviour". Feelings of

confidence and self-assurance are generated from the brain domain where the social and emotional hub resides, i.e. The Right Side of the Brain. The collection of memories and emotions is for pre-service teachers to recognise and react in similar situations in the future.

Kolb's (2014, p. 38) Experiential theory states, "Learning is the process whereby knowledge is created through the transformation of experience." The pre-service teachers' experiences are gaining effective knowledge through thinking skills and affective experiences through the practice of Whole Brain Creativity and Thinking. The research method and design support Kolb's theory as pre-service teachers can enter the programme at any stage of the learning and teaching process and still gain experience. Invaluable insight into the four stages is further explained in Kolb's four-stage cycle.

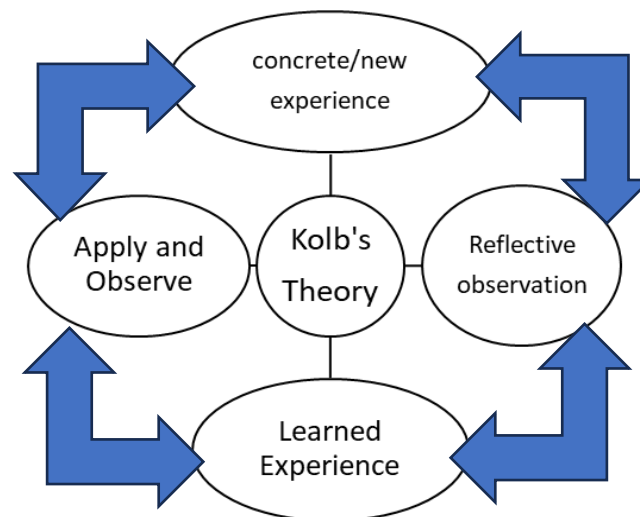


Figure 3. A diagrammatic representation of Kolb's Four Stage Cycle: Fiona Khan (2020)

Piaget (2008, p. 9) explained, "The principle goal of education in schools should be creating men and women who are capable of doing new things, not simply repeating what other generations have done; men and women who are creative, inventive and discoverers, who can be critical and verify and not accept, everything they are offered." Furthermore, in working in this 21st Century with all the challenges that we face, the knowledge and skills that may be required to live well in the world is aptly described by Brown-Martin (2017); "we think of creativity, innovation, ingenuity, higher order and critical thinking to solve complex and abstract problems as well as how to get along with one another and become civically engaged. Nevertheless, nothing in our formal education systems today is designed to meet the human challenges" (Brown-Martin, 2017, p. 8).

The transition from old to new educational approaches changes from knowledge transfer to knowledge acquisition through innovative and different practices and the students' experiences and reflections. Learning is an active process of creating one's constructs as information is imbibed and actively processed knowingly or unknowingly. In the WBCT programme, pre-service teachers are introduced to various literacies and reflect on their experiences and the convergence of new knowledge with previous knowledge. Students as pre-service teachers were inspired to use different techniques, including technology and digital and mobile literacies, in exploring their experiences as teachers and students.

My experiences with the pre-service teachers transcend through a metamorphosis, as resources and technology change through the pressing demand of computer-generated technology, artificial intelligence, robotics, and the introduction of the 4th Industrial Revolution. Through Action Research, and the Critical Transformation Theory, the WBCT programme encourages the change in classroom practice with pre-service teachers for the global common good. "The Internet of Things is becoming mainstream, forcing organisations to re-examine their value creation methodologies in light of new consumer behaviour and expectations. The Internet of Things will reframe the existence of the ones enriched by it. It will do so not because it can, but because our motivation will demand it." (Manu, 2016, p. 1).

Much of the advancement of technology in its use and betterment is based on previous knowledge and the limitations or opportunities availed from present knowledge. The WBCT programme, through Kolb's (2014) and Piaget's (2008) model, encourages the effective and affective use of whole-brain thinking and creativity in pre-service teachers using technology. The programme used or is based on the inputs from the WBCT programme, i.e., SDG4 - ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all and SDG 11- making cities and human settlements inclusive, safe, resilient and sustainable. One of the critical indicators in *Rethinking Education*, a publication by UNESCO, is "... raising the standards for teachers and putting classroom management and curriculum building decisions in the hands of the community" (Peña-López, 2017, p. 5).

1.11 Research Design and Methodology

An interpretive, qualitative, narrative action research was designed and conducted. McNiff and Whitehead (2011) quote Lewin (1981), the founder of action research, as the process that "... gives credence to the development of powers of reflective thought, discussion, decision and action." Through change, action research improves educational

practice through one's actions and reflection. This means that the theory is valid through practice. I used literature study and qualitative data gathering methods, and content analysis because it was a subjective study and a constructivist paradigm. Pre-service teachers at a university in Durban, South Africa, from all phases of teaching fields/specialisations and different levels of study (undergraduate and postgraduate), responded to the call to attend a student programme - Whole Brain Creativity and Thinking Programme.

1.11.1 Data gathering

The data gathered included document analysis (reflective journal, student work) and visual methodology (videos, drawings and slides). I used the reflective journal to write the reflections concerning the design and implementation of the four concepts, including using various strategies and resources. The reflections recorded my experiences and gave insight into how vital change in methodology is to the mindset and practice of teaching. It was imperative to reflect in my analysis on the pre-service teachers' work used. They were the poems and materials they made, the videos and slides were included during the design and implementation, and the drawings were the pre-service teachers' tasks. I included our discussions and feedback, their diaries and experiences of the programme to add impetus to the WBCTP of the programme's impact even though it was my narrative. Knowing their responses would increase the shift and impact knowledge acquisition.

1.11.2. Data analysis entailed a content approach to data analysis that was objective based on experiences, knowledge and references and was, therefore, interpretive. The depth of thought from many inferences and experiences emerged from the data.

1.11.3 The Ethics of the Research: The ethics were trustworthiness. Knowing it is narrative action research, it was a critical inquiry into my own experience, practice, and profession in teaching and learning, and it was meant to enhance that of the pre-service teachers through their experience of the programme. Thus, the research must exhibit the highest ethical standards through the analysis methods, which were systematic and disclosed methods of analysis that were credible and consistent. Lincoln and Guba (1985) argue that qualitative inquiry findings are "worth paying attention to" based on credibility, dependability, transferability and conformability. The four workshops revealed persistent observation, discussion, and procedures that increased credibility.

1.11.4 Research rigour: To increase trustworthiness, I followed all the rules of design and delivery, facilitation and commitment. I accepted accountability, vulnerability, honesty

and competence with the utmost truth and without favour. The research revealed that the design, method and conclusions are without bias. As action research, all conclusions and results are explicitly expressed and bias-free. The qualitative research and findings can be open to critique and provide the foundation for further research and findings. The design and implementation experiences and findings in the WBCTP and model are mine and are unbiased.

1.12 The Plan of the Dissertation

The subsequent chapters will include the following:

CHAPTER 2: Literature Review.

I present the literature review on the research literature related to designing and implementing a Whole Brain Creativity and Thinking Programme. In this review, I discuss the content, concepts and data and compare it with other relevant research to establish the gaps or niches in the field of study.

CHAPTER 3: Research Design and Methodology.

In chapter three, I present the research design and the methodology used to research the development of the Whole Brain Creativity and Thinking Programme and Model. The research procedure and design included data generation of document analysis (reflective journal, student work) and visual methodology (videos, drawings and slides). The chapter includes the following key aspects: the study research type and area, sampling techniques, sample size, and application of the research data gathering tools. I discuss the data gathering, analysis process, and trustworthiness used in designing and implementing the WBCTP model and programme. Trustworthiness and ethics were influential throughout the study.

CHAPTER 4: The Four Cycles.

In this chapter, I have compiled all the summaries of the four cycles in action research for the Whole Brain Creativity and Thinking Programme and Model. Chapter Four is an

interpretation and a presentation of the plan of the findings of the WBCT programme. As a community engagement project, the objectives of the more comprehensive study were to develop, design and implement a programme and model to explore the pre-service teachers' experiences (understandings and actions) of the WBCT. In this programme, the pre-service teachers were engaged in creativity, innovation, collaboration and critical thinking using the principles of Whole Brain Creativity and Thinking. Furthermore, the focus and objective of this study were to explore what, how and why I designed and implemented the WBCTP and model in the way I did, what, how, and why I created the programme and model, and what the content of the programme and model was. The programme and model are based on the narrative action research theory and experiential learning and follow the principles of the design and development of a programme and model.

CHAPTER 5: Findings: Workshop1: Environmental Sustainable Development

In designing the first workshop on Environmental Sustainable Development, I set a precedence for the other three workshops: Imagineering, Business Model and STEAM. All the workshops had to be concise, impactful, creative, and innovative. I considered the main focal point, Whole Brain Creativity and Thinking, as the guide in the pre-service teachers' experiences. In every aspect of planning and implementation, it had to engage a whole-brain experience. Workshop One was the platform and the ideation for other workshops. Using Design Thinking, I had to be mindful of the content, my presentation style, my rapport with the pre-service teachers, my whole brain knowledge and experience, and being a role model for change and innovation through lifelong learning. I recorded this as my observation and experience. I had to be cautious that there were no biases and that all information was factual with resources. The context and content had to be aligned with future visioners' and Imagineers' purposes and goals. I considered the virtual and hands-on training and activities based on the objectives.

CHAPTER 6: Findings: Workshop 2: Imagineering

Imagineering in Education is a new concept I created for pre-service teachers within the WBCT programme. The context of Imagineering, unpacked by Imagineers (creative, imaginative, engineering designers), is a concept of Whole Brain Thinking and Creativity. Imagineering welds the ideas of creativity with cognitive thinking skills to create fantasy, play, and abstract thinking in a holistic classroom. WBCTP allows for continuous details, visualisation, development, and artistry for innovation and creativity. Creativity through

experiential storytelling becomes an outer manifestation of whole-brain thinking, creativity, and intellectual processes. Imagineering is the building block of creative thinking and design, inspiring aspirants to be visioners. I take teaching from the chalkboard into integrative, interactive, techno-driven methodologies and pedagogical content knowledge. Teaching and learning are entrepreneurial, profitable, and beneficial to pre-service teachers and learners.

CHAPTER 7: Findings: Workshop 3: Business Model

Having designed and implemented Workshop One and Two, I moved on to Workshop Three and established the basics of STEAM education through a Business Model. Kolb's (2014) experiential learning cycle is a critical aspect of the learning process in the workshops. We examined a whole teacher with holistic values. We went back to basics (Back 2 Basics) to affirm our roles in being human, i.e. Human-to-human (Human 2 Human) interactions are integral to our daily interactions, whether in or out of the classroom. Socio-environmental interactions impact conscious and subconscious daily activities in value-based education. Pre-service teachers' experiences within the programme and previous knowledge change their views and perspectives of the future and how enterprising they can be as teacherpreneurs. In this workshop, we remind pre-service teachers that the situation in a lecture hall is almost the same as a learner in the classroom. Professional development and team building are central to the platform for STEAM education.

CHAPTER 8: Findings: Workshop 4: STEAM

Chapter 8 encompasses the three previous workshops and how they encapsulate STEAM education for a Whole-brain experience. McNiff and Whitehead (2011, p. 12) extrapolate, "The focus of your research will be your action to achieve the purpose you set for yourself". The primary purpose of this research was the experiences of designing and implementing a WBCTP for pre-service teachers. Within the programme, Workshop Four encapsulates all the elements of the previous workshops for the vital importance of teaching STEAM at tertiary institutions and including STEAM in the curriculum within the model of the Whole Brain Creativity and Thinking Programme.

STEAM education is an acronym for Science, Technology, Engineering and Environmental, Arts and Mathematics. We require Wholistic teachers in a holistic environment to implement holistic education for cognitive skills, which is STEAM. The subjects guide critical thinking, communication, inquiry-based thinking and tasks, whole-

brained thinking, innovation and creativity. STEAM is excellent for inclusive classrooms and learners to understand content and concepts better. It must be introduced to tertiary institutions as various teaching methods can be used interchangeably. The Arts support STEM subjects for a more interactive learning experience and style.

CHAPTER 9: Conclusion, Recommendations and Future Research

This chapter concludes the significant findings relevant to designing a programme. Interpretivism, an epistemological exposition for the study, was undertaken to understand and discuss the presentation and findings. Diverse perspectives and experiences were reviewed based on different theorists and academics. Pre-service teachers, in the context of the theoretical framework underpinning this study, the seminal work of Ned Herrmann, together with the various literatures consulted, were able to provide meaning and give impetus to new content concerning the design and implementation of the WBCT programme. The objective and purpose of the study were to create and design and implement a programme and project a future model by understanding my engagement with these processes. A model for the future design and implementation of short programmes for undergraduates and pre-service teachers addressing SKAVS and leadership.

CHAPTER 10: Appendices

CHAPTER 11: References and Bibliography

Chapter 2

2. LITERATURE REVIEW

2.1. Introduction

I present the literature review on the research literature related to designing and implementing a Whole Brain Creativity and Thinking Programme. In this review, I discuss the content, concepts and data and compare it with other relevant research to establish the gaps or niches in the field of study.

“Education alone cannot hope to solve all development challenges, but a humanistic and holistic approach to education can and should contribute to achieving a newly developed model”. *Rethinking Education*, (UNESCO, 2015, pp. 32-33). Developing a new model and programme for Whole Brain Creativity and Thinking for tertiary institutions was defined by acquiring knowledge from the most effective and affective concepts and expertise.

2.2 Developing a Programme

2.2.1 What is a Programme?

A programme is defined by the Longman’s Dictionary of Contemporary English as “a programme is a collection of related projects or related sequential actions designed to deliver

a tangible output”. The WBCTP, therefore, has four related concepts which are related and each concept was delivered sequentially to ignite the latent potential and assist the pre-service teacher in examining and sharing their experiences within the context of the programme. Furthermore, the WBCTP is primed on Kolb’s (2014) experiential learning and cognitive styles for whole-brain functioning. The idea behind a new programme was intended to bring changes in education in a rapidly changing society, including the workplace and workplace experience, which can be hybrid. There would be diversity and changes in approaches, methodology and the learning environment. The design was creating a programme to suit the needs and aspirations of pre-service teachers embellished with technology and the Fourth Industrial Revolution but to energise their thinking and creativity in a changing learning environment of integral value-based education.

2.2.2 What is a Model?

As the Oxford Dictionary explains, a model represents a proposed structure. In Herrmann’s Whole Brain Model, much of his work elaborated on Sperry’s initial exegesis, the Split-Brain Theory. However, Herrmann (1996) created and examined a plethora of new knowledge in whole brain function and its ground-breaking creativity and thinking skills in business for optimum performance and achievement in individuals. “But typically, it is an *implicit* model in which the assumptions are hidden, their internal consistency is untested, their logical consequences are unknown, and their relation to data is unknown. However, when you close your eyes and imagine an epidemic spreading or any other social dynamic, you are running *some* model or other. It is just an implicit model you have not written down” (Epstein, 2008). The Whole Brain Business book (1996) was, as Epstein (2008) explained, “When you alter the assumptions, *that* is what happens. By writing explicit models, you let others replicate your results.” Herrmann (1996) acknowledged Sperry’s research, created a logical representation of a previous model and findings, explored new knowledge, suggested dynamic analogies, and researched plausible outcomes from uncertain theories. Furthermore,

he educated the public through his book (and his programmes are still used in business) and simplified the complex concept of the Whole Brain Theory. Herrmann (1996, p. 6) wrote: “At the core of Whole Brain Technology is a metaphor of how I believe the brain works. It is founded on my brain-based research and observable evidence that thinking styles can be best described as a coalition of four different thinking selves”.

Research on the Herrmann Whole Brain model explored its disparity in teaching and learning in pre-service teachers. However, it has not been expounded in its entirety. Herrmann (1996) explains his theory as every individual having the objective of being as whole-brained as possible, although one has solid and dominant preferences reflected through one’s personality. Herrmann (1996), a model is a prototype or demo of a system or body of work. It also indicates that as much as his theory was seminal, it was metaphorically a seed planted, and the exploration further into Whole Brain functioning was exponential and multifaceted. The Whole Brain Model provided the foundation for many more models and programmes that could be developed from the Whole Brain Model. Herrmann (1996, p. 35), “The grand design is to be whole; that the normal, ordinary, everyday brain is specialised and interconnected in ways that position it to develop as balanced....” Everyone has a preferred quadrant of brain dominance; however, any other quadrant works with the dominant quadrant. Individuals can embrace any other quadrant of the brain at any time in their development and growth. He firmly believed that the “multi-dominant brain capable of accessing and using all of its mental options”. Herrmann (1996, p. 35) “Mental preferences we have already reinforced them many times over so that they have now developed sufficient strength to become a mind of their own.” The preferences are reinforced since childhood with socio-environmental and socio-emotional influences. In essence, we are shaped by our dominant thoughts and the influences on thinking.

Two different researchers from South Africa worked with the Whole Brain Model. One examined the effectiveness of creativity among nurses, and the other the effectiveness of

thinking independently at a higher education institution. Potgieter (1999) explored creativity in the nursing fraternity, and de Boer (2001) studied thinking styles and how multiple intelligences can be nourished among undergraduates by using and developing their full potential. de Boer (2001) deduced, “Research on whole brain thinking and multiple intelligence shows that these human attributes form an integral part of one's interaction with life - one's environment and especially people as an integral part of the environment.”

Pre-service teachers required the **Affluence of Knowledge** to exalt the future of education. The Affluence of Knowledge is a new terminology I introduced into the literature. The **Affluence of Knowledge** is the increase in SKAVS in pre-service teachers who are Visioners and Imagineers who stay ahead of others to carve leadership ownership. The ideation period was a lengthy process detailing ideas for innovative and creative solutions tailored to the needs of present, 21st-century pre-service teachers who were overawed with technology and social media. The challenge was to take their enthusiasm for technology and their exuberance for a Digital Identity to take their skill into the classroom. Pre-service teachers require digital and mobile skills, multi-modal thinking, the attributes of leadership and game changers, and upkeep values and ethics for social benefit through cohesion and moral regeneration and that starts in the classroom. The ingenuity was vital as I developed and tested a programme prototype in a non-linear phase. The WBCT programme was then implemented for pre-service teachers to experience and replicate a measure of reformation and transformation in their experience. The very same process was duplicated in Imagineering and the Business Model.

2.2.3 Implementing a Programme

Alsubaie (2016, p. 106-107) discusses the development of a new model and programme “It must be a useable tool to assist teachers in the development of individualised strategies and the methods and materials necessary for them to be successful.” Comparing

model and programme development with Hussain, Dogar, Azeem and Shakoor (2011) outlines the fundamental questions that must be asked when designing a programme or curriculum and developing and implementing a model and programme that addresses the needs of society or a particular group. Hoosen et al. (2011, p. 2) asked four basic questions - “What to teach? When to teach? How to teach? What is the impact of teaching?”

In implementing the model and programme, the needs of pre-service teachers and the gap within tertiary institutions, which remained un contemplated, were explored. The development of such a model included transformation. Included in the programme were the five W’s and an H. (5 W’s and an H) to better understand the implementation. I commonly use the questions to comprehend any aspect of design thinking, comprehension and development. Questioning the design is a part of ideation and iteration in design thinking. The questions of implementation remain: What to teach? Why do we teach? When to teach? Who to teach? How to teach? What is the impact or experiences on those being taught? The questions asked in planning a template for a model or programme provided the information I required and how that information translated into methodology and pedagogy. Print (1993, p. 122) discusses a situation analysis concerning curriculum design to be “aware of the curriculum presage factors affecting them, to bring a reasoned, rational approach to the development of curricula... to take account of local factors when developing curriculum to meet student needs”. Using the questions asked by Print (1993) and based on the *South African Professional Development Structural Framework* and resources, I substituted answers to Print’s (1993) questions.

a) What to teach?

“Cultural and social changes and expectations”: Pre-service teachers' goals and expectations, expectations of their communities and employees, their contribution to inclusive communities, and the relationship and precepts between educator and learner through value-based education. Forging ahead with their

acquaintance with technology, sustainable goals and artistic expression, pre-service teachers were still connected to their communities and the rural lifestyle, away from urbanisation.

b) “Educational system requirements and challenges”: Examining policy documents within the Department of Education, the different modalities for examinations and assessments, curriculum development and transformation, and education research. Furthermore, taking an ethnocentric perspective, the pre-service teachers’ expectations were my reality. The empathy mapping in Design Thinking included their experiences of what they said, thinking skills and social-emotional health.

c) “The changing nature of the subject matter to be taught”: Pre-service teachers should be directed to understand the changing nature of education and curriculums. In South Africa, we have a penchant for change in curriculums with the change in government. Understanding the subject matter and the needs of the pre-service teachers, taking into consideration the subjects they would teach, they should be encouraged to be innovative through ideation in Design Thinking. The process is non-linear and should be revisited continually to improve the methodology and pedagogy through action research.

d) “The potential contribution of the teacher-support system”: The consideration that the capacity building and strategies for the teacher support system should have access to high-quality Learner Teacher Support Material (LTSM), coaching and mentoring by unions and the Department of Basic Education, Tertiary institutions for pre-service and in-service teachers, research institutes and Non-Governmental Organizations, Public Benefit Organizations, South African Council for Educators (SACE), Lifelong learning. Subsidies, Mental Health support, Professional

Development Framework, teacher centres, Subject Specialists Training and support and digital training and support, Integrated Quality Management System (IQMS).

e) “Flow of resources into the school”: The Department of Basic Education provides registration with the South African Council for Educators. Registered professionals can apply for teacher awards; they have access to planning resources, Curriculum resources, Classroom management, safety and policy briefs, exemplars, professional development resources, digital resources, community engagement, and Corporate Social Investment and Responsibility.

f) “Pupils: aptitudes, abilities and defined education need”: Resource kits are available, Continuous Assessment and Policy Statement (CAPS), Learner Performance Support, manuals for teachers and learners, Reading Strategies, and study guides.

g) “Teachers”: value, attitudes, skills, knowledge, experience, social strengths and weaknesses, roles, professional development, Integrated Quality Management Systems (IQMS) and expertise in specialist subjects, induction booklet, short courses protocol documents, communities’ guidelines, Continuous Professional Development (CPD). Include socio-emotional learning, mindfulness and EQ.

h) “School ethos and political structure”: Schools mission and vision implantation plan, core values, Inclusivity and Special Educational Needs, Diversity and The Bill of Rights, The South African Constitution and schools’ structures. Common assumptions and expectations include power conformity to norms and dealing with deviance.

I) “Material resources including plant, equipment, and potential for enhancing these”: Provided by the Department of Education; however, schools are encouraged to engage with communities for CSI and CSR.

j) “Perceived and felt problems and shortcomings in the existing curriculum”:

The IQMS provides guidelines for teachers to implement strategies, engage in community-based projects to enhance their professional development portfolios, and collaborate with other staff members and teaching communities within the districts, circuits and communities.

Further to the above, implementing a programme and model should be strategic enough to include planning intention objectives, designing and implementing procedures in presenting a programme, and methods and activities to employ. Ultimately, the objectives corresponded should correspond with the outcomes.

2.3 Social-Emotional Learning:

Social Emotional Learning (SEL), within the Whole Brain Creativity programme, contributed towards examining pre-service teachers’ experiences on a social and emotional level. This is when pre-service teachers can identify emotions while navigating studies and be mindful of feelings and their engagement to create a more collaborative social environment. Social and emotional experiences enhanced by the five senses during the presentation of the WBCTP serve to drive the learning experiences of the pre-service teachers. SEL is learning through emotions in a social context. Gazibara (2013, p. 71) explains, “Their social experiences from the previous and present knowledge and the emotional experiences were from their response to the social environment”. An example of the emotional experience is Ned Herrmann’s whole brain theory engaging with visual literacy. It informed the affective, creative right side of the brain, whereas the analysis of visual literacy informed the left, analytical, logical side of the brain, indicating a whole brain experience.

“Such changes are especially relevant in the context of lifelong learning, which integrates all three domains of learning: cognitive (head), affective (heart) and

practical skills (hands). In this way, cognitive, affective, experiential and active learning interests are fully expressed, which bears witness to the fact that people learn, think, feel and act differently” (Gazibara, 2013, pp. 71-72). How we feel affects how we learn especially for a holistic pre-service teacher. Gazibara (2013) elaborates, “to encourage the student to take an active part in the acquisition of knowledge, which includes an independent search for comprehensive answers, understanding life and the surrounding world”. The Whole Brain Creativity and Thinking programme included Emotional Intelligence, Mindfulness and Head, Heart and Hands for the intercession in allowing pre-service teachers to be whole-brained with empathy, compassion, and social-emotional learning so that it transcends into the classroom.

It is, therefore, a wholistic learning experience for both pre-service teachers and learners in classroom management and professional development. Sustainable Development, Imagineering, Business Model and Science, Technology, Engineering, Art and Mathematics (STEAM) principles are the four concepts of the Whole Brain Thinking and Creativity Programme (WBCTP). Regarding Whole Brain indicators, we glance at other branches of measuring whole-brain thinking. It is imperative to note that the Measurements or measuring instruments will be presented as something other than an anomaly in my research. A structured approach to experiential learning through whole-brain creativity and thinking must be added to past methodology and pedagogy. “Not only can you analyse how you think but also how others think,” Herrmann (1996, p.37).

Developing a programme and model in teaching and learning for pre-service and in-service teachers establishes new strategies that have yet to be practised profitably. The emphasis is on profitability. In this chapter, I focus on research already completed on whole brain theory. It blends with theories in pedagogy, methodology and research contributing to the WBCTP that have not been explored before within

the parameters of whole brain creativity and thinking. My input of new concepts in the literature introduced new concepts to design that enhances the WBCTP and elevate methodology and pedagogy within teaching and learning in pre-service teachers.

2.4 Conceptual Framework

The conceptual framework encapsulated the comparative literature based on research by other researchers or the lack thereof to address the research questions with meaningful answers. This was done through assumptions, knowledge, or beliefs and how I presented them. In this research, it is a narrative account.

I addressed the knowledge gap, answered questions, and explained concepts researchers have neither used nor explained before within the Whole Brain Theory nor among pre-service teachers in higher Education. The basis of my research is Herrmann's (1996) seminal work, *The Whole Brain Business Book*, together with the four concepts through experiential learning, provides the framework for a new programme, modelling a new design in classroom practice and pedagogy. The four concepts of Sustainability, Imagineering, Business Model and STEAM examined the effects of sustainability, the environment, behavioural, social and spiritual intelligence, the cognitive through emotional and intellectual experiences and the interpersonal relationships for the professional development of the pre-service teacher. A programme should encourage effective and affective teaching and learning.

Only a few articles were published in the scanning for the literature review section. Information on designing and implementing a programme and Whole Brain were scant. I, therefore, developed the paradigm of the WBCTP. Visual literacy and technology provide the infrastructure for comprehending various aspects of the programme and obtaining detailed reflections on the experiences and recommendations. Gagné's (1992) taxonomy of learning to capture pre-service teachers' attention aligns with Kolb, Nilsook et al. and the interpretive paradigm.

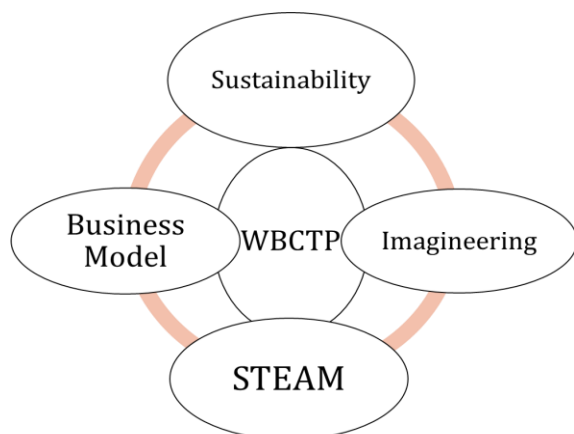


Figure 4. A graphic representation of the Whole Brain Creativity and Thinking Programme. Fiona Khan (2020)

2.4.1. Thinking and Creativity:

Models and programmes represent ideas and thought processes. Sometimes, they represent a system or phenomena, objects or hypotheses. They communicate explanations and solutions in science and technology when understanding and logical explanations are incomplete or incongruent.

Creativity, according to Kaufman (2016, p. 10), is explained as “Creativity is a synonym for Imagination. Thinking new ideas and deciding which ones are best, whereas innovation entails implementing these ideas.” He further emphasises that unless “creativity and imagination materialise into something concrete, it remains a sheer fantasy. Transforming creativity into something concrete or a product allows for entrepreneurship.” (2016, p.10). Thus, the Business Model, like the other three models in the WBCTP, is very much a creative, entrepreneurial concept and process of the programme. Creativity, on the other hand, has become a critical consideration because it “... becomes a force of great value when applied to causes that benefit humankind and the world at large” (Livingston, 2010, p. 61).

Mosely, Baumfield and Elliot (2005, p. 371) define thinking as “a human activity that involves cognition (knowing), affect (feeling) and conation (wanting and willing)”. However, De Bono (2017) critically examines the interpretation of thinking and creativity since its inception. The meaning of thinking may be based on “Socrates who emphasised argument and dialogue, Plato who focused on truth and appearance and what lies beneath the surface ...Aristotle who used judgment as an active process of choice both internally and externally” (De Bono, 2017, p. 6). The argument widens the gap between cognition and meta-cognition for a whole brain experience. Flavell (1979), who introduced metacognition, proposed that metacognition consists of metacognitive knowledge and experiences. Livingston (2003) describes the machinations of thought processing and thinking styles, “Metacognition refers to higher order thinking that involves active control over the cognitive processes engaged in learning. Because metacognition plays a critical role in successful learning”. Pre-service teachers need knowledge and experience to be capable of the strategies to be implemented. Naushad (2008), in his exegesis ‘*cognitions about cognitions*’ wraps the higher order thinking as, “It is usually related to learners' knowledge, awareness and control of the processes by which they learn and the metacognitive learner is thought to be characterised by the ability to recognise, evaluate and, where needed, reconstruct existing ideas”. It brings us back to De Bono (2017, p. 7) who concludes, “Western thinking is all about ‘what is’ which is determined by analysis, judgment, and argument. However, another aspect of ‘what can be’ and ‘what if’ involves constructive thinking, creative thinking and designing a way forward.” Thinking styles are based on the processing of information. Western styles of thinking and psychology believe ‘what if’ and ‘if only’ are counterfactual thinking. In designing, it is creativity and innovation.

Bloom (1964) examined three models to classify learning objectives and thinking styles into levels of complexity and specificity. The hierarchical models are still used today for teaching and learning in schools. *Bloom's Taxonomy* is also used by teachers in the unpacking of the curriculum and assessments. The three learning objectives or domains of learning and thinking were cognitive, affective and psychomotor. Bloom's (1964) taxonomy was nouns in cognitive skills for teaching and instructional planning. Anderson and Krathwohl (2001) revised the taxonomy into active verbs and strategies for teaching and learning. Whereas Bloom (1956) classified his first attempt at taxonomy through assessments and curriculum development, which were more concrete, Anderson and Krathwohl (2001) examined the continuous learning process and instructional process through questioning by taking strategic action when revising and developing through metacognition.

Bloom's Taxonomy:

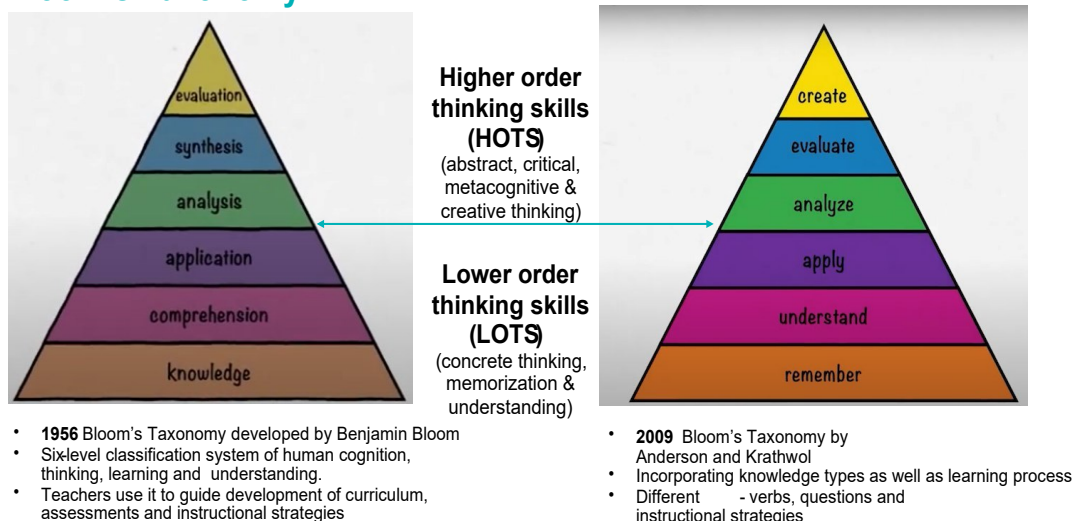


Figure 5. Bloom's Taxonomy illustrated by Oxford University Press (2022)

In the WBCTP, critical and divergent thinking contribute to pre-service teachers' whole brain function and processing as continuous learning in a holistic

paradigm shift. Pre-service teachers were encouraged to be curious with fresh eyes and to ask questions using different lenses by eliminating preconceived beliefs and myths. Subsequently, the principles of Bloom (1964) provided a relative cognitive framework for pedagogy. Still, the methodology was aligned with Krathwohl and Anderson's (2001) metacognition. Pre-service teachers internalised their experiences for a more critical evaluation of self and their impact on teaching and learning. The programme was designed for self-enhancement with automatic processing. I ensured there was no confusing academic jargon. Moreover, the language was simple and contemporary.

Gagné (1992) explores short-term and long-term memory, retention and transfer through stimuli and sensory perception in gaining attention and the cognitive response to the stimuli. Gagné (1992) presents the framework for learning conditions, which includes the thinking styles and their internal and external responses. I argue that the WBCTP programme should enable using the five senses and visual literacy, especially blending and additional bilingualism.

In his approach, Walt Disney (Gabler, 2007) used digital media and visual literacy with creative and divergent thinking styles to process information, combining cognition and metacognition. His main aim was to think out of the box and create digital art and animation that was unique and visually pleasing with subliminal messaging. Walt Disney integrated the concept of collaborative creative thinking and design thinking. He combined Engineering and Mathematics with Art, creating a new phenomenon called Imagineering. Disney believed that all creative ideas and output or prototypes must start from the foundation and be built upwards. Much of his work included Design thinking in being iterative by working and refining ideas into a successful visual feast. His work in animation encompassed deep thinking processes for a whole brain experience. He made animations for people to love and need, practical

stimuli and viewed in content and context. An inclusion and focus on Imagineering should explore the causes and effects in teaching and learning, the propensity for inclusivity, and to examine different perspectives in a multicultural environment. Gabler (2007) speaks of Disney emerging to the viewer with various emotions, most importantly empathy, apart from invaluable moral lessons and love. In adopting a design that includes Imagineering as one of the concepts in creativity and technology, the emotional aspects are considered. Moreover, an opportunity for pre-service teachers to interpret resources, learning concepts and content through visual literacy should be created, as they should be able to teach in an inclusive classroom to cater to all learners. The introduction of Disney videos and music, cartoons and visual imagery to raise various thinking skills within a programme should be considered. With enthusiasm and positivity, the concept of visioners in Imagineering is unfolded.

Working in this 21st Century with all the challenges that we face, the knowledge and skills required to live well in the world are aptly described by Brown-Martin (2017): “We think of creativity, innovation, ingenuity, higher order and critical thinking to solve complex and abstract problems as well as how to get along with one another and become civically engaged. However, nothing in our formal education systems today is designed to meet the human challenges” (Brown-Martin, 2017, p. 8).

2.4.2 Mindfulness

Thich Nhat Hanh (2001), the originator of the concept of Mindfulness which dates back to the 6th century India and Zen Buddhism, encouraged the absence of preconceived beliefs and seeing things with fresh eyes. One can only accomplish this when one understands feelings and attitudes and has control of the mind and the body. Awareness and empathy are pivotal, as are the foundations of the body, senses, mind

and mental contents. The tenets and concept of Mindfulness exploded into mainstream culture and education by Jon Kabat-Zinn (1979). Kabat-Zinn encouraged mindfulness to reduce stress. In a programme, mindfulness in the Business Model focuses on pre-service teachers being in control of their environment and careers with unexpected ideas and infinite possibilities in entrepreneurship. Mindfulness is essential to Emotional Intelligence (EQ), a concept encouraging empathy and compassion. Empathy is the most critical aspect of Design Thinking, as well as understanding the needs and limitations of pre-service teachers, which translates into the classroom.

Crane, Kuyken, Williams, Hastings, Cooper, and Fennell (2012, p. 4) inspect workplace competence, including “expressions of ‘performance’ and ‘role’”. The teaching process is not seen as a set of techniques and a collection of skills which can be learned.” They discuss further changing perspectives: “Perspective in teaching is about ‘right’ and ‘wrong’ and judgement and opinions. Mindfulness is about the universal aspects of human experience”. Any programme developed should encourage diversity and inclusivity, considering the historical background and the profound impact of psycho-social, socio-economic and environmental factors, as the pre-service lived experiences inform their perceptions, feelings, ideas and personality. From what was experienced previously in teaching and learning, pedagogy and methodology, Crane *et al.* (2012) considered changing the rationale, “In mindfulness, the teacher can become a vehicle for conveying vulnerability in contrast to a position of ‘expertise’ or competence,” the importance of collaborative thinking and sharing in professional development. Personal development is summed, “The Self is removed in ‘my’ teaching and ‘my’ experience and ‘my’ competence. There must be connectivity, wider perspectives and spaciousness”. (Crane *et al.*, 2012)

A programme that explores pre-service teachers' mindset, feelings, and ability to discover, define, develop and deliver within its context through their experiences in the programme is essential. This could be explored through creativity and efficacy. Furthermore, the self-concept is considered self-reflective of experiences and the self without being a conduit of change. So, Whole Brain Processing is an "active cognitive process that involves understanding and reasoning, including the assimilation and translation of words into an active experience. Two processes... Interest to get the process off the ground and Application ensures ideas are implemented to solve real problems." (Herrmann 1996, p. 217)

The effort to create a WBCT programme influences the impact and effect on the future of teaching and learning. Considering the action research perpetuated, the diverse, multicultural implementation, and breaking stigmas associated with education,

2.5 The Herrmann Model of Whole Brain Thinking and Creativity.

The Herrmann Whole Brain Model is the basis of the programme. Research on the Herrmann Whole Brain Thinking and Creativity model was explored in its disparity for teaching and learning in pre-service teachers. In South Africa, Potgieter explored creativity in nurses, and De Boer explored thinking styles and creativity in pre-service teachers. Herrmann's people-centred approach indicates pre-service teachers becoming pedagogical changers for social change at social institutions.

Sperry (1975), who predated Herrmann's whole brain research, has shown through his experiments that the brain is divided into two hemispheres, each with a specialisation. This theory is called the "Split Brain Theory" (Sperry, 1975, p. 30). "The corpus callosum connects the two hemispheres, and when severed, each side of the brain could function independently with perception, impulses and concepts."

(Sperry 1975, p. 31) states, “. . . human beings are the only mammals whose left and right brains are specialised for different functions”. Sperry’s Model provided the foundation for the Herrmann Model when Sperry further explained, “The two hemispheres could be trained concurrently to learn mutually contradictory solutions to a task with no apparent mental conflict. It was as if each hemisphere has a mind of its own.” (Sperry, 1975, p. 32) The left hemisphere’s cognitive competencies are mathematical, verbal and analytical-logical. The right hemisphere competencies are spatial, creative and cannot be replaced by computer-generated technology.

Herrmann (1996) uses Sperry’s model and extends the exploration of effective and affective use of innovative creativity and lifelong learning through the juxtaposition of whole-brain thinking, creativity, ownership and creative ideas. Herrmann (1996) explains his theory as every individual having the objective of being as whole-brained as possible, although one has solid and dominant preferences reflected through one’s personality. Everyone has a preferred quadrant of brain dominance; however, any other quadrant works with the dominant quadrant, and any individual can embrace any other quadrant at any time in their development and growth. Therefore, different brain domains can work concurrently for whole-brain thinking and creativity.

‘Rather than Brain Dominance from Sperry, we explore brain preferences as a constructive whole in thinking’ (Herrmann, 1996, p. 29). Understanding creativity with Herrmann (1996, p. 214), “Creativity is about the interconnectivity of using all four brain quadrants. However, every individual has a brain preference.” In other words, he dispels the myth of right-brain or left-brain dominance or domain dominance in determining a person’s intelligence and creativity, as expressed by Sperry (1976). He further explains brain dominance as the part used the most “develops to a higher level than the non-dominant one” (Sperry, 1976, p. 17). In the Herrmann Model of Whole

Brain Thinking and Creativity, the entire brain function is interlinked and interrelated, and one hemisphere of the brain works concurrently with the other as much as it can work independently. Academics and educators have attempted to adapt teaching and learning, which had become prescriptive, focusing on discipline in students and learners based on stimuli and responses. Herrmann (1996) explains further, “In the individual-centred approach, the person or individual is the centre of the decision-making process. It requires socio-cognitive, creativity, innovativeness, mentoring, and sharing ideas with effort and constructive feedback.” Herrmann (1996) summarily indicated the interconnectivity through blending four quadrants with the four thinking styles as a preference in interests, competency development, decision making and influencing choices. His observations were successfully implemented as the basis for high performance and creativity for professional development. Furthermore, the Herrmann model is the foundation for individual success and achievement in different areas of life and in’s professional life.

Derived from the basis that ownership allows for creativity and innovativeness, pre-service teachers could adopt an attitude of creative classroom practice and the right to increase performance and outcomes. The effectiveness is in best practice rather than being an employee and dissociated from strategic and collaborative growth with benefits. The four quadrants have a specialisation of each quadrant. However, the representation indicates the congruence between all four quadrants through cognitive, instinctive and limbic systems as much as the dominance of each quadrant. The model is an adapted representation of Herrmann’s (1996) seminal work for whole brain creativity and thinking entitled *The Whole Brain Business Book*. The book was developed for business professionals; however, the principles applied to best business

practices for success can be applied to all areas of professional development. The principles of leadership may be applied to pre-service teachers.

In developing the new literature, the concepts (meaning and application) from the Whole Brain Business Book into the Whole Brain Creativity and Thinking Programme, it was crucial that I worked with paradoxes. It started as an absurd and abstract concept. Literature was limited. Instinct and understanding of the subconscious that the proposition, after years of teaching, tutoring undergraduates and contributing to the curriculum, the concepts within the Whole Brain Creativity and Thinking Programme would be groundbreaking, innovative, and unique but filling the gap that was sorely missing in pre-service teachers. On investigation, it was well-founded and workable. A core factor was thinking skills and overcoming the prejudice of language and literacy. The challenges for language and literacy would be cyclical if they were not corrected at the Foundation Phase.

As I examined the source of the programme, Ned Herrmann's *Whole Brain Business Model* (1996), I was more convinced that the Whole Brain Business model can be used within the context of pre-service teachers and further serve the needs of all students. Guided by Herrmann (1996) in creating Brain Hemispheres, herewith is an example of how I created a student using technology which can be whole-brained in a task by using the internet for a project.

Left-hand Side of the Brain	Right-Hand Side of Brain
<p>Quadrant A: Analyze</p> <p>Research Surf the internet Search subject/ topic Emails</p>	<p>Quadrant: D Strategize</p> <p>Learning through tools and applications Graphic design PowerPoint Software presentations</p>
<p>Quadrant B: Organize</p> <p>Software applications Stimulate or process information Opportunities Choices of various resources</p>	<p>Quadrant C: Personalize</p> <p>Communication Skype Zoom Webinars Hybrid and online teaching and learning</p>

Figure 6. An illustrated representation of the four quadrants of the Brain. N. Herrmann (1996)

Herrmann (1996, p, 214) alluded to, “Creativity is about the interconnectivity of using all four brain quadrants. However, every individual has a brain preference.” In other words, he dispels the myth of right-brain or left-brain dominance in determining a person’s intelligence and creativity, as expressed by Sperry (1976). He further explains brain dominance as the part used the most in a whole-brain system compared to Sperry, who speaks of only the right brain and the left brain “develops to a higher level than the non-dominant one” (Sperry, 1976, p. 1). In most schools, this theory of right-brained and left-brained persists in subject and career choices. In the Herrmann Model of Whole Brain Thinking and Creativity, the entire brain function is interlinked and interrelated, and one hemisphere of the brain works concurrently with the other as much as it can work independently. In the whole brain function, schools refer to them as “all-rounders” or “achievers”. The incongruity is found at tertiary institutions. Therefore, it is easier to

Creative approaches of Design Thinking and Imagineering to problem solving and innovation for the development of the WBCTP focused on understanding the needs and behaviours the habits and limitations of pre-service students who have challenges on solving problems within the classroom and with professional development. Hence, the WBCTP, by using all four quadrants of the brain, can design solutions to meet the needs of the pre-service teacher through design thinking, creativity and holistic thinking in creating and designing solutions to meet the challenges, behaviours and needs. Design thinking or human-centred design assists in using all quadrants from both the right and left brain as a fully functional whole brain.

Herrmann's model (1996) speaks of design and delivery in professional development. I translate this into pre-service teachers, which revolves around effective and affective curriculum delivery, classroom practice and teaching for effective and affective learning. Academics and educators have attempted to adapt different approaches to teaching and learning through multiple curriculum changes, which had become prescriptive, focusing on discipline in students and learners based on stimuli and responses. Herrmann (1996, p. 215) explains further, "... in the individual-centred approach, the person or individual is the centre of the decision-making process. It requires socio-cognitive, creativity, innovativeness, mentoring, and sharing of ideas with team effort and constructive feedback." Herrmann (1996) summarily indicated the interconnectivity by blending the four quadrants with the four thinking styles as a preference in interests, competency development, decision making and influencing choices. His observations were successfully implemented as the basis for high performance and creativity for professional development.

The Whole Brain Creativity and Thinking Programme can be summarised in a very evocative and simplified manner for pre-service teachers to identify and

understand very quickly using a graphic representation of the four quadrants and their efficacy in the daily use of the whole brain. Below is a specific example of how a search for a particular topic on the internet can be done using WBCTP based on the Herrmann model. The concept is also used to guide pre-service teachers in using the world wide web, considering that many were still challenged in grasping the research tools.

Left Hand Side of the Brain	Right Hand Side of the Brain
<p>Quadrant A: Analyse</p> <p>Research topic</p> <p>Search the Internet for information</p> <p>Emails</p>	<p>Quadrant D: Strategize</p> <p>Create one's own learning through creative tools and presentations</p> <p>E.g., PowerPoint, Mind Maps, Doodles, Emojis, Giphy</p>
<p>Quadrant B: Organize</p> <p>Application of the PowerPoint, Mind Maps, Doodles</p> <p>Stimulation process and Opportunities</p>	<p>Quadrant C: Personalize</p> <p>Communication through emails, chat rooms, Social media, Skype, Hangouts</p>

Figure 7. A diagrammatic adaptation of the Four Quadrants specializing in Whole Brain Creativity and Thinking for everyday use. Fiona Khan (2020)

The Whole Brain model presented in Figure 8, represents the four quadrants and the specialisation of each quadrant. However, the representation indicates the congruence between all four quadrants through cognitive (brain) and instinctive (limbic system) as much as the dominance of each quadrant when required. The model is an adapted representation. I have taken the information given and simplified it through a graphic to be identified and understood easily. In the WBCTP, visual literacy for easy processing in the creative process was necessary for pre-service teachers of English as a First Additional Language. Herrmann (1996), "Their heterogeneous diversity is based

on synergy, which resolves the diversity with a creative outcome. It doesn't take long for diverse individuals to begin to respect and honour the differences". The graphic mainly illustrates to pre-service teachers the use of different aspects of daily skills in synchronicity with their daily lives. It indicates through creative graphics how subconsciously we use the whole brain but never acknowledge such synchronised fluidity because we prefer using the dominant thinking styles. In *Figure 8* below, a graphic illustration shows the different domains of the brain necessary for understanding the whole brain concept developed by Herrmann (1996).


Intellectual / Memory/ Front of Brain			
Analytical/Comprehension Scientific/Skills/Verbal Number/Math Skills Written Language Objectivity/details Reasoning/Logic/ IQ Analyse /problem solving Name/places/directions LEFT BRAIN Quadrant A	Cerebrum FRONTAL 	Experimental/ Strategize. Imagination/ Non-verbal 3-D shapes Music/ Art/Creativity Subjectivity Emotion/ EQ Synthesizing Face recognition RIGHT BRAIN Quadrant D	
Sequencing linear thinking Research skills/storage Convergent /Non-fiction Symbols/Graphics Systematic/Realistic Directed/ Abstract	Parietal lobes Heart Education Occipital lobes Heart Education Mid-Brain	Random/ divergent intelligence, language, reading, and sensation, sensory Casual/free Vision/Colour perception/holistic/ psychic Concrete	
Practical/ Organize. Critical analysis Quadrant B	Cerebellum Excellence	Relational/ Personalize. Co-ordination/ Sound Innovative Quadrant C	
Instinctive/Natural body processes. BRAIN STEM			

Figure 8. A Diagrammatic Representation of the Brain Adapted from Herrmann's Whole Brain Model (1996, p.20-26).

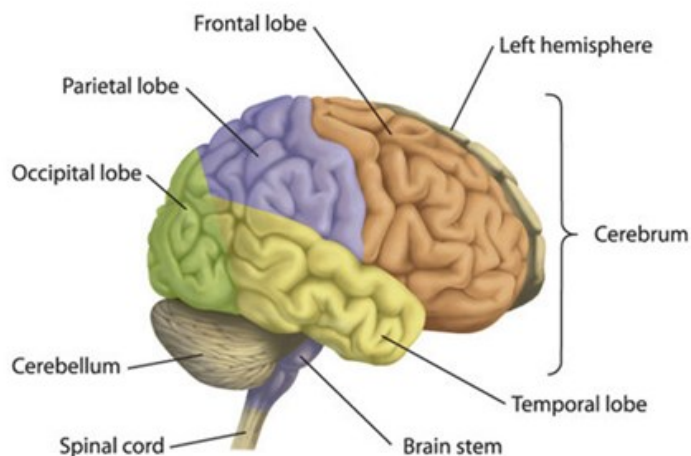


Figure 9. The Seven Parts of the Brain: ResearchGate (2017)

Figure 9, is a simplified graphic representation of the quadrants of the whole brain creativity and thinking model of mental processing. *Figure 10* is a picture of the brain *in situ*. Herrmann (1996, p. 205), “People must be free to think in whatever ways allows the process to unfold”. The process of free will in thinking is elaborated further, “A person who is mentally handcuffed by the constraints will be less able to think and function creatively”. Herrmann expresses explicitly the significance of breaking barriers, stigmas and environments, and workplace environmental factors that can enslave one’s thinking and creativity. Allowing the brain to be pliable in using any domain for brain dominance or a combination of domains or quadrants in thinking and creativity validates the reliability of whole-brain thinking and creativity in the WBCTP.

2.6 The Concepts and Research - Whole Brain Creativity and Thinking Programme.

In developing a Whole Brain Creativity and Thinking Programme, we acknowledged that education is multimodal, but a digitised education is now a social institution. We examined the concepts and research behind the WBCTP for successful implementation and dissemination of information for a successful programme. Four innovative and inspirational concepts were chosen to motivate and cultivate a presence of pride in serving the community as a social entrepreneur for inclusive, sustainable communities (SDG 11) and their education with the Department of Basic and Higher Education (SDG 4) in their professional development. The importance of social media, a conduit for technology and education, cannot be ignored. Social media has become the primary resource for knowledge, skills and attitudes, as knowledge is at the flick of a finger. It is instant! We are subscribed to a generation of “I want it all, and I want it now,” placing pre-service teachers precariously on instant gratification with entertainment or with facts and no entertainment.

Based on the evidence from Murray Print (1993) and Hussain et al. (2011), situational analysis and evaluation determine “An effective curriculum should reflect the philosophy, goals, objectives, learning experiences, instructional resources, and assessments that comprise a specific educational program”. Merfat Alsubaie (2016) observed, “Curriculum development should be viewed as a process by which meeting student needs leads to improvement of student learning. In addition, it cannot be stagnant. The curriculum must be a living document that is in constant flux”. Meeting students’ needs encourage technology in the lecture halls and ultimately in the classroom. Action research methodology is a social construct. B. Somekh (2005, p.31)

indicated, “Because action research is a methodology that closely involves participants in a social situation it is necessary strongly influenced by their values and culture (...) action research projects.”, in developing a plan to improve the present curriculum at tertiary institutions. Rather than pre-service teachers choosing subjects based on brain dominance, the WBCTP presented an alternative through their cultural and historical experiences with the four concepts: Sustainable Development, STEAM, Imagineering, and Business Model for a whole brain experience.

“The elements for creativity are as follows: interest, preparation, incubation, illumination, verification and application” (Herrmann, 2015, p. 217).

2.6.1. Sustainable Development

This enhancement of teaching and learning about Sustainable Development is driven by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Sustainable Development Goals (SDGs). According to UNESCO (2017), Sustainable Development is the concern for the planet's growing environmental challenges and the accompanying effect on all knowledge, skills, attitudes, and values for a sustainable, equitable society. Educational Sustainable Development raises a concern for UNESCO for global citizens to meet the needs of the present without compromising future generations by preserving the planet. “Education alone cannot hope to solve all development challenges, but a humanistic and holistic approach to education can and should contribute to achieving a new developmental model.” (UNESCO, 2017, p. 1).

I focused mainly on two of the seventeen Sustainable Development Goals, SDG 4 and SDG 11, designed for quality education. SDG 4 “ensures inclusive and equitable

education and promotes lifelong learning. SDG 4 also aims to provide equal access to affordable vocational training and to eliminate gender and wealth disparities to achieve universal access to a quality higher education” (UNESCO, 2017, p. 2). SDG 4 provides for a global individual through the UNESCO vision of a holistic person to fulfil sustainability goals such that future needs are not compromised. This is comparable to the goals of the WBCT programme for strategic intervention and implementation. The Brundtland Report on *Our Common Future* defines Sustainable Development as, “The Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Brundtland (1987, p. 5). Gutierrez (1999, p. 3), further disseminates the concept of sustainable development, "Sustainable development is development that meets the needs of the present without compromising the ability of the future." This statement directly impacts pre-service teachers from diverse socio-economic, cultural, and historical backgrounds. “The goal, then, is to create rich zones of development in which all participants learn by jointly participating in activities in which they share material, sociocultural, linguistic, and cognitive resources.” Gutiérrez, (1999, p. 4). This statement completes the WBCT programme through the SDG 11 of sustainable cities and communities.

The classroom and practice must adapt quickly to meet the challenges of a fast-changing and unpredictable globalised world in higher education and pre-service teachers’ professional development programmes. The Whole Brain Creativity and Thinking Programme (WBTCP) will help students understand the SDG 4 indicators to ensure holistic and wholistic individuals who can contribute to a sustainable development environment. Sustainable development lends itself to the concept of human values and ubuntu. Previous knowledge and experiences based on socioeconomic and psycho-environmental shape the

worldview of the pre-service teacher. The loci of past experiences blend into the knowledge and experience of each individual who creates a vision of the present in sustainable knowledge. Each pre-service teacher's knowledge is shaped by the ethics, values and holistic upbringing within their environment. It invariably reflects in the mindfulness of actions and words within the classroom.

2.6.2 Imagineering

According to Disney (1998) in his book, *A Behind the Dreams Look at Making More Magic Real*, Imagineering is a portmanteau based on combining two words, imagination and engineering. An Engineering company called ALCOA, introduced Imagineering. "We're always exploring and experimenting - we call it Imagineering. It is based on devising, creating and elaborating on creative ideas like building and layering in Architecture and Engineering" (Prosperi, 2016, p. 5). In Disney Imaginations, Walt Disney productions invited Imagineers in a collaborative effort to bring Science, Technology, and Art together to create a world of fantasy and escapism in their theme parks. Like Engineering in layering and building, the imagination is layered, stretched, and evolves in each creative layer built. Imagination becomes concrete. Based on constructivism, the use of the imagination stretches beyond the confinement of a classroom by examining previous knowledge and repackaging it with present knowledge to create new knowledge. Through innovation and creativity, dreams become a reality, and the unexplored is explored. The impossible becomes possible as Imagineering is created by Imagineers, who take imagination and make it into detailed reality through artistic creativity and design thinking.

Nilsook, Utacrit, & Clayden (2014) explored the possibilities of using Imagineering in the classroom. They provided an extensive framework of the possible outcomes in

education. The Whole Brain Creativity and Thinking programme implements Imagineering as an innovative tool in teaching and learning.

“Would it not be positive if we could merge Imagineering and education as a transformation of education? We could enrich curriculum studies, creativity, and citizenship education by increasing students' creativity in developing and implementing new and existing ideas and advancing innovative practices in schools and society”. (Nilsook *et al*, 2014, p. 19).

They further claim, “Imagination is a powerful engine that can drive people to bring their ideas, dreams, and desires to reality. The imagination constructs stories that lead people to create. Combining imagination with engineering knowledge creates inventions which initially might seem fantastic”.

Nilsook *et al*. (2014) have summarised the Imagineering processing of creative knowledge and thinking knowledge perfectly coordinated with Kolb (2014) and Design Thinking. In all the experiences, pre-service teachers could enter the programme at any given point and continue with the cycle. The comparative study I took between Nilsook *et al*., Kolb and Design Thinking features below.

Table 2

The Similarity in Comparative Principles with Imagineering, Experiential Learning and Design Thinking. Fiona Khan (2021)

Nilsook <i>et al.</i> Imagineering	Kolb Experiential Learning	Design Thinking
1. Creativity and innovation: Problem solving by creative thinkers, from basic processes to new ideas.	1. Concrete experience: A new experience or a new interpretation of a previous example.	1. Empathize: Understand the needs and limitations, and behaviours to create new innovations.
2. Knowledge: use facts and theory to design and create better products and services and to use technology to facilitate learning.	2. Review and reflect on the experience	2. Define the experience or problem to solve.
3. Attitude in using opportunities to design and create technologies and prototypes for sustainability	3. On reflection, there is a new idea or a learned experience	3. Ideate by generating new ideas for innovative and creative solutions.
4. Skill: the ability to apply knowledge effectively, manage learning skills, Imagineering, communication and research.	4. Applying an idea and observing the response	4. Prototype and test: Generate ideas to show how the prototype might work and test the feedback to improve the solution.

I compared the principles of theories between Nilsook *et al.*, Design Thinking and Kolb; they are similar and congruent. The similarities are iterative to rework, refine and redefine the problem for the best solution. The pedantic language does not change the process as it is the same. According to Nilsook *et al.* (2014), the most desirable characteristics of Imagineers, as expressed for Imagineers in 2012, are as follows:

Table 3

Characteristics of Imagineers adapted from Nilsook et al., for Whole Brain Creativity and Thinking. Fiona Khan (2021)

CHARACTERISTICS OF IMAGINEERS		Brain Domain
1. Attitude	Research qualities to design and create	Right Brain
2. Creativity and Innovation	Problem-solving skills	Left Brain
3. Global Citizens	Address current and future environmental challenges	Whole Brain
4. Knowledge	Using fact and theory to create and design better	Whole Brain
5. Skill	Effective knowledge application and management	Left Brain
6. Habit	Self-manage one's ability through discipline, transparency and responsibility	Whole Brain
7. Market mentality	Recognise the value of a creative economy	Whole Brain
8. Culturally aware	Global markets, cultural and social challenges by providing learning experiences	Whole Brain
9. Lifelong Learning	Continuous learning through rapid change to newer technology and social evolution and changes.	Whole Brain

The above figure indicates the characteristics explained by Nilsook *et al.*; however, I have added the significance and impact on the right brain, left brain and whole brain showing brain dominance together with the whole brain experience in the programme. In designing the programme, all characteristics were included for the **Affluence of Knowledge** and a holistic experience. The approach of whole brain creativity and thinking

in Imagineering is further described by Gabler (2006), who has written extensively on Walt Disney, the founder and creator of Disney World: “Fantasy turned into reality and dreams into magic, and magical things can happen. Our Heritage and ideals, our code and standards – the things we live by and teach our children- are preserved or diminished by how freely we exchange ideas and feelings” (Gabler, 2006, p. 8). Those words are the inimitable words of Walt Disney, who registered Imagineering as its trademark for Disneyland, Disney World, and Fantasia. The concept and context of Imagineering, unpacked by Imagineers (creative, imaginative, engineering designers), is an additive concept to the Whole Brain Thinking and Creativity programme. Imagineering welds the concepts of creativity with cognitive thinking skills to create fantasy, play and abstract thinking in a holistic classroom with a wholistic worldview. WBCTP allows for continuous details, visualisation, development and artistry for innovation and creativity. Creativity through experiential storytelling becomes an outer manifestation of whole-brain thinking, creativity, and intellectual processes of cognition. **The Exposition of Integration** is the integration of Imagineering, Sustainability, Business Model and STEAM into a socially accepted heuristic model. I created a theory based on the WBCTP and the integration of content among the four concepts in building a model for the future of teaching and learning.

2.6.3. Design Thinking

Human-centered design or design thinking is a five-phase model which originated at the Stanford University Design School (IDEO). Creatively it drives problem-solving and innovation. As a meticulous step-by-step process to ensure an understanding of any design or project's needs, behaviour and limitations, design thinking meets the needs,

desires and behaviours of everyday demands, new tech services, and challenges solved through greater creativity, innovation and skill.

Design Thinking is a cognitive style of thinking. Razzouk and Shute (2012) "...to identify the features and characteristics of design thinking and discuss its importance in promoting students' problem-solving skills in the 21st century".

"Design thinking is generally defined as an analytic and creative process that engages a person in opportunities to experiment, create and prototype models, assignments and projects, gather feedback, and redesign". Critical thinking skills encouraging flexibility in Design thinking provide the core of using the four quadrants of the brain and whole brain thinking and creativity as indicated in the model and programme. Kimbell (2011) asserts, "Three main accounts are identified: design thinking as a cognitive style, as a general theory of design, and as a resource for organisations". WBCTP and model used all three accounts and encouraged diverse thinking based on their experiences and diversity, tacit knowledge and the ability to innovate through design and redesign. In designing and implementing the WBCTP, I implemented Design Thinking to achieve my goal.

2.6.4. The Business Model

The Business Model in teaching combines all four quadrants of the brain in whole-brain thinking and creativity. The business model allows the pre-service teacher to take ownership of a pre-existing role and transform it into a beneficial and profitable social entrepreneurial experience for all involved stakeholders, primarily through collaborative planning and sustainable partnerships. Using Ned Herrmann's (1996) Whole Brain Thinking for Business theory, any learned experience can be activated during the individual's lifetime through reflection and practice. Herrmann (1996, p. 198) "One is a

change process, and the other is the creative process that provides solutions to change.” Change in the role of pre-service teachers now calls for leadership, management, and continuous professional development through lifelong learning. Creativity and change are processes for understanding. Furthermore, the onset and demand for technology in the classroom facilitate a learning environment that surpasses barriers to learning and an inquiring mind filled with curiosity. Among the pre-service teachers selected, all nine participants were different and sought different fulfilment of needs. Now, when we dissect the four quadrants of the brain for analyzing, organizing, personalizing and strategizing, as explained by Herrmann (1996), each with different needs, different levels of study, historical and cultural background, and heights of success, as a need, we had a whole-brained focus group within the WBCTP.

2.6.5. STEAM: Science, Technology, Engineering, Arts and Mathematics

The Whole Brain Creativity and Thinking programme encompasses all the learning areas of science, technology, engineering, arts and mathematics and the use of all four quadrants of the brain. It also blends with Imagineering in the different subject areas. The diagrammatic representation of Herrmann’s Whole Brain Model includes skills for all the STEAM learning areas. Traditional STEM (Science, Technology, Engineering, Mathematics) focus on “convergent skills whereas art degrees focus on divergent skills. Having the ability to execute both at scale can better position our nation for global competitiveness” (Land, 2013, p. 547).

Furthermore, including the ‘A’ in Arts from STEM to STEAM indicates the purpose of integration and interconnectedness between the four quadrants of the brain. Harris & de

Bruin (2017) makes a compelling argument, “STEM has consistently been challenged by STEAM, where 'art and design' represent the 'A'. STEAM advocates for creativity and expression to be included as a core part of any interdisciplinary approach.” They clarify further the significance of the Arts in STEAM. “There is no defensible reason why the 'A' of arts should not be included in domain interconnectedness and the development of critical and creative thinking skills' preparation of students for the global economy” (Harris & de Bruin, 2017, p. 54).

In the Whole Brain Creativity and Thinking programme, the STEAM principles apply to Science and Technology, Engineering (Imagineering), Arts & Mathematics. The WBCTP encompassing the above learning areas or subjects work in conjunction with Imagineering and the Business Model. Developing the WBCTP and Model, I re-examined Ralph Tyler (1949) on curriculum development. There were four basic questions which every researcher referred to in their curriculum development.

- “1. What educational purposes should the school seek to attain?
2. How can learning experiences likely to help attain these objectives be selected?
3. How can learning experiences be organised for effective instruction?
4. How can the effectiveness of learning experiences be evaluated?”.

When designing the model and programme, these questions were used in the objectives and applied to each of the four concepts.

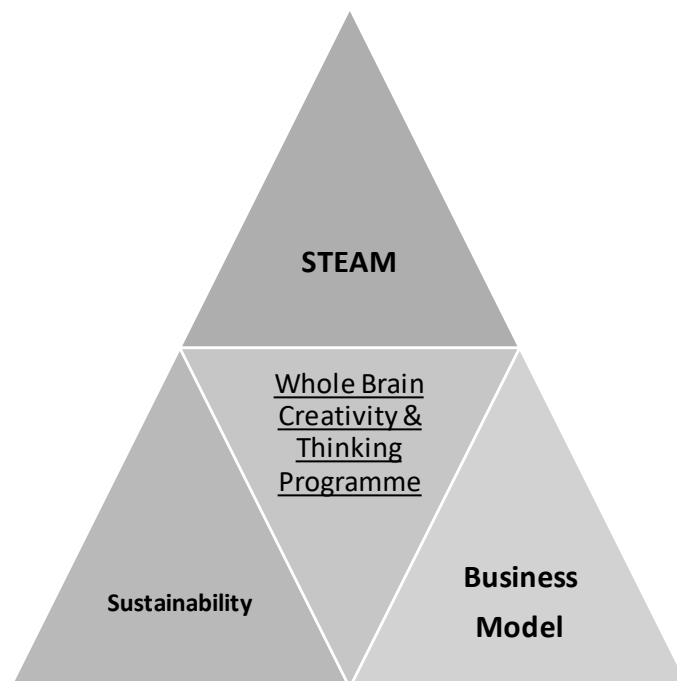


Figure 10. A graphic representation using the four concepts in the WBCTP Fiona Khan (2021)

The STEAM principles focus on Skills, experience, and principles of gender by encouraging gender-based equality in STEAM through female participation. Creativity and innovation, critical thinking, collaboration, problem-solving, and integration into the different Learning areas of the school subjects required by pre-service teachers. STEAM encompasses Imagineering through Engineering, Mathematics and the Business Model, Technology in Imagineering, Robotics and Coding, and Environmental Sustainability for a holistic module of head in cognition, heart in emotions and hands in skill. Generally, STEAM is considered time-consuming and not conducive to the present Curriculum. STEAM is human-centred. All approaches to problems and problem-solving have a humanistic perspective. As with pre-service teachers in the design process and thinking, one must empathise and experience the problem vicariously to find a solution. The solution serves all; therefore, any solution must be easily accessible and understood, follow the design thinking process and be inclusive.

2.7 Professional Development

Teachers' knowledge acquisition and practice and the support offered to learners from this knowledge in the programme encourage learning and constitute professional development. Guskey & Spark (2000) reveal that if professional development is not encouraged and supported at the individual level, the organisational level cannot succeed. They further discuss the paradigm shift in professional development as new and different by developing models on objectives and outcomes, mentoring and action research in professional development. "How do we determine the effects and effectiveness of activities designed to enhance the professional knowledge and skill of educators so that they might improve the learning of the students?" (Guskey & Sparks, 2000, p. 1). The WBCTP pre-service teachers were mentored and coached into the foundational professional development phase. Developing the self and transcending into a professional with values and professional attributes is a priority. Pre-service teachers were reminded that certification and a degree do not define a holistic teacher.

Korthagen (2004, p. 87), in his critical analysis, states, "It is vital that teachers are not only cognitively aware of their core qualities, but that they are emotionally in touch with those qualities, that they take the step leading to conscious decisions to make use of those core qualities, and then carry out those decisions. Often, this may initially require help from a teacher educator". Korthagen (2004, p.87) examines the need for collaborative planning for pre-service education with pre-service teachers by encouraging the development of effective and affective personal behaviour. Therefore, holistic classroom practice is necessary to explore the understanding of whole-brain thinking and creativity for professional development, which aligns with Korthagen (2004) and Guskey & Sparks (2000). The understanding and knowledge sharing of the Whole Brain Creativity and

Thinking programme and the pre-service teachers' experiences of the programme allows them to enhance their knowledge, skills, perceptions, attitudes, and values. "Professional development encourages them to rethink practice and teaching methodologies, to learn new knowledge and unlearn or reinvent old methods through inquiry and collaboration and of significance is that it is necessary for effective personal behaviour to be developed" (Potgieter, 1999).

de Boer (2001) examined the inclusion of the Herrmann Whole Brain Thinking Model in enhancing the quality of information literacy used in research and by working with pre-service teachers. de Boer (2001, p. 187) advocates "... change traditional teaching modules to enhance the quality of the learning experience with divergent thinking styles compared to the traditional approach at tertiary institutions". In her qualitative and quantitative study, she further emphasises the necessity and rationale of improving practices in tertiary institutions in an innovative and accountable way. In using the Herrmann Brain Dominance Instrument, an instrument created by Herrmann for testing brain dominance, De Boer paved the way in creating a dialogue with inter-relations in thinking and learning in pre-service teachers at a South African university. In her thesis, de Boer introduced Herrmann's (1996) Whole Brain Thinking Model to Higher Education Institutions. De Boer used the Herrmann Brain Dominance Instrument (HBDI) to determine pre-service teachers' preferred modes of thinking.

"... teaching information literacy, to be aware of their thinking style preferences and their implication for their teaching style to develop the full potential of pre-service teachers. Adopting a whole brain approach to facilitating learning will develop the pre-service teachers' full potential and should form the basis of all education practices". (de

Boer 2001, p, 185.). de Boer (2001) speaks of the development of pre-service teachers as holistic individuals attaining knowledge, application, analysis, and creation in their Whole Brain Thinking and professional development.

Potgieter (1999) explored Creativity as the active process of generating innovative, imaginative, and divergent ideas into reality in real situations. Potgieter (1999) examined the holistic perception of creativity in Ned Herrmann's Whole Brain Creativity model and its implication for nursing education and practice through creative teaching strategies. Not all problems can be solved by theory and technology. By combining the four quadrants of the brain in thinking and learning, holistic education can be given to nurses who require creativity in the workplace to become effective and innovative nursing practitioners using concrete, theoretical, generic and abstract. "Effective nursing practice in the new millennium will require innovative and creative nurses who can adapt to change and have the courage to take risks to provide holistic, individualised, context-specific care." (Potgieter 1999, p. 42). The qualitative study drew on various experts in creativity and teaching and learning styles to prove the necessity of creativity within nursing due to the increasing diversity in the profession.

In their research, Potgieter (1999) and de Boer (2001) have indicated the necessity for the renewal of education and education models in Higher Education Institutions in South Africa and the global context. It means acknowledging the evolution of generational transformation to prevent the risk of failure. Education becomes the catalyst for change and improvement. Education develops knowledge, values, and skills for undergraduates and pre-service teachers, allowing them to live enriched lives. They face opportunities, overcome challenges, make informed choices, and identity and culture forge themselves with opportunities. A greater socio-cognitive

awareness creates opportunities and avenues for lifelong benefits through lifelong learning. The call for new models and systems contributes to productivity and transformation within the education system. “Planning in sustainable development is believed to be an important element in allowing higher education institutions to set their goals and to commit themselves towards undertaking concrete actions and measures at all levels in order to implement sustainability”, Filho, Pallant, Enete, Richter, & Brandli (2018). Bollag (2004, p.12) recommends, “The challenge is to produce a 'job creator,' not a 'job seeker,'” the strategic plan says. To that end, the main goal of education must be "cultivating analytical skills and developing critical thinking.” Pre-service teachers must be taught business and financial skill, “more emphasis has been placed on teaching business and financial skills in order to encourage entrepreneurship”. Considering all the above research, it is imperative to examine the different thinking and learning styles based on using the pre-service teachers’ senses, skills and attitudes. The Whole Brain Creativity and Thinking Programme integrates various learning styles for the pre-service teacher. As mentioned by Herrmann (1996), at any given time, different quadrants of the brain work with different thinking styles but they can work as a coordinated whole for optimum functioning. However, the whole brain interconnects all the learning and thinking styles from the four quadrants of the brain for a holistic, global person. I have illustrated the various thinking styles by Bloom (1964) and defined them as used by the WBCTP.

Table 4

Bloom's 9 Different Thinking Styles (2020)

Thinking styles	Details of Bloom's Thinking Styles
1. Abstract	Relate random things together and looks at the bigger picture. Thinks out of the box by searching beyond the obvious. Looks at everything objectively and subjectively. Loves problem and puzzle-solving. Easily bored.
2. Analytical	Problem-solving is structured and methodical. Looks at all the components that make a whole. Uses logic for answers. Overthink things.
3. Creative	Out-of-the-box thinkers, solutions are ingenious, are non-conformists who follow their dreams. They constantly have new ideas and divergent ways of thinking.
4. Concrete	Examines the physical world. Loves facts, statistics and figures. Thinks of objects and ideas as specific rather than general.
5. Critical	Criticizes the accuracy, worth, value, and validity of things. Objective, evaluates and reflects by looking at influencing factors.
6. Divergent	Generates creative ideas to find a solution to what works. Uses facts and data and applies logic and knowledge for problem solving and decision making. It starts at a common point and spreads outward to include different aspects, perspectives and ideas. Use of the Imagination.
7. Convergent	The ability to combine different aspects, ideas and perspectives to find a solution logically. Use of logic.
8. Sequential	Processes information in an orderly manner, e.g., Step by step
9. Holistic	One sees the big picture and recognises the interconnections of various components by using various thinking styles for a bigger, more global perspective. It is best for the Whole Brain Creativity and Thinking Programme. Holistic thinking uses all four quadrants of the brain as an integrated whole-brain function of understanding by using patterns.

The nine thinking skills can work independently or together to synchronise the Whole Brain's Creativity and Thinking. The Whole Brain Creativity and Thinking programme focuses on the qualitative analysis of experiences of pre-service teachers' professional development in the Whole Brain Creativity and Thinking programme as action research. We examine the etiquettes of concept and context of the Whole Brain Creativity

and Thinking as professionals who impact learners through their experiences in methodology and pedagogy as pre-service teachers. The thinking styles based on their brain dominance or whole-brain thinking impacts service delivery, personality, and how they influence the learners in the classroom. It has a ripple effect. In the programme, I mention “You are what you think, and your experiences shape you”.

2. 8 Theoretical Framework

The Theoretical Framework is driven by the gaps within the context of the pedagogy and methodology for pre-service teachers who interact within the teaching environment. The Whole Brain Creativity and Thinking Programme bridges the gaps within an integral value-based system of inclusivity and new knowledge. The interconnectedness of cognition, emotional intelligence, social and spiritual intelligence and environmentally sustainable action with community development celebrates the foundations of a new model and programme for the future of classroom practice. The instructor's role traverses the teaching landscape into collaborator and innovator. This programme is qualitative research into inquiry-based and experiential learning with design thinking. There is always interaction within the classroom, clarification through inquiry and understanding, the relevancy and innovation in design thinking.

2.8.1 Experiential Learning

Potgieter (1999) examined the congruencies between Kolb’s experiential learning and the Whole Brain Creativity Model with the implications in nursing. “Each one of Kolb's learning styles is a combination of two of the four learning modes of the learning process as described by him” (Potgieter, 1999, p. 94). The Theoretical Framework which informs my research problem and questions will be based on Experiential Learning. David Kolb

(2014), who sees experiential learning as an integrated process, revealed that the two levels of learning are based on internal cognitive processes and external influence. He explicitly explained the knowledge and use of abstract concepts, which are flexible and can be used in various circumstances.

Kolb's four-stage cycle includes the following:

- **Concrete experience** – which is a new experience or a new interpretation of previous experience:

The concrete experience is associated with the affective or feelings in individuals and is interrelated to abstract thinking and knowledge, according to Kolb (2014). It converges on how we think about things and divergent thinking patterns. Concrete experiences were recorded in journals and questionnaires. Pre-service teachers and I recorded our experiences and their observations within the WBCTP.

Concrete experiences were accomplished and encompassed twofold:

a) **Business Model in teaching:** The business model allowed the teacher to take ownership of a pre-existing role and transform it into a beneficial and profitable experience for all involved stakeholders through collaborative planning and sustainable partnerships. Using the Ned Herrmann theory of Whole Brain Thinking, any learned experience was activated during the individual's lifetime through reflection and practice. Creativity and innovation indicated problem-solving by visioners and imagineers from basic processing to new ideas.

b) **Design Thinking for creative experiences:** It is a creative and practical process for cognitive abilities in creating new human-centred experiences i.e., knowledge through

action. The experience was multidisciplinary, holistic and innovative. It involved critical thinking skills encouraging experimentation, creating, developing prototypes, getting feedback, reflecting and redesigning. Concrete experience is also a vital component of constructivism in Piaget's developmental theories. Piaget (2008). It is a concept included in Engineering, Architecture, Mathematics and Technology, which are included in the STEAM principles expounded by the WBCT programme. Brown. (2008, p. 84) expostulates the qualities of a design thinker: empathy, integrative thinking, thinking out of the box, experimental and collaboration through observing, watching, and thinking. The skills applied were remembering and recalling from memory.

- **New Experience or reflective observation**- *to review or reflect on the experience:*

It is particularly important for abstract thinking and conceptualising the use of previous or indigenous knowledge to play a pivotal role in the new or learned experience through understanding. The WBCT programme explores a holistic approach to teaching and learning. It is imperative for the development of a holistic individual to reflect on the learned experience, to review the information and to build on the knowledge, whether new, known or unknown. This cycle is vital when implementing the concept of Imagineering and STEAM principles. Both concepts allow for reviewing, reflecting, layering and expanding previous ideas and experiences to create new knowledge and innovative creativity. Sharapan (2012, p. 36), expounding on Fred Rogers theories of STEAM, encourages STEAM education as we have applied to pre-service teachers, "Let's give the children an opportunity and time to explore their ideas and to think things through, even if their ideas seem far-fetched".

- **Abstract Conceptualization**- *on reflection, there is a new idea or a learned experience:*

The core concept of the WBCT programme is creativity and thinking. Design thinking is out-of-the-box. The WBCTP is abstract. In this phase, pre-service teachers think out of the box by expanding their innovativeness and creative and abstract thinking skills. We consider creativity using all four quadrants of the brain working simultaneously rather than each quadrant working in isolation. However, the quadrant of the brain used the most will be the most predominant. New or learned experiences will be reflective of previous knowledge and will reflect on the dominant quadrant of the brain. Design Thinking and Imagineering are both concepts. "Imagination is more important than knowledge. For knowledge is limited to all we know and understand, while imagination embraces the entire world and all there ever will be to know and understand" Vygotsky (2004, p. 9).

- **Active Experimentation**- *applying an idea and observing the response:*

This phase focuses on the actual doing or the experimentation by feeling and doing, then reflecting based on the reality and context of the surrounding. This is the phase of thinking and doing, the converging of ideas and thought processes, and then evaluating, and I included it in the design process. The active experimentation within the parameters of sustainable development and the WBCT programme accommodates challenges and failures. It encourages the re-imagining and thinking of new creative ways of problem-solving. Kolb's (2014) learning and learning styles involve internal cognitive processes and

the application of processes. The environment influences the learning and experimental style through the attitude a task is approached and the emotional response to the task. The welding of the four concepts in the WBCTP with a project and group-based activities allow learners the following:

Experience - Reflection - Conceptualize - Test

Each stage is integrated into the other, so entry at any stage must complete the cycle of all four Stages. A single stage cannot be effective on its own. This relates directly to the concept and content of WBCT and the four modules integrating various competencies in education. Pre-service teachers can enter and integrate the WBCT programme at any stage of teaching and learning and complete the cycle for positive changes in classroom practice and methodology.

Experiential learning is an integral component of the circular economy of knowledge to create more excellent value in the knowledge-based systems through Back 2 Basics and Human 2 Human interactions. It ensures that there is no material and knowledge-based systems wasted as per the WBCT programme and the circular economy, i.e., using recycled materials and information where energy is never wasted. This applies to experiential learning by ensuring there is no waste in the knowledge system through repurposing. The true potential of the pre-service teachers lies in the unexplored potential and tapping into the indigenous, tacit or inherent knowledge.

The WBCT programme ensures that knowledge is always reused, retained and recycled. It ensures knowledge is kept in use through experience, new knowledge, reflection, and experimentation. Experiential learning accommodates the continual change

in teaching practice and curriculum design through flexibility and experimentation by levelling the playing fields in education in an inclusive environment.

Indigenous Knowledge Systems assist in maintaining the culture and heritage of pre-service teachers in a safe environment. They acquire the confidence for innovation and experimentation to learn additional knowledge and languages through association. Furthermore, in working in the 21st Century with all the challenges that we face, the knowledge and skills that may be required to live well in a world overwhelmed with technology are aptly described by Brown-Martin (2017), “We think of creativity, innovation, ingenuity, higher-order and critical thinking to solve complex and abstract problems as well as how to get along with one another and become civically engaged. Nevertheless, nothing in our formal education systems today is designed to meet the human challenges” (Brown-Martin, 2017, p. 8). The understanding of empowering the mind and the self from what was once relegated to an inferiority complex plagued by subjugation due to colour must be erased. We are not the third world, but only through colonisation and plundering our resources. That is the essence of power: breaking the self-image and self-esteem to keep the citizens subjugated. Sanusi Credo Mutwa (1964) in *Indaba My Children* and Steven Biko (1987) *I Write What I Like* raised Black Consciousness to the echelons of pride and self-belief. While Credo Mutwa (1964) instilled pride in Africanism and African Traditional Religion and beliefs, I was reminded, as I designed this programme, that we sold our souls to colonialism. Nonetheless, it must be a source of inspiration that our hearts still belong to Africa, even though we are constantly reminded that we reside in the ‘*Heart of Darkness*’ by Joseph Conrad (1899). Steve Biko (1987) reminded Africans that being black is not the lacuna for an inferiority complex or mental attitude. The Philosophy of Black Consciousness is that “Black is Beautiful” and “Education and society are inseparable”. I reiterate this philosophy because I observed and read in the literature that

most theories are based on Caucasian, White theorists with white subjects. The subjects were not black. Then again, we continue to write and view our research on the colonial mindset and verbal vitriol to keep Africans disempowered. The narrative must change, and that change must start with the WBCTP.

The transition from old to new educational approaches changes from knowledge transfer to knowledge acquisition through innovative and different practices and the students' experiences and reflections. Learning is an active process of creating one's constructs as information is imbibed and actively processed knowingly or unknowingly, subliminally and subconsciously. In the WBCT programme, pre-service teachers were introduced to various literacies and reflected on their experiences and convergence of new knowledge with previously acquired knowledge. The aim was to integrate left and right brain intercommunication between hemispheres through the corpus callosum, resulting in a change in behaviour through acquired knowledge. Through the interconnectedness, pre-service teachers were inspired to use different techniques including technology and digital and mobile literacies in exploring their experiences as pre-service teachers and students.

The pre-service teachers' experiences transcend through a metamorphosis as resources and technology change through the pressing demand of computer-generated technology, Artificial Intelligence, Robotics and the introduction of the 4th Industrial Revolution. Through Action Research, the WBCT programme encourages the change in classroom practice with pre-service teachers for the global common good and the upgrading of the knowledge economy, enhancing best pedagogical and methodology practices. Whitehead (2008) expresses the importance of collaboration through 'globalising communications' for 'improving practice and generating knowledge', creating an

‘educational influence’ to ‘communicate new living standards.’ The summation of the WBCTP is that all pre-service teachers can learn within any environment, with the creative resources and actions to expand human capital and eliminate waste in human potential, as Whitehead (2008) expounded.

The most significant stride pre-service teachers must take is to cross the digital divide and leap into the 4th Industrial Revolution. At a time when classroom planning and dissemination of information is digitised, the use of digital devices is a necessity. My research at a South African University brings pre-service teachers’ challenges to the fore. The most significant challenges are the need for more resources and skills to integrate the transmigration into the digital economy. In most cases, learners in the classroom are more hands-on with devices and technology than the teachers.

2.8.2 The Internet of Things.

The Internet of Things (IT) had become the biggest game changer for teaching and learning in the Fourth Industrial Revolution (4IR). It has changed how we use computers and data, our search and share on the web, and the track and trace to create our profile preferences has become the greatest innovation through Design Thinking in creating a digital footprint. The WBCTP and model provided the platform for pre-service teachers to understand the digital divide. They actively experienced (IT) through visual literacy, their digital profile, open resources, discussing coding, app development and use on mobile devices. “Today, the Internet of Things has become a popular term for describing scenarios in which Internet connectivity and computing capability extend to a variety of objects, devices, sensors, and everyday items” Singhania (2015, p. 7).

“The Internet of Things becoming mainstream, forcing organizations to re-examine their value creation methodologies in light of new consumer behaviour and expectations. The Internet of Things will reframe the existence of the ones enriched by it. It will do so not because it can, but because our motivation will demand it.” (Manu, 2016, p. 1). Much of the advancement of technology in its use and betterment is based on previous knowledge and the limitations or opportunities availed from present knowledge. The WBCT programme through Kolb’s (2014) and Piaget’s (2008) model, encourages the use of the whole brain thinking and creativity affectively and effectively in pre-service teachers with the use of technology. The aspect of visual literacy, digital and mobile downloads for effective teaching practice is encouraged among the pre-service teachers in enhancing lesson delivery by efficiency and diversity of skill, time management through storage and sharing and speed, effective teaching practice and classroom management using automation and increasing the efficacy of communication. The advantage of technology in the classroom encompasses the four concepts of Sustainability, Imagineering, STEAM and Business Model learning, especially in developing business skills for effective and profitable teaching through shared resources.

Examining creative solutions changes the dynamics for pre-service and in-service teachers. Professional development and success are not “about them”, the learners. It is about the “us” in Ubuntu, meaning the teachers and the learners in a cohesive symbiosis. Schools privately funded can afford technology that upscales the teaching experience, and they can employ more teachers. Government schools will depend more on the Internet of Things as there are fewer teachers, burgeoning classes, and extensive workload. These teachers will seek the easiest and quickest way to assist with methodology. They will source artificial intelligence and free resources to supplement teaching practice.

2.8.3 Massive Open Online Courses (MOOCs)

In the use of the internet, we examine blended education through MOOCs. SDG 4 calls for lifelong learning, and one example is through Massive Open Online Courses through various Universities. It is a resource available to anyone who would like to study at a tertiary institution with openness to higher education using a computer and an internet connection. Teachers, lecturers, and academics facilitate coursework. There are various advantages to the comfort of one's home or office. It is free, and most courses are studied through networking with other studies. Students are from various countries around the world and speak different languages. All materials are presented and prepared by various academics through videos, webinars, and study material, and admission is open to everybody, making education accessible to everybody. The most enjoyable aspect is that students can choose specific subjects and majors to supplement their course modules. They can expand their knowledge and their skills and research subjects online. Furthermore, students can gain specific knowledge or make career choices at tertiary institutions. MOOCs lend themselves to disruptive education by redefining higher levels of learning but also sets new parameters to distance education.

Cormier and Siemens (2010), in their article, explain openness "When learners step through our open door, they are invited to enter our place of work, to join the research, to join the discussion, and to contribute in the growth of knowledge within a certain field." Baturay (2015), in an overview of distance learning, stated, "MOOC is based on the connectivism approach; therefore, any knowledge should be distributed across a network of participants". Within any course, participants network online and offline socially, on a collaborative process through connecting over a network. She clarified, "Most course activity occurs in social learning environments, where participants interact with the material (and each other's interpretations). The course readings and other learning materials are starting points for discussion and further thinking".

2.8.4 Digital and Mobile Literacies

Digital and mobile literacies are in the information age of digital literacy skills for pedagogical content knowledge (PCK). Kathirveloo, *et al.* (2014), discusses PCK in teaching and learning as “Involves teachers’ competencies in delivering the conceptual approach, relational understanding and adaptive reasoning of the subject matter”. Pre-service teachers and in-service teachers must integrate content with pedagogy and technology. The framework is in welding their knowledge with the content they teach to create an environment conducive for effective and affective teaching and learning. The intervention includes innovative and creative strategies to enhance methodology. It is essential to knowledge transformation for all pre-service teachers to enhance knowledge of research, augmented reality and resources. Different resources were available in the different phases of teaching and learning, which extended from Early Childhood Development literature and visual literacies on YouTube to undergraduate and postgraduate studies. Pre-service teachers have the opportunity and platform to create, communicate, download and upload content. They were directed to digital sites containing free content. Pre-service teachers broke the image of knowledge and digital discrimination and the mental paralysis of Black Discrimination. They were vociferous in taking digital and mobile skills to the rural areas to empower communities, surfing the idea of bringing power and enthusiasm back to learners by getting them back into classrooms with new Learning and Teaching Support Material. Pre-service teachers discussed cyber security and leaving a digital footprint on the net. UNESCO (2005, p. 181) described digital and mobile literacies as “A continuum of learning in enabling individuals to achieve their goals, develop their potential and knowledge and participate fully in community and wider society”.

Leaving a digital footprint precluded that patterns for digital and mobile uses were logged into an algorithm in which companies could use data to predict, search and use patterns and locations of all internet users. Together with digital and mobile literacies lies the aspect of content and copyright and the abuse of privileges of working on the internet. Pre-service teachers were always mindful of downloading open resources under the Creative Commons, and all content uploaded had to be protected. There must be no infringement of copyright. Creative Commons is an international Non-profit organisation providing free licences for content creators making content available publicly. They permit certain conditions for the public to use the content without infringing on copyright.

CHAPTER 3

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In chapter two, I provided the supporting literature for the Whole Brain Creativity and Thinking Model and Programme research study. In chapter three, I present the research design and the methodology used to research the development of the Whole Brain Creativity and Thinking Programme and Model. The chapter includes the following key aspects: the study research type and area, sampling techniques, sample size, and application of the research data gathering tools. I discuss the data gathering, analysis process, and trustworthiness used in designing and implementing the WBCTP model and programme. Trustworthiness and ethics were influential throughout the study.

3.2 Research design

Creswell (2017) refers to a research design as a road map for reporting data when a researcher collects, analyses, and interprets data for a research study. The research design was qualitative with a thematic-centered analysis. The type of design is narrative action research. According to Kothari (2004) research design “Is a plan and blueprint strategy of investigation”. He further explains, “And conceived to obtain answers to research questions.”

3.2.1. Research Paradigm – a) Interpretivist

Following the interpretive paradigm, Willis (2007, p. 4) expounds interpretivism as “seeking to understand the context and the core belief of the paradigm in socially constructed realities.” Interpretivism included “Accepting and seeking multiple perspectives, being open to change, practicing iterative and emergent data collection techniques, promoting participatory and holistic research and going beyond deductive and inductive approach” (Willis, 2007, p. 583).

Thanh and Thanh (2015, p. 24), “In seeking the answers for research, the investigator who follows the interpretive paradigm uses those experiences to construct and interpret his

understanding from gathered data. Specifically, interpretivism supported scholars in exploring their world by interpreting the understanding of individuals.” In our discussions and reflective conversations, I considered the views of pre-service teachers on their experiences and understanding to “generate or inductively develop a theory or pattern of meanings”. Creswell (2014, pp. 9-10) expounds on the belief that qualitative research of the interpretive paradigm "may change the participants' lives, the institutions in which individuals work or live, and the researcher's life". Interpretivists maintain that knowledge is observable but also interpreted by the participants' attitudes, intentions, perceptions, interpretations, values, and beliefs.

Thanh and Thanh (2015, p. 26) point to researchers’ insight and in-depth observation within the study area. However, I was mindful of my attitudes, values, beliefs, and, significantly, my intentions within my lived experiences. As an interpretive researcher, I preferred to reflect and interact with the data to enrich the data generated.

3.2.2 Paradigm: Transformative Paradigm

Mezirow (1994) introduces the Transformative Paradigm as a paradigm that affects adult learning. Cultures and traditional structures provide the infrastructure for transformation based on the voices of the adults. Meaning and learning are exacted by how experiences, senses and interpretation lead to learning. Rational discourse and critical reflection affect learning through rapid social change. The old structures of traditional authority are weakened. Diverse decisions are then made on their own. “Learning is then a tool for a new and revised social process of construction and appropriation.”

In the WBCTP, I was transformed by implementing the programme to the pre-service teachers' reception and experiences in their understanding and transformation. Their transformation was reflected in their response to the programme and the impact on their lives. In the programme it was imperative to weld the past with the present and future. I encouraged the past informing the present infrastructures of learning especially when bilingualism and multilingualism, incongruency in the socio-economic lifestyle exists. Preservice teachers are role models and were compelled to preserve and conserve the sustainability of knowledge, both secular and indigenous.

3.3 Approach: Qualitative

Mouton (2007, p. 2) states, “Qualitative research is interpretive and is understanding and interpreting the meanings and intentions that underlie everyday human action.” Furthermore, qualitative data is non-numerical. Qualitative research includes gathering data through interviews, questionnaires, observation, and description. My research adopted a qualitative approach focused on my experiences in the design and implementation of the programme. The sampling was purposive. The experiences were insights into the methods used: questionnaires, reflections, and visual methodologies. The tools were used twofold: To explore the programme’s implementation and to implement skills, knowledge and strategies for professional development. Creswell (2017, p. 44) observes, “Participants’ meanings further suggest multiple perspectives on a topic and diverse views. Therefore, a theme developed in a qualitative report should reflect multiple perspectives of the participants in the study.” The value of a qualitative study concerning self-reflection and keeping a journal is further expounded and summarized by Gutiérrez (2015). Thus, pre-service teachers, undergraduates and ‘participants’ can be used interchangeably.

The WBCTP, in its qualitative analysis, considered skills, ethics, values, inclusivity and equity, varying socio-economic and enviro-cultural backgrounds and the influences of disadvantaged and advantaged backgrounds in our research studies. Vygotsky’s (1933) social-cultural theory states “That consciousness is constructed through a subject’s interactions with the world”. WBCTP was created on integral value-based education. In the interpretive paradigm, Thanh and Thanh (2015, p. 26), researchers obtain “insight” and “in-depth” information about their study area through the participants’ view. This qualitative study explored the development of a programme and model, taking into consideration my experiences and the interactions with pre-service teachers’ reality to develop a framework for the future successful implementation of the Whole Brain Creativity and Thinking Programme.

I used qualitative data and methodology to fully understand the meaningful context in which I conducted the research. It was critical to interpreting the data gathered in a subjective approach or experience. Nestor and Schutt (2012) assert that qualitative data focuses on the presented text rather than numbers. The typical analytical procedures usually include coding and categorizing the data, generating themes and presenting interpretations of the data. In my dissertation, I used the interpretations exclusively. The themes were

based on the content in the slides. In adopting the qualitative approach, the data analysis has data reduction, display, and validation.

3.4. Strategy: Narrative Action Research

Designing a programme and model, Whole Brain Creativity and Thinking Programme and Model requires contextual and comprehensive knowledge. Characteristics and meanings, design and implementation, assign meaning and give depth to the implications of the action research.

My literature analysis has revealed no formal templates for designing and implementing a WBCT programme for pre-service teachers. My choice of narrative action research is the opportunity to introduce new knowledge and terminology. Furthermore, with this strategy, I considered the gaps and identified the urgent need for socio-emotional learning and mindfulness, due to the highly challenging conditions in government schools. Another aspect I considered is the urgent need for teachers to be teacherpreneurs and business-minded, have leadership qualities, and be agitators, disruptors and visioners.

I identified key phrases and words significant in the design and implementation of my study that strategically informs my research and which directs the course of the research.

Imagineers, visioners, disruptors, socio-emotional learning, teacherpreneurs, design thinking, social entrepreneurs, whole brain thinking and learning, whole brain, Imagineering, STEAM, split brain, Environmentally Sustainable Development, Sustainability, Sustainable Development, visual literacy

In Action Research, McNiff and Whitehead (2011) are concerned with improving pre-service teachers' approach and methodology through inquiry, discussion, and revision. The research was progressive in finding solutions to challenges and addressing issues raised within the undergraduate study of pre-service teachers. The research must be transformative through action, critical reflection, and collaboration. McNiff (2016) defines action research as, "The highest aim of all research, including action research, is to create original knowledge and explain its use value in personal, social, organisational or political contexts". "In Action Research, the teacher is the catalyst for change and inspires and motivates experiences and the discussions derived from holistic, sustainable living" (Tilbury, 2004, p. 96).

McNiff & Whitehead (2011) infers that action research cannot be prescriptive and attached to a specific model, but the research must be honest and done with great care. “However, it is a continuing and growing process of communication, cooperation, connecting and sharing a vision. All of which contribute to professional development” (McNiff & Whitehead, 2011, p. 22). As much as Action Research set parameters and guidelines, it allowed further exploration and intervention on WBCTP. McNiff and Whitehead (2011) argue that the teacher is the center of research and exploration. It examines the methodology of 'How' the research is done. They further discuss the importance of an internal and external realization where the primary observation is from the 1st person's experience and their responses.

The focus shifts to a social relationship between learner and teacher without inhibitions and expounding the ability to be creative with ingenuity and innovativeness. Action research blends concept and structure with design thinking. The cycle is continuous in the four concepts within the Whole Brain Creativity and Thinking Programme. Participants can enter any four stages of the Action Research Cycle within the Whole Brain Creativity and Thinking Programme. Their reflections on each concept were essential in their experiences to improve their professional development. In Figure 16, the reflective cycle shows the action research influencing my understanding and the pre-service teachers,” learning and understanding to do something different. McNiff and Whitehead (2011, p. 10) indicate that the research design improves the researcher's understanding, develops learning and develops and influence the learning of others. Thus, Kothari (2001) discusses action research bringing social change. Using both the conclusions on the research design, the WBCTP combined both the designs of Kothari (2001) and McNiff and Whitehead (2011).

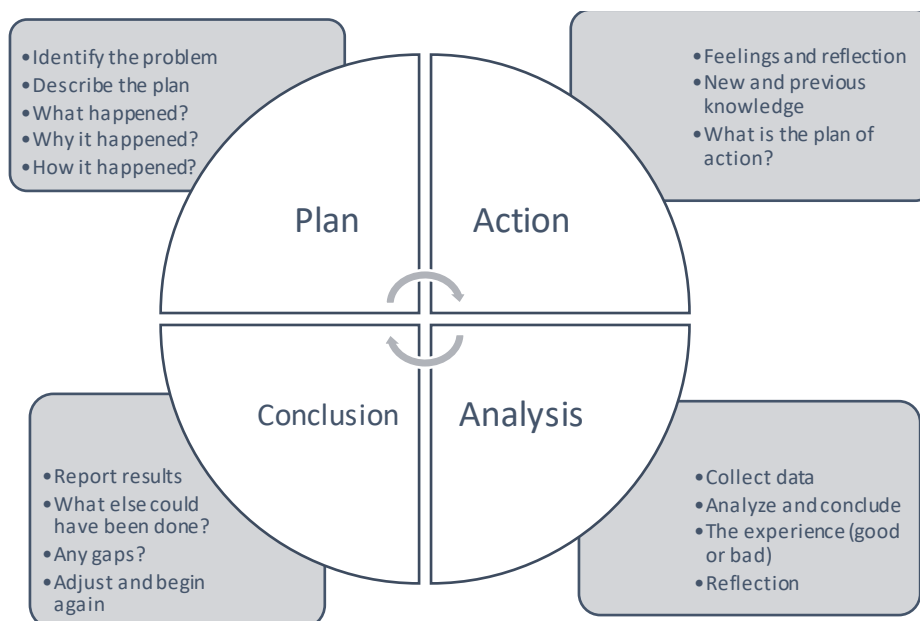


Figure 11: A diagrammatic representation of the Action Research Cycle. McNiff and Whitehead (2011, p. 4)

In presenting the four workshops, I created four cycles of collaborative action research (one for each workshop), which included Kolb's (2014) experiential learning. The cycles had the introduction and focus, the design (what, why and how), and the implementation (what, why and how). I completed the cycle with a reflection and recommendation. The same cycle was included for each slide as individual action research.

Plan: Experiencing the programme elicited different responses. On entering or creating the programme or model, what was the intention? Subsequently, what happened? Why it happened, and how it happened?

Action: Describe the feelings and reflect on them. How did it impact on the previous knowledge and on the new knowledge? The plan of action is quintessential in moving forward or returning to the plan. Once again, we observe the similarities with design thinking.

Analysis: Was the experience good or bad? What was the analysis of the observations and experiences? Reflections in their diaries and in the questionnaires were crucial to the experience of the programme.

Conclusion: What are the results and conclusions? What can be done to improve the programme? Were there gaps? What were the recommendations?

3.4.1 Elements of Narrative Action Research in the WBCTP and Model.

3.4.1 a) Project information: The research was completed on Ned Herrmann's Whole Brain Business Book. The programme and model included four concepts with additional support to enhance the experience.

3.4.1 b) Clear goals: Clear goals were set with the objectives and research questions

3.4.1 c) Adequate preparation: There was adequate preparation because we presented a pilot programme.

3.4.1 d) Appropriate methods: A narrative action research. Qualitative research method with questionnaires as research instruments, reflective journals and presentations.

3.4.1 e) Significant results: Chapter 4

3.4.1 f) Reflective critique: Analysis of the findings and the process. How will the findings and analysis of the results be used for the future of pre-service teacher learning in the use of the model and programme?

3.4.1 g) Effective Presentation: Successful in both presentation as research and as a Programme and Model.

3.4.2 Theory and Design of Narrative Action Research

Narrative action research conceptualises the meaning people assign to their experiences. Toledano *et al.* (2017) describe narrative research as "Narratives are also knowledge-producing devices since they make sense of personal experiences and share that sense-giving with others". They further argue, "What has been seen as a weakness in the narrative method, its deep subjectivity, can be employed as an analytical strength in action research". In the WBCTP, I had to be very objective, even though narrative

action research is primarily subjective. In this manner, I had to place myself in the pre-service teachers' context and ponder what was most valid and exhilarating. What could push me that much farther to be the best I can be with world knowledge? Toledano *et al.* (2017) extend the importance of the narrative style further, "We show how examining explanations of context, inherent in narrative processes, can provide rich insights into the meanings of action research."

3.5 Research Context and Setting:

The research context includes the setting, population, and sampling. I completed the research at a higher education institution in Durban.

3.5.1 Selection and Biography of Participants

Purposive sampling was adopted, as I was the participant designing and implementing the programme.

Letherby (2002) summarizes biography in qualitative research as assisting with the issues of emotion, personal preferences, gender, and positive and negative responses. In association with research questions and biography, Letherby (2002) states, "The biography takes a personal glimpse of the participants and their expectations in a social setting. Access to the participants' prior knowledge and reasoning will enhance the research findings." (Letherby, 2002, p. 94). In the WBCT programme, the biography in the form of motivation for participation is an insight into the participants' prior knowledge by which I was inclined to create and design the WBCTP. I considered myself and the participant's holistic, gender, historical, cultural, and traditional background. They voluntarily completed the motivation. The expectations, background knowledge, and the pre-service teachers' interests are relevant to the research questions in their response to the programme. However, it also foregrounds the pre-service teachers' gaps in whole-brain creativity and thinking.

3.6 Data Gathering

Data was gathered and measured systematically by answering research questions on design and implementation through different methods. The collated information is analysed to support or refute the research hypothesis. Conclusions were drawn to support the aim and the questions and evaluate the outcome of the WBCTP.

3.7 Data Gathering Method and Instruments

The data gathering was based on reflection, journaling, discussions and observation with the pre-service teachers based on my facilitation of the programme. It resonated on a metaphysical platform of the mind with a subjective reflection of the heart and emotions and ongoing personal application of WBCT as an adopted programme for pre-service teachers

Their experiences after implementing what they had learned in the WBCTP and the acquired experiences from teaching practice allowed them to compare, upgrade, and upskill their knowledge through sustainable collaboration and integration. Finally, a post-workshop questionnaire examined the post-workshop response, gaps, ongoing research, and a diary of the affective changes for effective classroom changes during the programme's implementation. The research methods included questionnaires, observations, visual methodology (videos and photographs), and document analysis (researcher notes and reflective journals).

3.7.1 Observation

During our sessions of interactive discussions, visual literacy and tasks, I noted various motor and executive functioning skills, coping strategies and thinking strategies. The impact of the implementation was only evident in the tasks they presented, but the most impactful was their oral skills. There was modelling based on my presentation and facilitation skills. My observation has also noted the change in the receptiveness of knowledge and information and the eagerness to increase learning and imbibing knowledge.

3.7.2 Questionnaires

“Questionnaires are used to question the understanding and practices of the participants. This is an objective and non-personal method.” Kvale (2009).

The questionnaires were used to understand and gain knowledge of the pre-service teachers' experiences and the actions they had taken from the experiences and the knowledge gained within the programme. Pre-service teachers answering these

questions assisted me in ideating the design and implementation process. The process indicated whether the implementation was affective and effective.

3.7.2.1 Questionnaire: 1

Title: Pre-service Teachers' Response to the Whole Brain Creativity and Thinking Programme on their Experiences of Sustainable Living.

Purpose: To explore the whole brain response to ESD in a class of pre-service teachers who are right-brained, left-brained, or whole-brained.

The questionnaire ignited a whole-brain response to the pre-service teachers' experiences and reflections on the programme regarding their previous knowledge and thinking on sustainable development and sustainability in conjunction with the environment and indigenous knowledge. SDG 4 encourages cultural and indigenous knowledge in maintaining identities and sustainable communities. We examined the spirit of Ubuntu and the cultural aspects of communities. Furthermore, we identified aspects of culture and tradition on the sustainability of knowledge systems. Question 1, further sought their knowledge of Environmentally Sustainable Development (ESD) and their understanding of the workshop.

3.7.2.2 Questionnaire: 2

Title: Responses to the Whole Brain Creativity and Thinking Programme.

Purpose: To explore the pre-service teachers' responses after knowledge of the four concepts of the WBCTP.

Some pre-service teachers attended teaching practices in rural and urban schools. The responses after the experience of the programme had changed their way of teaching practice. I asked them to implement the WBCTP as an intervention and acquire their perspective and responses. SDG 11 was about bringing knowledge and education to the communities to make sustainable communities and allow more opportunities for education in rural areas. We examined hybrid teaching and learning together with the introduction of technology. I introduced them to visual literacy and asked them to observe the impact on teaching and learning, especially with learners with learning challenges and Special Educational Needs and Disabilities (SEND) or any learning difficulties they experienced. They discussed experiences with

absconders, late arrivals, learners absconding to different lessons, liking or disliking a teacher, discipline, and absenteeism.

3.7.2.3 Questionnaire 3

Title: A Survey: Opinions, Suggestions and Recommendations

Purpose: To ascertain the programme's benefits after the four workshops and the response to the Whole Brain Creativity and Thinking experience.

Questionnaire 3 engaged with metacognition and Executive Functioning Skills (EFS). Pre-service teachers responded using higher-order thinking, offering them a chance to contemplate their professional growth. Based on the information, the pre-service teachers provided their opinions and ideas in the four workshops, and WBCT presented them in the case scenarios. Pre-service teachers needed to be allowed to express their thoughts based on cognition and emotional intelligence. Using executive functioning skills, they discussed coping strategies, social-emotional learning, journal writing, sharing successes or challenges, affirmations and gratitude.

3.7.2.4 Group Discussions- my reflective journal of Discussions

According to Kvale (2009), group discussions are meant to point out or obtain descriptions of the world of life and to be able to interpret the meaning of the desired phenomena. The purpose of selecting semi-structured discussions and questions with the pre-service teachers was to ensure that the responses were comprehensive and substantive. Group discussions were conducted during each workshop. Responses to my questions and prompts from the content were in groups and individually. Each of the concepts and its content were discussed at length. Much of the discussion revolved around the content output from my design and implementation. The pre-service teachers honed in on their experiences within the context of teaching practice, the challenges and the use of the WBCT programme as an intervention. With face-to-face discussions, I could identify educational barriers, explain concepts more simply, and clarify questions and responses. After receiving full permission for the workshops and consent from the participants to participate in discussions, I assessed the levels of understanding, language barriers and general knowledge of the pre-service teachers. The consent form outlined the benefits of the study and the respect for confidentiality. The open access to information and discussion was voluntary, and pre-service teachers could withdraw or refuse to comment if they wished.

3.7.3 Interaction/reflection

Bryman (2012) explains that structured observations are methods to observe participants' behaviour through a schedule of categories. Bryman (2012) mentions that the main advantage of observations is to observe participants' behaviour first-hand but, in this research, my interactions and reflections were the primary source. The observations were done during group discussions, and their creativity and critical thinking skills in making their boxes, telling their stories and poems and presenting their making of a mobile object. Most important is their innovative creativity and thinking skills in designing, creating and showcasing a unique item, with recycled material. The pre-service teachers were tasked with creating a game for literacy or language and bringing in tradition, culture, and indigenous languages into their creative pieces. They ensured that the presentation from tasks was collaborative and coordinated for maximum, dynamic effect, which they could use in the classroom or design something similar using recycled material for maximum impact at minimum cost. Their body language and comfort levels in discussing topics were considered because that was a part of their executive functioning skills and modelling. I discussed the language barriers as I observed some difficulty grappling with English, their mannerisms, enthusiasm, or dismay. Observing their initial response to the first workshop and seeing them grow with a flourish in energy and confidence levels was a part of the WBCTP.

3.7.4 Visual Methodology:

Using visualization, I examined the trend in technology in symbolism, efficacy and representation, the case of recognition and cognition, and connecting experiences and perceptions. The visual methodology is a medium that use the senses to represent and produce knowledge. I chose Visual literacy as an inclusive tool for the language barriers and for those with SEND to communicate meaning effectively and affectively. In the WBCTP, I used cartoons, pictures, posters, and books to stimulate discussion and share different interpretations. Visual literacy and interpretation of visual literacy were based on the various animated clips provided. Photographs, images, and drawings are used in the slide presentations and in the templates given as an exercise that combines mathematical literacy with creativity. The nets or box templates were used to create new literacy games and knowledge in the classroom. I included photographs and videos of tasks assigned to the pre-service teachers during the Whole Brain Creativity and

Thinking Programme. Using visualization, in the words of Walt Disney, I reminded the pre-service teacher. Gabler (2006), “Laughter is timeless, imagination has no age, and dreams are forever.”

3.7.5 Document analysis: Reflective journal

Observations were done through the purposive sampling method. Bowen (2009, p. 25) states, “Document analysis gives voice and meaning around an assessment topic. It incorporated coding into themes and analyzed”. I used reflective journals to allow pre-service teachers to reflect throughout the action research process. I, too used a journal reflecting my experiences and my observations. Reflective journals were planning documents where my reflections and doodles of the thoughts and experiences of the WBCT programme were written. They were dated and written in the comfort of my time and surroundings. Lee (2008) confirms that reflective journaling promotes professional development, which stimulates knowledge and allowed me and the participants to reflect critically and grow and distinguish between imagined views and reality. My notes showed different ideas and perspectives and helped achieve the difference in perceptions and feelings before and after the programme. The same was achieved with the participant.

3.8 Research Rigour

It was imperative that the research quality be kept within the boundaries of ethics in being concise with the goals and outcomes of the research. Every measure was taken to ensure that pre-service teachers’ experiences were thorough, reliable, and transparent. The pre-service teachers, the supervisor and I worked towards optimum validity and reliability. As action research, we examined existing knowledge and ventured into the unknown for new knowledge to create new paradigms and phenomena. The existing knowledge on the Whole Brain Model is integrated and generated into new knowledge through hypotheses and theories that can metamorphose into a body of work which can be analysed, replicable and researched further. In the Whole Brain Creativity and Thinking Programme, the solution leads to implementing the findings and enhancing pedagogy and methodology at various tertiary institutions.

The research rigour reflects the quality and authenticity of the research to impact policy and practice. The findings are impactful and have integrity. Trustworthiness, or

the research rigour according to Lincoln and Guba (2007), evaluates the research projects worth through four aspects listed below. In my research, I focused on the Whole Brain Creativity and Thinking Programme through the following from Lincoln and Guba (2007):

a) **Dependability:** My research evaluates the quality and is repeatable and consistent.

The research can be conducted at any institution with the same methodology and pedagogy. It is consistent and can be continued or repeated with or without any changes in the original content.

b) **Transferability:** findings in the study are applicable in other contexts.

All findings are applicable and adaptable in other contexts of recognising prior learning as an all-inclusive and holistic programme for Life-long learning.

c) **Credibility:** There must be complete confidence in the truth of the finding.

Whole Brain Creativity and Whole Brain Thinking as individual subjects of creativity and thinking have been used before by De Boer and Potgieter, respectively, as independent studies at a Higher Education Institution and further in institutions in the USA. The programme I proposed is inclusive, innovative and creative and includes both Creativity and Thinking. It is my lived and learned experiences and that of pre-service teachers, therefore, a first-person account of innovative education. My findings assist in filling this niche with the action research proposed.

d) **Confirmability:** This study had no researcher bias, motivation or personal interest. Therefore, I had to be utterly neutral while conducting this study. The participants or respondents shape all findings. The research conformed to the above. Neutrality was the key to exploring the lived experience of the programme for sustainability.

3.9 Data Generation

Articulating the observation and experience was vital in analyzing and comparing the empirical research methods for generating WBCTP data. We could extract the programme's experiences, emotions and responses with qualitative data.

3.10 Trustworthiness

“This trustworthiness depends on several research features: the initial research question, how data are collected including when and from whom, how they are analysed, and what conclusions are drawn” (Roberts & Priest, 2006, pp. 41-45). They clarify that reliable data collection must be error-free and accurate, contributing to validity. Research questions were unambiguous to avoid biases. Privacy, confidentiality and the participants’ self-image were maintained with dignity and respect when conducting group discussions.

3.11 Conclusion

Chapter 3 was an overview of the research methodology and insight into the questionnaires for group discussion used to gather data from participants. The WBCT programme-maintained reliability and validity of all matters in the study. Ethical parameters were established and maintained in this research study.

Chapter 4 presents the summaries of the four cycles of the study.

Chapter 4

4. Summaries of the Four Cycles

Presentation of Findings for the Whole Brain Creativity and Thinking Programme. In this chapter, I have compiled all the summaries of the four cycles in the Narrative Action Research for the Whole Brain Creativity and Thinking Programme and Model.

4.1 Introduction

Chapter Four is an interpretation and a presentation of the plan of the findings of the WBCT programme. As a community engagement project, the objectives of the more comprehensive study were to develop, design and implement a programme and model to explore the pre-service teachers' experiences (understandings and actions) of the WBCT. In this programme, the pre-service teachers were engaged in creativity, innovation, collaboration and critical thinking using the principles of Whole Brain Creativity and Thinking. Furthermore, the focus and objective of this study were to explore what, how and why I designed and implemented the WBCTP and model in the way I did, what, how, and why I created the programme and model, and what the content of the programme and model was. The programme and model are based on the narrative action research theory and experiential learning and follow the principles of the design and development of a programme and model.

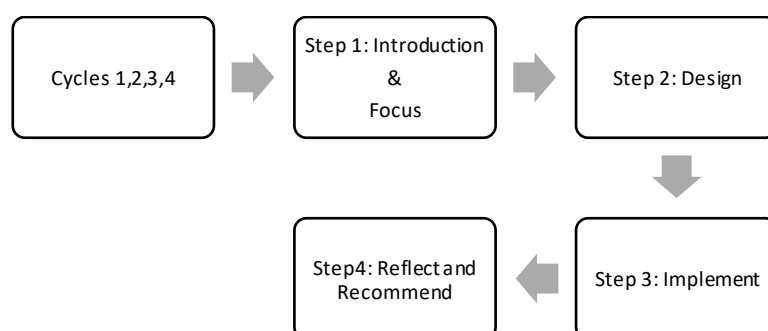


Figure 12. Action Research in Designing the Whole Brain Creativity and Thinking Programme. Fiona Khan (2022)

4.2 Planning the Whole Brain Creativity and Thinking Programme

Planning the design was primarily on the Whole Brain Creativity and Thinking. Pre-service teachers' knowledge and skills gained from the whole brain experience to develop the concept of an entire and holistic global citizen who could lead future learners into a techno-savvy, futuristic smart classroom as future leaders, visioners, and Imagineers. The implementation was based on action research, and the conceptual framework was the tool used to support the pre-service teachers' experiences within the WBCTP.

Each workshop cycle (there were four cycles) followed the Action Research process for each step:

1. Introduction and Focus
2. Design of the programme
3. Implementation
4. Reflection and Recommendation

The design, implementation and recommendation for a programme and model were based on my experiences within the programme. Furthermore, for each step of the cycle, action research followed. I included my expectations and observations and had the responses from the pre-service teachers regarding their experiences for a whole brain experience. I decided the same cycle would be included in the workshop presentation and slides, concepts, critical analysis, and observations. In every process, the experience had to be holistic and whole-brained. I pushed boundaries for change to be implemented in tertiary institutions and schools. I was daring enough to raise the bar on breaking barriers, introducing new concepts and designs and a new model in Education. Strategically, I had to ensure that as much as I was creating and designing a new programme, and model for pre-service teachers, it had to be aligned with schools and tertiary institutions, with policymakers and curriculum designers. However, the foray into technology and hybrid teaching and learning had yet to be initiated.

Therefore, the WBCTP was the foundation for developing a programme and model design that had yet to be attempted. Experiential Learning was the key to understanding the design and the framework. The entire process of the WBCTP was the active participation of the pre-service teachers in learning through experiences,

hands-on doing and discussion to help them memorise the experience, retain the information and experience and remember the theory around those experiences. Information processing was critical due to language, socio-historical past and present and socio-economic challenges.

Below are the cycles for Chapters 5,6,7 and 8 with the four concepts.

Chapter 5
Cycle 1
Environmental Sustainable Development

5.1 Introduction to Workshop One

Step 1

In designing the first workshop on Environmental Sustainable Development, I set a precedence for the other three workshops: Imagineering, Business Model and STEAM. All the workshops had to be concise, impactful, creative, and innovative. I considered the main focal point, Whole Brain Creativity and Thinking, as the guide in the pre-service teachers' experiences. In every aspect of planning and implementation, it had to engage a whole-brain experience. Workshop One was the platform and the ideation for other workshops. Using Design Thinking, I had to be mindful of the content, my presentation style, my rapport with the pre-service teachers, my whole brain knowledge and experience, and being a role model for change and innovation through lifelong learning. I recorded this as my observation and experience. I had to be cautious that there were no biases and that all information was factual with resources. The context and content had to be aligned with future visioners' and Imagineers' purposes and goals. I considered the virtual and hands-on training and activities based on the objectives. Below is a graphic on Workshop 1.

Cycle 1

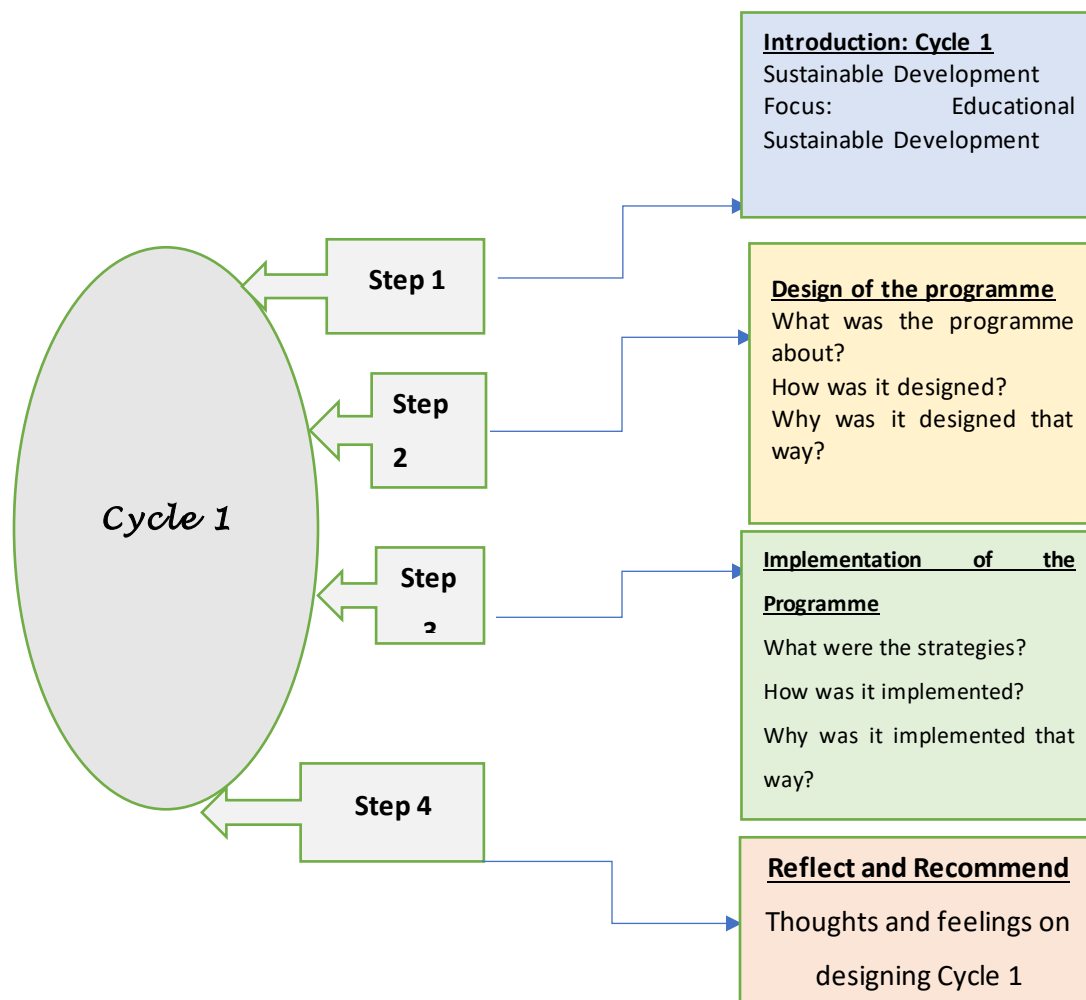


Figure 13. Cycle 1, Workshop 1. Environmental Sustainable Development
Fiona Khan (2022)

The Cycle for Experiential Learning in Workshop 1 - Chapter 5

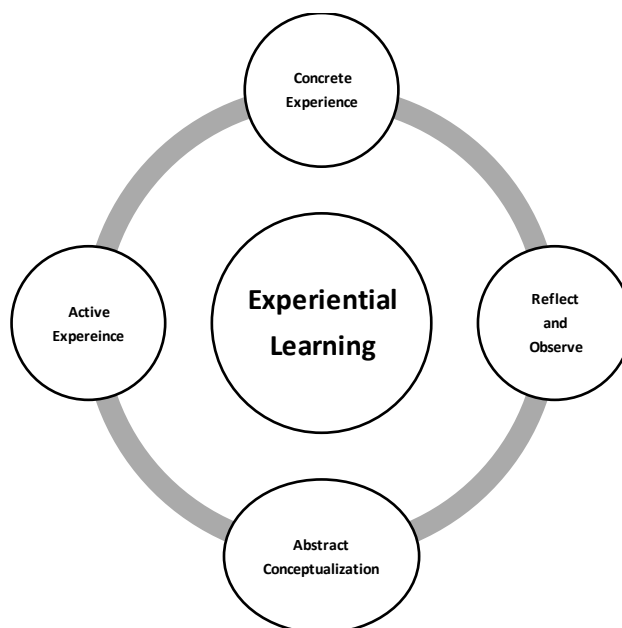


Figure 14: Kolb's Experiential Learning within the WBCTP (2022)

In designing the first workshop on Environmental Sustainable Development, I set a precedent for the other three workshops: Imagineering, Business Model and STEAM. All the workshops had to be concise, impactful, creative, and innovative. I considered the main focal point, Whole Brain Creativity and Thinking, as the guide in the pre-service teachers' experiences. Every aspect of planning and implementation it had to engage a whole-brain experience. Workshop One was the platform and the ideation for other workshops. Using Design Thinking, I had to be mindful of the content, my presentation style, my rapport with the pre-service teachers, my whole brain knowledge and experience, and being a role model for change and innovation through lifelong learning. I recorded this as my observation and experience. I had to be cautious that there were no biases and that all information was factual with resources. The context and content had to be aligned with future visioners' and Imagineers' purposes and goals. I considered the virtual and hands-on training and activities based on the objectives.

What was the focus of the design for the WBCTP? Sustainability, Sustainable Development and Environmentally Sustainable Development (ESD) were discussed as the first of the four concepts in the WBCT programme. The others were Imagineering, The Business Model and STEAM. The programme's main focus was the whole brain

experience of ESD through creativity and thinking. Sustainability and ESD is a transformative pedagogy and methodology within the SDG goals in the world that is transforming every day due to industrialisation and technology. The focus was largely on where pre-service teachers are and where they intend to be through teaching and learning through a collaborative sharing of knowledge, skills, and values. Unpacking Skills (S), Knowledge (K), Attitudes, Attributes (A), and Values (V) refer to the knowledge economy in gaining and transferring knowledge. Learning concepts and facts is knowledge acquisition. Transferring that knowledge into action through work, training, and education is a skill. Learning diverse views and being holistic is the attitude. Wholeness is enhanced by attributes that are the intrinsic qualities of a pre-service teacher. The value system encompasses ethics, i.e., dignity, truthfulness, fairness, responsibility, and unprejudiced. Pre-service teachers understood themselves and their role in the environment as a conduit for change in education. They understood the education, edification and, environment within themselves first, and the knowledge, skills and, values gained enhanced their professional development. As much as they understood this within themselves, they explored SKAVS further to be elicited within the WBCTP. Sustainability, sustainable development, and environmentally sustainable development were used synonymously and interchangeably. “Sustainable Development is a learning process through which we can (if we choose) learn to build our capacity to live more sustainably” (Scott & Gough, 2004, p. 116).

In Examining the principles for the creation of a programme, the WBCTP within ESD, Ned Herrmann’s discussion on whether programmes we offer are effective and the efficacy of education from what was learned to what was intended to be learned based on brain processing (Hermann, 1996, p. 151), was taken into account. Therefore, to create the WBCTP, I considered pre-service teachers’ environmental past to their present circumstances, history, culture, and tradition.

5.2 Step 2: Design of Cycle 1

What is the design about?

Primarily the programme was created around cohesive and integrated whole-brain thinking and creativity. The outcomes and objectives were the programme's

implementation and the pre-service teachers' experiences. As a Whole Brain Programme, the four quadrants were adapted from Ned Herrmann (1996), showing the four domains or quadrants, the Right and Left side of the brain and the functions of each quadrant or domain to create a whole-brain experience. What pre-service teachers required from the WBCTP was to make a significant difference in teaching and learning. They were the mentors in the classroom and the mediators of change.

The student's experience of the programme had to be vibrant, innovative and an aural-visual feast based on their past experiences and learning and thinking styles. These had to be aligned with the content and context of the curriculum, of their present study and their capacity to experience the knowledge of a whole brain programme and model. If they were not creative or right-brained thinkers before, they would tap into it in the programme, and if they were not exposed to a left-brain experience, they would also experience it in the programme. The intention is to facilitate design thinkers and content creators, especially in a world where social media give learners what they want with the motto "I want it all, and I want it Now".

Herrmann's (1996, p. 21) Four-Selves Models (*figure 14*) illustrate the specialised domains and modes of the brain as we respond to everyday situations. It was evident in their reaction, responses and observations through discussions that these brain centres were activated through their thinking preferences.

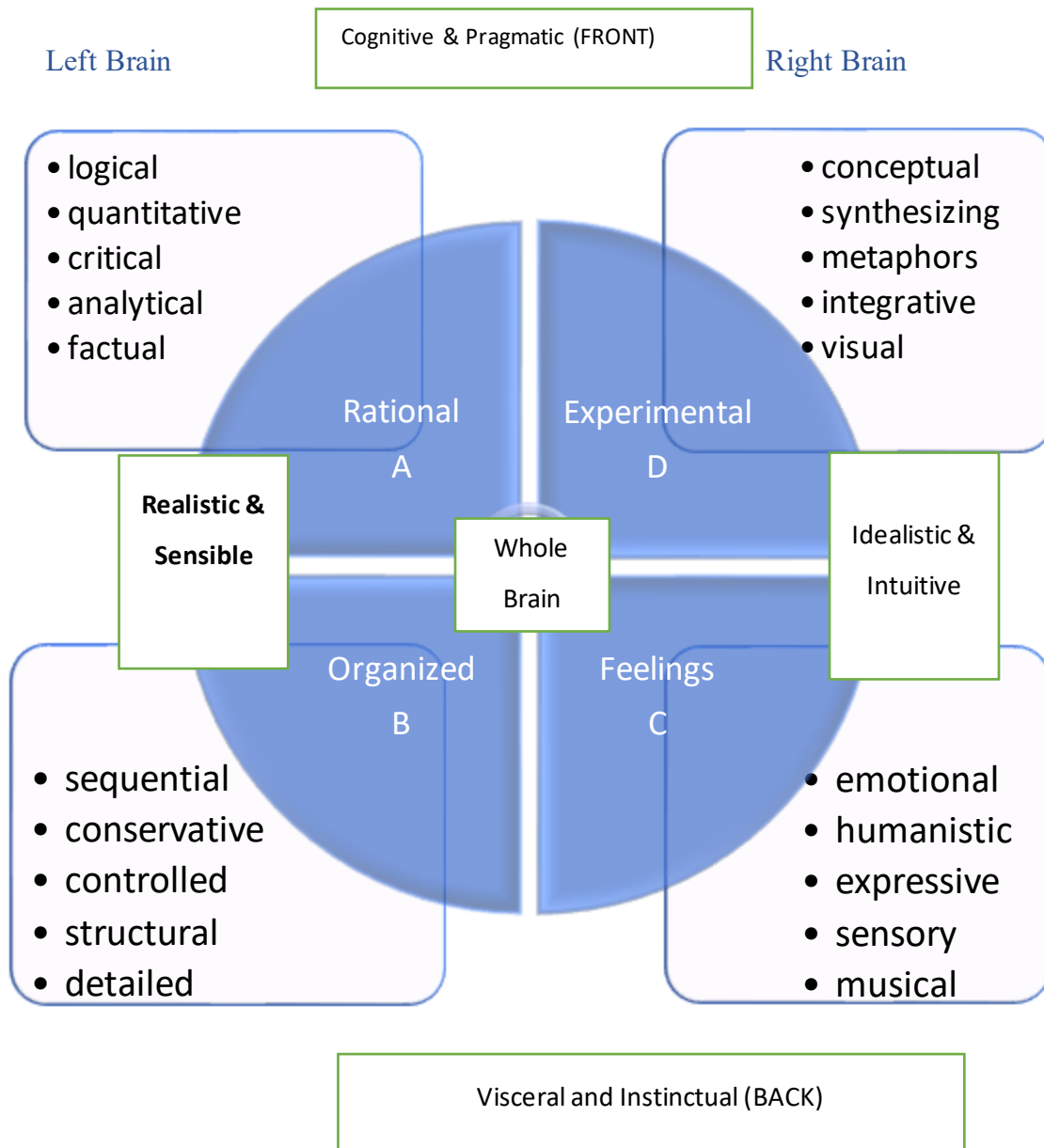


Figure 15. Herrmann's Four-Selves Model (1996, p. 21)

5.2.1 The meaning of ESD and Sustainability

The focus of the design was Environmental Sustainable Development (ESD), or Sustainability and Sustainable Development (SD). The focus for the action research was the Province of Kwa-Zulu Natal, where the students live and where the university is geographically positioned. Kwa-Zulu Natal is a microcosm of the world in diversity, inter and multidisciplinary ecosystems, indigenous fauna, flora, and a sharp contrast of tropical and sub-tropical climates.

What is the difference between Sustainability, Environmentally Sustainable Development, and Sustainable Development? Comparing the differences and similarities between the three terms, I explain why they are used interchangeably, their differences and similarities, and why they matter for our future. Sustainability is a broad concept that refers to "the ability of a system or process to maintain its function and quality over time, without depleting or degrading the resources or environment on which it depends". Sustainability applies to various domains, such as ecology, economy, society, culture, and technology. Sustainability implies a balance between the needs of the present and future generations and between human and natural systems (Kaur & Kaur, 2017).

Environmental Sustainable Development (ESD) is a specific approach to sustainability that focuses on the environmental dimension. ESD integrates environmental considerations into all aspects of development, such as planning, design, implementation, monitoring, and evaluation. ESD minimises the negative impact of development on the environment while maximising the positive ones. ESD advocates for the conservation and restoration of natural resources and ecosystems and the participation and empowerment of local communities and stakeholders. Sustainability can be defined as a learning process of learning to live with the environment in which we reside. "Sustainable Development is development which meets the need of the present without compromising the ability of the future generation to meet their own needs." (United et al. *Commission on Environment and Development*, 1987, p. 14). Considering the research, the WBCTP is narrative action research. ESD in my research, will be an action learning concept of concrete experience and reflection, using logic, theory and creative ideas with operational experience within the WBCTP. Pedagogy

and methodology must transform to embrace new concepts and capacity building and takes on the challenge of local issues to support and change the programmes, policies and practices in Sustainability. The WBCTP was designed to lead pre-service teachers from the socio-economic and environmental influences of the past and present into the future of the Fourth Industrial Revolution in pedagogy and skill.

Some examples of ESD:

Life below Water – keep the oceans clean and avoid over-fishing;

Life on Land - Planting trees, green cities, the circular economy, Sustainable cities and communities, SMART cities. Efficient homes.

5.2.2 KwaZulu-Natal as the Microcosm for a Sustainable Ecosystem:

KZN is the microcosm of the world due to its multiple interrelated ecosystems that co-exists in the province and is a resource for critical issues to be addressed and redressed by pre-service teachers. The sustainable ecosystems are the sea, air, land, mountains, agriculture and culture, history and diversity. Kwa Zulu-Natal has all the elements of the 17 SDGs and is integrated into a synchronous cohesive system that makes the province unique. Thus, my actions were transformative, using indigenous and diverse cultural knowledge to inform and transform pedagogical content knowledge through active intervention.

5.2.3 The Circular Economy:

I examined the circular economy of ensuring a carbon-free footprint, and the reasons were manifold. Pre-service teachers had to acquaint themselves with their birth or home environment (urban or rural), then the local social environment. Thus, they could compare the local experience of sustainability and Sustainable Development against the 17 SDG goals with the global experience and impact of being a global citizen. The main principles of a circular economy are *Rethink, Redesign, Reduce, Reuse and Recycle*. Using the principles, the product stays within that product chain for

as long as possible to its maximum benefit, creating a circular economy. The three forms of sustainability are environmental, economic and social.

The energy cycle between different energy sources and cycles is used in the blue economy (oceans and rivers, their ecosystems, economy and jobs) and the green economy (land, forestry, clean energy, natural resources and biodiversity). Thus, waste and pollution are reduced, and products are used to their highest value. Pre-service teachers' knowledge economy became their intellectual capital, beneficial, and profitable it can be used to its fullest potential. The brain works as a complete unit of different areas and functions in harmony with processing cognitive information and in performing tasks in its creative capacity. To sharpen the awareness and skills of pre-service teachers, sustainability focused on their personal everyday experiences and enhanced with learning, creativity and openness. They will be able to capitalise on the knowledge during the programme and disseminate it to learners shaped and informed by the pre-service teachers' individual experiences of the programme.

5.2.4 Social Activism:

Pre-service teachers are agents of change in education and as teachers. Using the CAPS curriculum, they are the first point of change through content and context. Different levels of pre-service teachers will have environmental knowledge to use at different grades. Notably, environmental knowledge changes all the time. It impacts economic systems. Social activism starts within the school environment when learners are conscientious in environmentally sustainable education. Pre-service teachers are prepared with sustainable knowledge in the knowledge economy to use in the classroom and job creation. Their worldview affects and effects the thinking and passion for making informed decisions in sustainability. Learners take that knowledge home and may thus engage parents in activism. In rural communities and in comparative educational sustainable knowledge or information, African parents are inherently subsistence farmers. The knowledge never expires. With the teacher's knowledge and that of the parents, children transform and reinvent social disparity and may use the schooling system as a platform to raise their voices. If the context educates and promotes in this regard...the context is essential... For active global citizenship, for a whole teacher with a holistic attitude and knowledge, love and appropriate actions

toward the planet are essential components of motivation, compassion and empathy. WBCTP encouraged pre-service teachers to transform and reinvent education without being exploitative.

5.2.5 Thinking Styles and SKAVS

Thinking styles were based on cognitive, affective and psychomotor faculties. The WBCT was the core factor in the design cycle incorporating the whole-brain function. Bloom's Taxonomy (1964) is still used in schools for learning objectives and thinking styles. On the affective framework of learning, socio-emotional learning, EQ, and mindfulness were the baselines for professional development. Gratitude, self-image and confidence were qualities enhanced with ESD. Soft power through diplomacy and understanding will assist with classroom management. SKAVS are essential requirements for the teaching profession or professional development. Their values weld the past to the future. Skills are upgraded through lifelong learning, but their attributes and attitude constantly evolve with new knowledge. The knowledge economy is a welding of the past, the present, and the future, as well as rural and urban knowledge. I introduced visual literacy for enhanced comprehension and methodology, especially for the whole brain experience and play. I considered the language barriers and that pre-service teachers were students of English as an Additional Language. The experience of designing the WBCTP, the factors of language and situational circumstances were included in the design. As I had used Design Thinking in planning and design, the four concepts were delivered in the ideation process.

5.2.6 Tools in the Design

The entry point of new knowledge means a preference and a choice by pre-service teachers. Professional development is the framework for leadership. Therefore, pre-service teachers would be expected to embrace and change their learning and thinking styles and create content as design thinkers within the programme. Each Tool was strategically created in their learning experience with specific outcomes in mind. With experiential learning by Kolb and Design Thinking, they could analyse, strategise, organise and personalise their experience.

5.2.6 a) Design of the slides: I chose a specific theme and layout based on the WBCTP. The background was based on children being carefree and playing. I loved the visual impact of the slides, which contributed to visual literacy. The visual and kinaesthetic experience enhanced their knowledge processing as it was easily accessible, and the content was relevant. In training, pre-service teachers could assess their access to information and motivate themselves for achievement.

5.2.6 b) Tasks or Activities: The tasks were designed with specific outcomes. Pre-service teachers making cards were to show empathy, compassion and their appreciation of the Earth. With mindfulness and being conscious of the task and workshop, they were grounded before the workshop started. Each task was completed based on the content and context of the WBCTP and in keeping with ESD principles.

5.2.6 c) Questionnaires: Specifically designed for ESD. The questionnaire gave insight into their thinking styles, reflections on the content of the first workshop, their impressions and level of understanding and their experiences. Through their experiences of the workshop, why did they experience it in the way they did?

5.2.6 d) Reflective Journal: I kept a reflective journal. It was critical to the design and implementation. Reflection was essential to design thinking as it was both intrinsic and extrinsic. The catharsis from designing, presenting the product and reflecting was profound due to my experience in project management. It complemented design thinking in considering time frames and deadlines. Pre-service teachers kept reflective journals too. They were also necessary skills for pre-service teachers, as they had learned to assess needs, see with fresh eyes, generate fresh ideas and test to learn. Journals were also a medium to design, evaluate and assess their experience and any shortcomings in the programme. The WBCTP was a project I had to deliver and address the necessary changes if they had risen. Using the experiential learning cycle, pre-service teachers learned to be iterative to create, collaborate and connect on ESD.

5.2.6 e) Videos, pictures, and animations: Visual Literacy examines creative approaches in the WBCTP. Memory is stimulated through visual and auditory stimulation. There are sensory perceptions from the five senses, which become visually stimulated and memorised when repeated. It is stored in short-term memory for retrieval

and association. Visual information is stored in long-term memory and compartmentalised. When pre-service teachers lean into visual literacy again, the brain goes to that compartment to retrieve information for reflection. I also considered the language barrier and literacy level when adding videos, pictures and animations

5.3 Reflection and recommendation on the Design of the WBCTP and Model:

As a community engagement programme, I was allowed to bring into consideration years of experience in my very extensive portfolio. When I discussed the programme with Professor James, I explained clearly the design and the concept of whole brain theory. The Whole Brain Creativity and Thinking Programme had to be unique, fill the gaps from further Education and Training in Grade 12 to the massive leap into tertiary institutions. In my research, I tried to find a model or programme designed exclusively for tertiary institutions or undergraduates in the way I designed the WBCTP and model. We must remember that every undergraduate who enters a tertiary institution is intimidated. It is the first step into the vast adult academic world. However, every student dreams big, wanting to fulfil their dreams or their parents. Sadly, not everyone can complete an undergraduate degree. Many are disillusioned because there are limited support structures, and a lack of knowledge in technology. The transition was slow, and the turnaround rate for graduates was slow. I looked at global leadership, partnership and collaboration for undergraduates that can start as soon as they enter tertiary institutions.

I regarded the programme as unique, written to inspire me to aspire, encourage passion and true grit, motivation and gratitude. As an entrepreneurship business model, the WBCTP was created for teacherpreneurs who were visioners and imagineers. Just as we did not want dull pre-service teachers, we did not want dull learners. The motivation was to promote positive, confident global citizens in the classroom and as role models to the learners. Pedagogy and methodology had to change. I considered how we require active inclusivity to inspire greatness in others and sustainability in education and the environment. I firmly believe every child is born with the potential to be great however, it is our socio-economic and social genetics which determine our altitude. I was allowed by the University and Professor James to explore and express myself as a leader, Global Goodwill Ambassador and social entrepreneur. It translates

to a programme of this calibre and depth that had never been done before. That is to enlighten pre-service teachers to think and dream big and remove the shackles of teaching with technology. Higher Education is capable of smart technologies, and pre-service teachers as agitators, have the capacity to facilitate change rapidly. We could no longer dwell on remnants of a colonial education system foisted on reluctant pre-service teachers.

A renaissance in education with a hands-on people-centred approach with both higher-order and lower-order thinking is required for a whole-brain holistic experience. Metacognition allowed pre-service teachers to relearn and rethink the future of education and edification with intent. Visual literacy through gamification and animation illustrated the diversity in tools for STEAM education in ESD, SD and

5.4. Step 3: Implementation of the Programme

Strategies were based on my role as designer, project manager and the participants' selection, motivations, and willingness to participate in the programme. The University of Kwa-Zulu Natal, Edgewood Campus, was our research site for pre-service teachers. To be included in the programme, pre-service teachers sent a motivation outlining their intention, goals, and what they hope to achieve or enhance their education and edification through a practical and exciting programme and model. The motivations were turned into actions and outcomes.

5.4.1 What were the strategies? Implementing the WBCTP aimed to encourage whole pre-service teachers who were holistic and critical thinkers and leaders who were confident in their decision-making skills. They could disseminate information learnt proactively for future reference in the classroom. I set clear goals and outcomes in each slide in the programme and presentation based on Kolb's experiential learning strategies. Visual literacy, Auditory and Kinaesthetic literacy meant removing language barriers and assisting in comprehension. I considered the levels of language at home and 1st additional languages. This aspect of code-switching was critical to the institution's change in policy and efficacy with the WBCTP in implementing the programme. As a new strategy for undergraduate study, pre-service teachers were observed and engaged through discussion to adjust the strategic

initiatives of experiences, affective and effective creative approaches and their internal responses.

The roles, objectives and responsibilities and the relationship between the facilitator, pre-service teacher and supervisor were outlined. Tasks were delegated with specific outcomes for pre-service teachers. The presentation was at the end of the programme and after the four cycles. They embraced new challenges and adopted new roles as visioners for a sustained, collaborative, and interactive programme. Mindful of the goal for each concept had to be achievable, the content was local, the language was simple and understandable, and the slides and presentation were presented in a style where pre-service teachers could access their frame of reference from previous knowledge while learning new knowledge. The presentation was executed with a specific plan outlined above (*figure 17*), and progress and performance were monitored through focus group discussion with continued support and encouragement, resources through the presentation and a chance to consult in the programme with their hand-held devices.

Whole brain creativity and thinking were the priority as an experience that changed the pedagogy and methodology. Interpersonal relationships were crucial in gaining trust among the pre-service teachers and myself. We had to learn how to interact with each other and be confident within the programme. Within the presentation of the first few slides, I had won over their interest and attention because of the confidence with which I presented the content and my in-depth knowledge through past experiences, education and edification. I aimed to ensure holistic knowledge for a Wholistic individual ready to imbibe the present knowledge acquisition. Global sustainability in education meant communities could connect through education and knowledge, and pre-service teachers could collaborate for a sustainable educational future. When there is dissonance and uncertainty, individuals are open to learning. Pre-service teachers knew the objective of a whole brain creativity and thinking programme and their responsibilities. There was effective and adequate explanation of the requirements when answering the questionnaires and filling the reflection in their journals. I knew their presence was voluntary but based primarily on their quest to absorb more knowledge.

The concept of sustainability required affective strategies for effective outcomes. Mindfulness, Socio-emotional learning and emotional intelligence were introduced. They were necessary for raising awareness through empathy, compassion, overcoming challenges and mediating conflict to bring affective change in behaviour towards the planet. Pre-service teachers required these strategies for understanding and managing emotions for positive peer and classroom emotions and conflict changes. Practical and affective communication skills were encouraged. In our discussions, we raised the issues of self-awareness, social and emotional awareness, self-management and inter-relational management through visual literacy. Communication skills and responsible decision-making were encouraged through social-emotional learning for better academic performance, being successful leaders, stress management and preventing mental issues of depression and meltdowns.

I executed the plan for the WBCTP, after that, monitoring progress and performance and providing support for any challenges. Different themes emerged. They centred around the four concepts. I constantly reminded the pre-service teachers about their presentations and listened attentively at their discussions. Implementation of the programme was iterative. With action research and design thinking, the subject of WBCT was constantly evolving. Processes were as planned, and any challenges were handled with proficiency and expertise. The activities increased as we moved from one theme to the next. There were calls from pre-service teachers for more technology and visual literacy, and most pre-service teachers wanted their English improved. I had to be very attentive and flexible and sometimes go to lengths to explain concepts that they never heard before, i.e., the back story. We conducted a retrospection and evaluation process through the questionnaires and after the sustainability workshop.

5.4.2 How was it implemented?

In implementing a change in pedagogy and methodology in tertiary institutions, I wanted to envision and encourage active participation of pre-service teachers in their lecture rooms rather than reclining on chairs and being passive learners. Together we discussed market mentality of tertiary institutions and whether the value of their mission and vision and institutional needs were met. For the WBCTP and model, pre-service teachers must 'make and do' as they would in a classroom, indulge in group

discussions and simulation of case studies. Therefore, in the making of their recycled project tasks, I encouraged them to work in pairs or in groups. A whole brain experience is an interactive mind with collaborative experiences and thinking skills. Creativity and innovation were discussed and worked with ideation and design thinking.

5.4.3 Why was it implemented in that way?

Did the institution converge the needs of the pre-service teachers as undergraduates with technological capabilities, their creativity and innovation (SDG4), and their conversion to a 5G generation with smart city needs for a creative economy and community (SDG 11)? Was the institution culturally, economically and technically aware of global trends and markets to understand their undergraduate pre-service needs, global and local diversity, challenges, and changes within the education system and the workforce in any plant or school? I asked these questions to validate my design and implementation. Then pre-service teachers were asked the same questions and challenged their potential to be visioneers and Imagineers through their learning experiences. Digital and mobile learning was the future of a virtual world. The institution must be prepared for more blended and bite-sized learning than pre-service teachers filling lecture halls. New-age students embraced gamification as a tool for the future of learning. The future is a faced paced change with newer technologies and communication strategies in building creative and knowledge economies through lifelong learning.

5.4.3 a) Slides:

PowerPoint presentations with slides. Each concept was workshopped for three hours. I considered the real-time for contact and the content to be addressed within the prescribed time. Consideration was given to the discussion and presentation time for each slide, the background knowledge, prior knowledge, and the present knowledge for all topics within the concept. Discussions with the pre-service teachers involved answering questions, answering queries and elaborating further information. The first workshop on sustainability took four hours and was presented on a Saturday to complete the content within the timeframe. I used discussion videos and animated videos to raise the interest of the pre-service teachers and to indicate that there are

alternate resources to pique the interest of learners in studying content. If they were fascinated, so too would the learners be captivated into an enjoyable learning experience.

5.4.3 b) Pictures in Slide:

The pictures were sourced, based on the concepts and content within the slide presentation and the topic. Every slide had to capture the heading, the ideation, and the content of that slide. Unleashing words through pictures on the senses was far more stimulating through the visual and aural medium than copious amounts of text. It was a whole-brain experience of reading the text, analysing the pictures, listening to the sounds, critiquing the pictures and the concepts associated with pictures and raising the relevant emotions and responses. We are all connected to our socio-environment. It resides within us to create a consciousness fired by traditional and cultural narratives. Whole brain activity connects with that consciousness by stimulating creativity and brain linguistics.

5.4.3 c) Tasks or activities: Pre-service teachers were excited to participate because it gave them the impetus to showcase their creative talents and the potential to be leaders and creators. The growth mindset and true grit are qualities of Imagineers and visioners. They worked with Bloom's different thinking styles and Kolb's experiential learning to explore the minds as visioners with thoughts of creating a better future through their experiences. Moreover, their presentations reflected leadership and their oral skills through creative communication. Presentations were allowed in English and Zulu or a fusion or blending of both languages. In their projects, they were asked to create a game from the content given and to be creative and innovative. The growth and leadership mindset through mindfulness encourages the belief that everything is possible with passion, inspiration and motivation.

5.4.3 d) Journals: Entrance into the WBCT programme, they expressed their vision, demotivation, the opportunity to be given the chance for success, learning something new, their disenfranchised past. Therefore, engagement within the group discussions and reflective journals were vital in the pre-service teachers' experiences. Participation barriers in lecture rooms are limited to raised hands and responding on

cues. In the WBCTP, they could reflect on the challenges, their experiences, confusion and what excited them for that workshop. They could discuss it before the next presentation and seek solutions to enquiring mindsets. Their Journals gave them an opportunity to discuss topics that were difficult to raise in an open group repertoire. In the learning WBCTP they were given the opportunity to dispel those fears and challenges, acquire new skills, work without excuses and build their confidence through metacognition. Metacognition is the driver on intentions and creativity and on memory and understanding. It reassesses how pre-service teachers think and learn and they can reflect on the strategy. For their growth leadership they could set new goals and find purpose in their careers, conquer objectives and build on their dreams. Journaling was an opportunity to express their objectives and goals without being affected by others' opinions and excuses. Metacognition conceptualised pre-service teachers' approach to knowledge, the task at hand and the strategies that will be addressed in their journaling.

5.5 Reflection and Recommendation

Implementation of the programme had to be strategic in terms of strengths, weaknesses, opportunities and threats (SWOT). I defined the goals with the research questions; therefore, I had to ensure that proper research was complete with fact-checking and the latest details and statistics. The requirements for SWOT were based on Kolb's cycle of Experiential Learning and on the Living Theory. Each aspect went through the rigorous process of the focus, the strategies and their viability, the thoughts and feelings on design and implementation and the programme changes. The goals and objectives were for the best planning, strategising, and implementing results. The goals were specific for each workshop and cycle. I used the business model of SMART goals. They were measurable, actionable and achievable. They were also realistic, relevant, and set within a time frame (SMART). We required SMART pre-service teachers for SMART learners in the digital age.

5.6 Conclusion

This study aims to explore the best practice for pre-service teachers. Challenges faced by pre-service and in-service teachers in pedagogy and methodology were acknowledged. I developed a framework for the future successful implementation of a

model and/or a programme to enhance professional development through the experiences and implementation of the WBCTP. The importance was placed on developing a programme and a model.

Pre-service teachers were curious therefore they had a thirst for knowledge. Observers cannot confirm that every pre-service teacher or undergraduate does not have learning challenges. Within the psychology of WBCTP we communicate the process and phenomena of the Whole Brain Creativity and Thinking in science practice because the understanding between science and nature is incomplete. Science and Technology does not work with Sperry's split-brain theory anymore. We need whole global citizens with holistic teachers in education and edification therefore the introduction of the Whole Brain Creativity and Thinking Programme is based on Ned Herrmann's (1996) theory of highly successful whole-brained individuals. To overcome any challenges of the past in higher education and basic education, I encouraged the correlation between concrete and abstract thinking and learning styles. I introduced visual imagery and literacy. The model and programme, the concept and the context complement each other apply to all contexts in life. The SMART goals were based on the skills and experience gained in the past. There was progression and succession from ability and understanding at school through a continuum in tertiary institutions and beyond. Therefore, the WBCTP and model is a repository of knowledge from all disciplines especially inclusivity. In narrative action research the plan included identifying the problem, acting upon that problem through trial, collecting information and questioning, observing and then reflecting.

CHAPTER 6

Cycle 2

Workshop 2: The Whole Brain Creativity and Thinking Programme and Model:

6. Imagineering

6.1 Introduction:

Imagineering in Education is a new concept I created for pre-service teachers within the WBCT programme. The context of Imagineering, unpacked by Imagineers (creative, imaginative, engineering designers), is a concept of Whole Brain Thinking and Creativity. Imagineering welds the ideas of creativity with cognitive thinking skills to create fantasy, play, and abstract thinking in a holistic classroom. WBCTP allows for continuous details, visualisation, development, and artistry for innovation and creativity. Creativity through experiential storytelling becomes an outer manifestation of whole-brain thinking, creativity, and intellectual processes. Imagineering is the building block of creative thinking and design, inspiring aspirants to be visioners. I take teaching from the chalkboard into integrative, interactive, techno-driven methodologies and pedagogical content knowledge. Teaching and learning are entrepreneurial, profitable, and beneficial to pre-service teachers and learners.

6.2 Focus of Workshop 2

STEP 1

Plan: Cycle 2

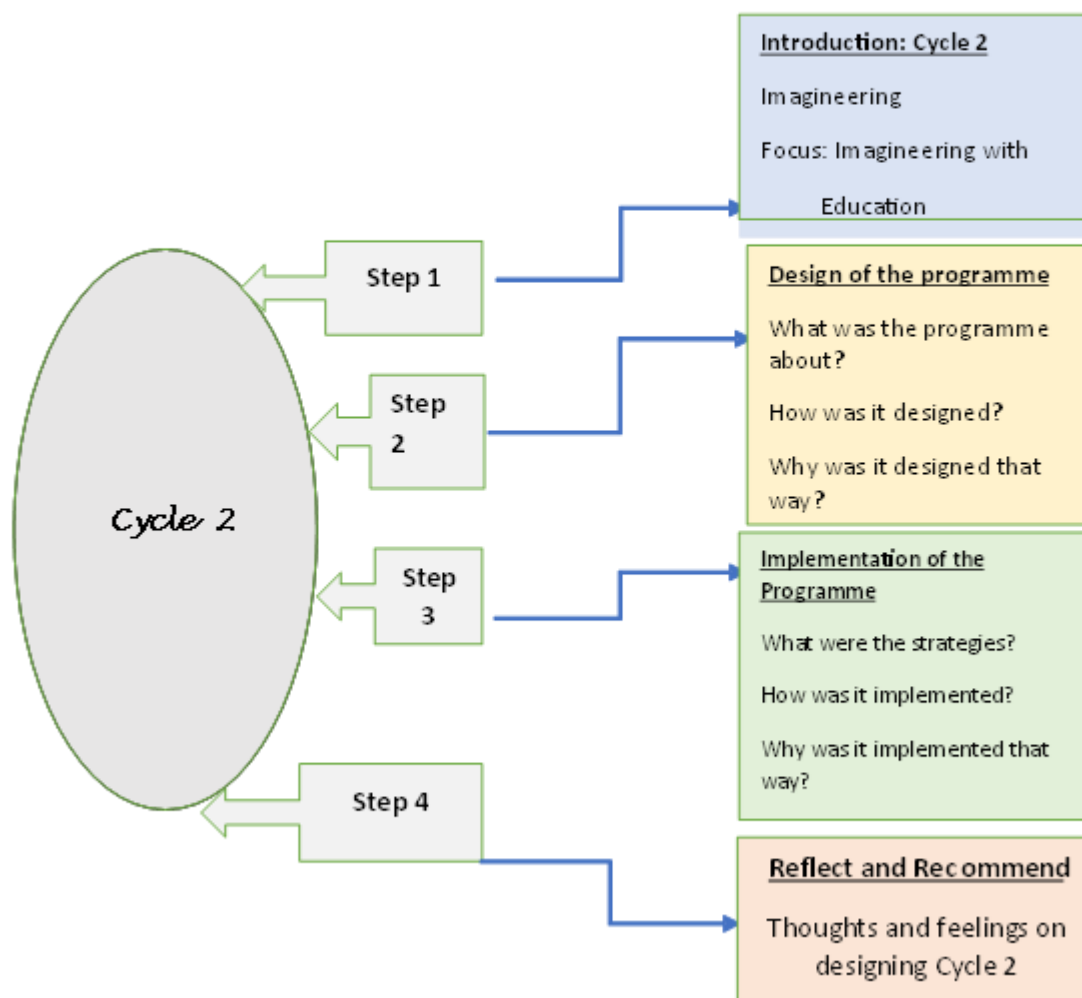


Figure 16: Cycle 2 on Imagineering of the WBCTP. Fiona Khan (2022)

6.2.1 What was the focus of the design? I introduced Imagineering as a word that thrives on imagination, innovation, and creativity. Introducing the concept meant we did not use it at a tertiary institution in Kwa-Zulu Natal among pre-service teaching and undergraduates. The focus of Workshop 2 was designing, planning, and implementing the WBCTP and model with Imagineering as its theme. In creating the SMART digital economy with a 5G reach, the area of focus was digitising Smart teachers for SMART schools in a SMART pluralistic society with a digital economy. I

applied and explored Imagineering through elements of design thinking, engineering, and imagination to create innovative solutions for challenging problems.

I used Imagineering to create the WBCT programme and model by using digital tools for pre-service teachers to be empowered through technology and enterprising in creativity and innovation as digital creators. It was an excellent guideline for project managing teaching and raising the level of teaching into teacherpreneurship in a business model. It is a new field used to design and develop new technologies within the SMART services and infrastructures, create new content, products, and services, and be enterprising entrepreneurs with electronic learning (E-Learning), mobile learning, and digital learning. Lifelong learning is now digital and enhances visual literacy, making learning a memorable experience in real time. The whole brain concept of Herrmann (1996) encouraged optimal performance for business practitioners and social entrepreneurs.

6.2.2 How did the focus reflect on the design? Pre-service teachers can create content by being enterprising digitally. The concept and practice of teaching and learning have transformed in the past decade. The change embraces the digital divide through technology. To create a holistic experience for whole teachers, I included social-emotional learning, mindfulness, and emotional intelligence. We cannot evade the challenge of mental stress and mental health in schools. Pre-service teachers must empower themselves holistically and strengthen their self-image for adaptability in any environment and circumstances. There must be collaborative thinking and skills, sharing of knowledge and skills, and for pre-service teachers to use various tools and resources to bring new expertise in pedagogy and methodology.

Pedagogy and process must triangulate with technology and digitisation. It is the path to the future where teaching must be engaging, adaptable and collaborative for the pre-service teachers and the learners in the classroom. Most schools have handheld devices. Teaching on the blackboard has numerous challenges, but through technology and Imagineering, the reach is farther, the attention and focus converge, and the possibilities of creativity and innovation are far greater than the chalkboard holds. Teaching and learning is now rejuvenated for sustainability. Pre-service teachers individualise learning and create a more significant space for exploration. All mistakes,

challenges and obstacles are new experiences, active experimentation and reflective observation through technology, digital and mobile literacies.

The design focused on changing the methodology for pre-service teachers and redesigning the pedagogy for future teacherpreneurs as visioners and Imagineers. The areas of connectivity were Environmental and Educational Sustainability, the Business Model, STEAM and Professional Development.

6.2.3 Why did I focus on this design for Workshop 2? At the outset, I knew the objective was to create a Business Model for Teaching and Learning. This included introducing digital and mobile literacy and skills through technology with pre-service teachers first, and then they could include these skills in the classroom. Teacherpreneurship is a combination of teaching with a flair for entrepreneurship. Leadership skills are essential in professional development. Teachers are the conduit and enterprising communicators between age gaps to create a bridge between the past and the future. I needed Imagineers who were creatives and leaders. Treating the digital age as the foundation for the future, pre-service teachers must be a sluice for knowledge, information, and communication. There must be a passion for the profession and change.

As professionals, pre-service teachers must build relationships and connect through technology, communicating more significant meaning and deeper connections between SMTs, parents and learners. Therefore, I included SEL, mindfulness and Emotional Intelligence (EQ) in the pre-service teachers' workshops to encourage and develop classroom social cohesion and for technology to be used responsibly. Any person being a digital guru and a mobile toktokkie translates into too much time being spent on social media platforms. However, technology promotes healthy conversations and builds meaningful relationships through education and edification. Social platforms have established content creation and digital media as sources of income. Followers, videos, and shared and partnered promotions help to raise much income. The visioner in teaching and learning *vis-à-vis* pre-service and in-service teachers must use digital and mobile content creation to further teaching and learning in the classroom

6.3 Introduction to the Design of Cycle 2

Step 2

Digital pedagogy and digital literacies are an ecosystem that creates challenges and solutions, opportunities and blocks, but for teaching and learning, it is the business tool for the future. Imagineering is the technology for the future. There must be congruency and welding among the technological content knowledge, the pedagogical content knowledge the existing knowledge. Most significantly, pre-service and in-service teachers are now global citizens with a digital footprint. They have transnational identities and are content creators, and their exchange rate is based on their digital knowledge economy. They are now the tabular rasa for the 4IR, where schools and tertiary institutions are the Metaverse for the multitude of digital content.

In the design, I subverted from the theoretical and conceptual framework of conventional design in programmes and models. I created a design for future programmes and models based on my experiences and SKAVS. Designing a programme methodically with a step-by-step process had yet to be initiated. After extensive research, what follows in the design and creation of the Whole Brain Creativity and Thinking programme and model is outlined in detail as a template for all future designs. The action research allows for the content and context to be upgraded (if required), for future research.

6.3.1 Concepts in the design

6.3.1 a) What is Imagineering?

Imagineering is a portmanteau combining two words, imagination and engineering. It is based on devising, creating, elaborating, and collaborating on creative ideas like building and layering in architecture and engineering. Imagineers take imagination and make it into a complex reality through artistic creativity. People who are visioners create Imagineering. Taking the concept from the design and building of fantasy with Disney, I introduced the concept to pre-service teachers for use in tertiary institutions and the classroom. Much of Imagineering is Design Thinking. It has

unlimited potential for creative design and logical planning. Teaching and learning have been revolutionised in pedagogical content and are now the technological art on a whole-brain canvas. Think of it as innovative project management through artistic creation, robotics and coding, animations and animatronics with colour, and movement in 3D and 4D. Education is now digitisation on steroids! Technology in Imagineering adds pizzazz to a foreign topic. Pre-service teachers can now identify the needs of any topic, collaborate and ideate, create and recreate, design and redesign, present a plan or prototype and then have a finished project.

6.3.1 b) Who are Visioners?

Visioners are people who can see beyond the present and imagine the future. They challenge the status quo and seek to create new possibilities and solutions. Visioners are often innovators, leaders, and change-makers who inspire others with their vision and passion.

We call them visioners because they have an exciting vision of what they want to achieve and how they want to make a difference. The constraints of reality or the opinions of others do not limit them. Their values and purpose drive them. Visioners can communicate their vision effectively and persuade others to pursue it. People who can see beyond the present and imagine the future are visioners. They are divergent thinkers, and they agitate the status quo. They strive to create new possibilities and solutions. Visioners often innovate, lead, and change the world with their vision and passion. They have a clear and exciting vision of achievement, their goals, and how they intend to make a difference.

The constraints of reality or the opinions of others do not limit them. Their values and purpose drive them. They communicate their vision effectively and persuade others to pursue it.

6.3.1 c) What is Design Thinking?

Design thinking is a creative problem-solving approach. It focuses on the needs and desires of the users, especially in the WBCTP, the pre-service teachers. It involves

understanding the context of the problem, generating and testing possible solutions, and iterating based on feedback. Design thinking is essential to create innovative and user-friendly products, services, and experiences to improve people's lives and meet their expectations. Design thinking encourages collaboration between designers, developers, customers, and end-users. Design thinking principles can be applied in tertiary institutions and the classroom. The WBCTP initiates pre-service teachers and, eventually, learners into creating and innovating purposefully. It is methodical and creative, logical and artistic, and a reminder of what is essential and required to make teaching and learning more fun and exciting.

6.3.1 d) Social-Emotional Learning

Social-emotional learning (SEL) use skills essential for personal and social well-being. SEL skills include self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. These skills help people cope with challenges, communicate effectively, empathise with others, and achieve their goals. In the WBCTP, it was incredibly beneficial, especially to pre-service teachers and learners who speak English as an additional language and where indigenous languages are home languages. SEL is important for people of all ages, from birth to adulthood. Research shows the positive impacts of SEL on academic performance, mental health, behaviour, and career readiness. SEL can also help create a more supportive and inclusive tertiary and school environment where students, learners and staff feel respected and valued.

Some examples of SEL activities that can be used for pre-service teachers in the WBCTP and in the classroom are:

- Practicing mindfulness and SEL for cohesion, focus and achieving goals
- Encouraging a whole individual in a holistic way
- Collaborative SMART goals for SMART (pre-service) teachers and learners
- Being mindful, trustworthiness, sharing feelings and perspectives respectfully
- Shared interests and support in group tasks and resolving disagreements amicably
- Reflecting on strengths, weaknesses, opportunities and attributes

- Seeking knowledge, interests and values through SKAVS.

SEL is a lifelong journey integral to lifelong learning that requires ongoing practice. Integrating SEL into SKAVS and the academic and school curricula, including the school culture, pre-service teachers, educators, and learners develop the skills for success. Social-emotional learning (SEL) is a vital part of education. Pre-service teachers develop attributes, attitudes, and values and a change in their mental, emotional and social capacities that enable them to thrive in leadership and achievement. SEL builds self-esteem encouraging diverse thinking and inclusivity. SEL within the WBCTP was purposefully included in creating positive and supportive learning environments and fostering authentic relationships with peers, families and communities.

6.4 Design of Imagineering (2nd Workshop)

Designing the Imagineering concept was tricky because it contained sufficient aspects of technology, digital and mobile literacies and its functionality in the business. However, I had to ensure the content was enjoyable, was new knowledge, was impactful, and aligned with the thinking and learning styles. Imagineering included layering of Bloom's (1964) higher and lower-order thinking skills in an innovative context and content.

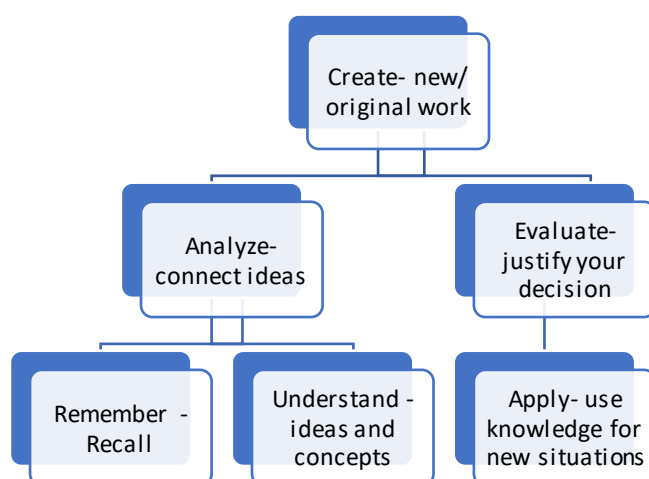


Figure 17. Bloom's Taxonomy adapted for WBCTP, illustrated by Fiona Khan (2021)

The updated taxonomy based on action research is similar in concept to Kolb (2014) and Nilsook et al. (2014). They align with Design Thinking, ultimately being innovative and creative. In cycle two, the programme was unique and a welcoming change for pre-service teachers because they could experiment with the basics of robotics and engineering. Pre-service teachers applied their essential skills to create an object that moves using simple movement. Their task was to complete an object that moves using the knowledge of pulleys. In this activity, they worked in different collaborative and design thinking groups. Testing their knowledge and skills with activities exuded enthusiasm and innovativeness. I inculcated the habit of constructive thinking by examining de Bono (2017). I expanded on the premise that sustainable education is only sustainable through both constructive and critical thinking, with the ability of pre-service teachers to engage in reflection and independent thinking. They have sufficient emotional stability, are mentally prepared and strong, and can make meaningful decisions that support growth and development.

Hybrid teaching and learning models have established distance learning and MOOCs. Accessibility forces tertiary institutions to adopt design thinking for knowledge acquisition and redesign the curriculum using technology. Unemployment and employability after graduation are profound realities in South Africa. Pre-service teachers need the competencies to be employed. A skills-first approach ought to be the foundation of educational ecosystems. The WBCTP encourages innovation and creativity with the premise that pre-service teachers can create self-employment within the field of teaching and learning. It will empower them with essential skills, knowledge, and objectives to be teacherpreneurs.

Bringing the Internet of Things and business ideology into education was daunting. If unemployment arises, teachers can work online by hybrid teaching, teach skills and tutoring, and offer online lessons through an application or website, Zoom or Google Teams, joining networks and establishing content created online. The Department of Education through its system of machination, enslaves teachers within the infrastructures. It is the mindset and the terminology we use for such spaces that determine our focus and our reach. We can no longer consider the school or tertiary institution as a 'plant' or 'factory of mass production', nor the access of learners and students to education as the 'output and input of the plant'. Imagineering in the WBCTP

introduces them to creativity and innovation, which means freedom to express themselves and use their time beneficially for profit.

6.4.1 What was the design of the programme on Imagineering?

Design Thinking in creating the WBCT programme and model required cognitive skills and Neuro-Linguistic Programming. Imagineering requires design thinking in inspiration, generating ideas, questioning and testing hypotheses, and then sharing the creative design. One must be open to constructive criticism in ideation and being iterative. With mindfulness and creativity, design thinkers indulge in practical and technical skills together with divergent thinking. However, pre-service teachers used critical and convergent thinking skills to finalise any concept or product. I incorporated simple robotics and discussed coding as a new language for artificial intelligence.

6.4.2 How was it designed?

I introduced Imagineering as a part of the Business Model for teaching and learning. The skills learned within Workshop One (1) were role-play for the classroom. We discussed technology in sustainability; therefore, pre-service teachers were familiar with certain concepts to help them understand Imagineering further. The neuroscience of Imagineering is believing in one's self and having expectations, and having expectations means having hope for possibilities with a limitless imagination. There is no scope for doubt. Bold declarations of success mean affirming one's greatness through trial and error. I encouraged pre-service teachers to recognise that teaching is a multitasking profession and accentuate it as a massive part of their daily lives. Being balanced holistically in being whole and humane teachers is the path to achievement.

6.4.3 Why was it designed this way?

With experiential learning (Kolb, 2014) and Design Thinking, I, as the creator, could navigate the cycle at any point and revise the concept and context of the programme and model. The cycle of experiential learning applied to the pre-service teachers as well. I used experiential learning (Kolb, 2014) and Design Thinking to subliminally

encourage socio-emotional learning for the workshop to be creative and flexible and for the experience to be less stressful because of the new content and knowledge. I encouraged group work and collaboration, fostering better interpersonal relationships, more social awareness of the surrounding technology, self-awareness, management, and responsible decision-making. Teaching and learning should never be mundane and laborious. There must be a vision of enthusiasm, positivity and motivation through each day, knowing that a creative visioner is a role model to all future leaders. Every pre-service teacher and learner that passes through the hands of teaching and learning have their mentor imprinted on them. What they are taught and how they are taught has a lasting impression.

We are in the Fourth Industrial Revolution; pre-service teachers must upgrade SKAVS to 5G knowledge and Smart Skills. Creativity is transformative and can generate ideas from randomness. 5G translates into being at the forefront of technology, and SMART Skills translates into SMART technology. Following sustainability, schools and tertiary institutions must comply with technology by going paperless. Through the WBCTP, we have connected pre-service teachers to organisations that work with connected classes and mentor connected learners for a sustainable future in education and technology. Content and context are through Smart boards and e-learning by using their Smart devices by embracing technology. Reaching remote schools and home-schooling proved very challenging. Blended Teaching and learning are a solution because of those challenges. Pre-service teachers can take learning to remote learners using technology.

Children who can barely speak are *au fait* with a mobile or handheld device and drawn to visual stimulation and imagery. Our classrooms are changing rapidly into digital spaces, and pre-service teachers must be prepared for the future in 4IR. With the introduction of technology, all pre-service teachers must be dexterous and see the world with fresh eyes. Therefore, pedagogy and methodology must transform to encourage creativity and innovativeness in technology. The foundation of Imagineering is Engineering. It is the building block of Imagineering through layering. Imagination and using the whole brain require logical thinking and creativity.

6.5 What are the tools of the design? Fostering the concept of welding creativity and cognition for a whole-brain experience in technology, all slides had to be futuristic in thinking and skill.

6.5.1 Slides: Slides were whimsical but bold in their statement of a whole brain programme. I carefully analysed each note and picture. The content was concise and factual, interacting with methodology, pedagogy, and technology. Each slide reflected an aspect of Imagineering and the Business Model.

6.5.2 Activities: Coordinated activities with sustainability and robotics.

6.5.3 Videos/Animations: Videos created a purpose for visual literacy and subliminal messaging in SEL and Design Thinking. They also reflected the new age thinking of Imagineering. They gave a broad overview of empathy, fresh eyes, generating tangible ideas, using Kolb's cycle in experience, reflection, conceptualisation, and bringing Design Thinking alive through visual feasts of animation, robotics, and Imagineering. They could apply their senses and reflection to experience the artistic experience through shared meanings. Visual literacy impacts and imprints memory and creates a memorable and forgettable experience. Understanding Imagineering meant understanding the process of layering in creativity. In animations, they could visually critique and analyse the process of creating and innovating a work of art through storyboards. They could use the metaphor of the Circle of Life in the circle and cycle of any design and creative process.

6.5.4 Reflective journals: I encouraged the 5 Ws and an H approach about the past, and the present WBCTP, where we envision the status of our future. The journal also reflected on their personal journeys and socio-environmental narratives, comparing the past to the present and what they envision for ESD using technology. SEL and EQ were integrated into the emotions, responses, and introspection of the programme and the content. Reflective journals were a tool for metacognition and recognition of their experiences and reflections on those experiences. Did they understand their own emotions and SMART goals? How did they manage their emotions and experiences? Do they recognise and value other cultures, languages, and experiences? What was their level of communication in a mixed and inclusive

workshop? How would they recognise and evaluate their impact on group discussions? Can they make constructive choices and decisions on their experiences within the workshop? How did they overcome any negativity if they were exposed to it? These are a few questions that were significant for them to ponder for their social-emotional health

6.5.5 Using the Internet: Pre-service teachers surfed the net for ideas, researched pulleys and movement, learned how to create PowerPoint presentations and games, and how to design their projects. They also researched ESD, recycling, and creating a business out of resources they had made. I insisted that all materials used in the design process were recyclable.

6.6 Reflection on the Design

There must be joy in creating and innovating. Designing is human-centred and iterative. I loved the adrenalin, which is a mixture of excitement and anxiety. The design was cradled in creativity but shaped in the context of new concepts and ideology because I am a creator and agitator, a visioner and an Imagineer. The main aim was to instil pride in a holistic teacher who is whole. The pride is from professional development and the profession. Journaling the pre-service teachers' experiences was a crucial reference for reflections on thinking and behaviour patterns. Feedback affirmed my assumptions and theories.

6.7 Implementation of Imagineering

STEP 3

Completing Workshop 1 of the WBCT programme and model, empowering the pre-service teachers with foundational knowledge and critical thinking skills, and raising the bar into Technology, was imperative. The programme planned to empower them with technology and lead them into the 4IR information skills with Imagineering and Design Thinking. They were in a pilot programme to enhance the creation of new knowledge, and with different thinking styles using whole brain function, become Imagineers and Visioners of the future. Most importantly, I introduced executive

functioning and soft skills within the WBCTP as conversational skills and abilities impacting everything they do daily. Creativity and innovation must be equated to accelerated productivity and executive functioning skills. We all need a shared value system. However, there must be optimism and enthusiasm for teaching and learning. This objective included me as the facilitator. Pre-service teachers examined gaming as an innovative way to create and deliver content in the classroom. Gaming meant not only toys and board games but also creating, inventing and innovating new games.

6.7.1 What were the Strategies of Implementation for Imagineering?

The content on Imagineering was widely based on the concept and context of Technology and the science of Business. New content with terminology from Sustainability and Imagineering was the foundation for Workshop 2. Imagineering was based on taking thinking and learning styles to another higher level using Bloom's taxonomy (1956). Using technology as a tool, I encouraged pre-service teachers to be thinkers and creators, not just teachers. It encouraged them to create new content, be innovators by introducing ideas and creations, and use recycled material to become champions for climate change and sustainability. As visioners, they needed to conceptualise their plans in advance to make their lessons enjoyable and profitable. The most empowering feeling for any teacher is knowing that the objective in any lesson was achieved.

Design Thinking and visual literacy are whole-brain concepts. Herrmann (1996, p.35) says, "Brain is multi-dominant and capable of accessing and using all its mental options". Even though thinking styles and brain dominance vary in each pre-service teacher, the WBCTP encourages varying thinking styles with cognition and creativity. In design thinking, were pre-service teachers able to identify a gap in the design world? Would it inspire them to generate tangible ideas, have the test of patience, and confidently share their work and ideas with the rest of the world?

I critically examined their motivations and encouraged SEL. Through SKAVS, they could achieve and maintain sustainable goals, make informed decisions, develop healthy identities through self-confidence, be empathetic, and establish and maintain healthy relationships with themselves and the learners. Each pre-service teacher was

encouraged to examine their value. Their contribution and output must be far more significant than any sacrifice and input because between the known and, the unknown lies a vacuum where they can fill the enterprising niche. Imagineering as a concept meant they would place their work for others to peruse and critique. That entails an excellent strong self-image. What would their value be in the teaching profession? How will creativity and innovation in the context of knowing technology change their market value? They had to push boundaries to break barriers to knowledge and education.

The qualitative analysis helped understand pre-service teachers' cultural and social contexts, and their points of view validated the importance of technology and the Internet of Things at tertiary institutions. Considering that Vygotsky's social-cultural theory dispels Piaget's theory on cognition, I based the content on integral value-based education. Factors influencing their development, cultural background, socioeconomic conditions, and bias or preconceived notions were considered. I worked on instilling a positive attitude towards a positive self-image to overcome the victimisation mentality. Leaders rise above their circumstances to achieve. Every pre-service teacher was a winner, and I quoted from Archie Comics an adage I had learned; *A winner never Quit, and a Quitter Never Wins*. To create a winning design team of high-achieving individuals, who are visioners, they must stay on the path positively to achieve their goals in a rapidly and radically changing world. I allayed their fears of intimidation in Technology and 4IR by allowing the topics and pictures in the slides to be more user-friendly and practical. All slides and content were associated with daily examples and the whole-brain concept identified in the programme and model. Above all the concepts and contexts, they aimed the subliminal message at global leadership and citizenship to encourage sustainable development goals for a sustainable future. Education requires tech-savvy individuals, and the WBCTP is the platform to start their journey.

6.7.2 How were the strategies implemented

The WBCTP are four concepts designed to deliver tangible outputs. Education requires leadership, and leadership cascades from Dept. of Education managers to SMTs to teachers or educators. However, teachers must be holistic and humane in persona and wholistic in their worldview and as role models to future leaders. In Imagineering in education, trust is paramount to all relationships—between colleagues,

learners and teachers, in the senior management teams and with parents. Therefore, in design thinking and Imagineering, which work concurrently, one must trust oneself, one's ability, vision, and perception. One of the goals of leadership is taking a risk and challenging perceptions. There must be a vision, a goal and a purpose to fulfil the design. Allow the ideation to percolate, question the inspiration and fire it with ideas. As in mindfulness and EQ, be empathetic to the recipient, work as a team, prepare, and present the best of creativity and innovation. Designing the WBCTP was daunting. However, I had to take the risk of filling a niche with the first group of pre-service teachers. They took risks in trusting my knowledge and facilitation, and leaders always take risks.

E-learning, distance or hybrid learning is the future of education in a digital and virtual world. Pre-service teachers acknowledged rural teaching, learning, and home-schooling as reasons for going digital. Using digital media as a tool profoundly affects how far audience outreach is. Believing and trusting in e-learning and going digital means embracing a future of unforeseen circumstances and encouraging pre-service teachers to enhance their knowledge base without the pressure of examinations. Nevertheless, the impact was exponential. They influence families, extended families, friends and colleagues to become lifelong learners by encouraging and extending that knowledge.

Coding for computers and technology, especially when pre-service teachers create content, is essential to tech education. Therefore, they surmised there is a new language in education, a new language for the future. All the participants in the WBCTP were computer literate with basic skills. However, once they had seen the composition of slides and the themes on the slides I created, they explored PowerPoint presentations, computer graphics, design, and, most importantly, how to use their handheld devices and laptops. Their devices were the windows to the world, as they could learn and use all the features for study and digital-social skills. Coding, the language of the future, is used in most software in computer-based technology. It must be noted that coding was only mentioned and not taught, nor were any instructions given on coding. The development of applications and games requires coding. I encouraged at least foundational coding patterns through technology, e.g., robotics and game applications. Using computer application technology, pre-service teachers extended their foray into

visual literacy through animation for a whole-brain experience through Disney animations, the architect of Imagineering.

Computers, Imagineering, Design Thinking, coding, and robotics contribute to entrepreneurship and business advancement. Crossing the digital divide to the mainstream of a fast-paced techno-world meant pre-service teachers must raise their stakes in the game of knowledge and education.

In the pre-preparation of the design, the consideration was the objective. My strategy was to use slides, new content, and context and take technology to the pre-service teachers. How did Imagineering contribute to the learned experience of the pre-service teachers? There was too much at stake if the pre-service teachers were not computer-literate, and creative to accept the challenge of learning something new. They understood from the first workshop that they needed knowledge and edification in professional development. All teachers require professional development points (CPD) for their portfolios. Extended learning through the community engagement programme was a privilege to enhance their knowledge base and contribute to their SKAVS toward professional development. Creating the slides in a sequence triggered all four quadrants of the brain for a whole-brain creativity and thinking experience. Again, the language was simple, punctuated with anecdotes and practical examples. Ensuring they were familiar with the terminology and the experience of knowing they could ride the digital divide, they watched videos of Disney, the visioner of Imagineering, who used techniques from engineering to layer the structures in his design and vision. Similarly, I designed the programme using the same layering technique for a whole-brain experience that left an indelible impression on the participants. The layering was the implementation of the workshops, the content, and the context. I presented the content concisely and with humour and positivity so that pre-service teachers will look forward to the next workshop. It was also a technique delivered subliminally as an example of encouraging positive classroom learning. There was always the eagerness to learn more. The education fraternity required whole teachers to have a holistic experience, and the WBCTP provided that framework.

The enthusiasm from the pre-service teachers was more the new knowledge to enhance their present knowledge. They all had mobiles, but how could they turn a

simple handheld device into an instrument of knowledgeable power and one that could manage their lives? It was insightful asking them to indulge in machine intelligence through voice-activated texts and instructions on their phones using artificial intelligence (AI). Siri, Alexa, and Google voice-activated search were new toys to enjoy. Voice-to-text and text-to-voice were featured as they used to experiment. How could they venture into social media with new knowledge and acquire greater exposure for their creative efforts? Their messaging became a very exciting experience for creating and sharing. Using social media as a creative tool for businesses and content creation translated into a free digital and social footprint without financing complications. Their digital footprint was the stepping stone to virtual reality safely and responsibly. Designing material or creating applications would take their knowledge into a new stratosphere of teacherpreneurship and business.

6.7.3 Why was Workshop 2 implemented this way?

The collective responsibility of pre-service teachers participating in the workshop meant they were prepared to imbibe new knowledge and explore new experiences within the programme. They enthusiastically embraced the community engagement programme, which benefitted them interactively and engagingly. Pre-service teachers had not experienced a whole-brain creativity and thinking programme before. They received a certificate of participation and involvement for professional development. For most of them, it was a mind-blowing achievement as they had never received recognition for their efforts. The main aim was digitising and visualising the CAPS curriculum using technology as a digital and virtual tool. The Imagineering workshop embraced inclusive learners and those with Special Educational Needs and Disabilities (SEND). Not all learners are alike or with extraordinary cognitive abilities. Some are more technical and skills-based, preferring the creative side of the brain function, while others have educational challenges and disabilities.

The workshop was fun and interactive to achieve the maximum benefit of a holistic teacher-centred approach. Making box templates and learner-centred activities was fun and exciting because they knew it was a new strategy they could translate and adopt in the classroom. They prepared and presented activities and tasks in a way that

learners in the classroom could indulge in. Ice-breakers were used to induce energy and positivity and encourage the same with their learners.

6.8 Reflection and Recommendation

STEP 4

Pre-service teachers were enthusiastic and thoroughly enjoyed the workshop. It was different from sitting in lecture halls. The WBCTP was stimulating and encouraged critical thinking. It was interactive and vibrant in discussion and healthy debate. The pre-service teachers used visual literacy, Imagineering, and technology to create a more practical approach to experiential learning in a curriculum short on delivery and time, one that teachers struggle to unpack and translate because of its complexity. The immensity of the content is debilitating, and learners do not understand it. The CAPS curriculum is driven by content, not inclusivity. The curriculum design does not foster equity in the classroom or the different levels of cognitive development. The WBCTP with Imagineering in Education creates flexibility using different models and toys and creative, practical skills in conveying concepts and content. We understand that not all learners have the same cognitive capacity in inclusive classrooms. We must emphasise inclusivity for a successful future in education. At this juncture, the concepts of mindfulness, EQ and SEL dramatically impact acceptance and empathy. Design thinking and engineering start with childhood. When children can place pieces of building blocks and Legos into intricate designs to create objects, they indulge in the first steps of engineering. Playing with sticks and assembling train sets with tracks is the first step in critical thinking skills and logical thinking. Therefore, children are whole-brain thinkers. The schooling system is designed to separate and segregate right-brained and left-brained thinkers by categorising children from their achievements and scores in the different subjects. Design thinking in children starts from childhood when a child creates an object and reassembles it if it is not built to their satisfaction. I call this theory I created in children the **Cadence of Imperfection**. In The Cadence of Imperfection, children do not look for perfection but appraise their creativity for what appeals to their visual literacy and their senses: the eyes, their visual perfection or imperfection and the rhythm that transcends in their minds, the rhythm of their senses. Observe children as they play and indulge in creative and innovative play; they are

impervious to everything around them and focus and concentrate on the task they are indulging in. They are little Imagineers and visioners. It is the adults and the teachers who do not tap into this potential. It becomes latent until sparked later in life. Children do not want perfection based on adult rules and social norms. They live in a state of imperfection where they understand that everything can be broken down and rebuilt. This is the growth mindset. It is the mindset we tap into as mentors and coaches to reignite their zest for achievement.

Similarly, children using handheld devices and accessing applications effortlessly on a mobile is the application of the **Cadence of Imperfection**. They are attracted to visual literacy through artificial intelligence because children gravitate to visual and aural stimulation. AI is futuristic of how children's minds will be conditioned for the future. Experts and designers in gaming and mobile applications understand the need for gratification and have understood this attraction. Gamification is crucial in its creation of engaging the mind because it is whole-brained in concept. It is visually and aurally engaging, requires logical and critical thinking in reaching goals and captivates the mind where children are impervious to outside distractions. Similarly, in the WBCTP, pre-service teachers were encouraged to revisit that aspect of their lives, the **Cadence of Imperfection**. They experienced this through being free to explore, experiment, create and innovate from their imperfections. They understood that there was no permanence. Their perfections based on social norms did not dictate their desire for success and achievement. Their imperfections did. Everyone is a winner!

5.9 Conclusion:

The Herrmann Model of Whole Brain Theory discusses design and delivery. Herrmann (1996, p. 150) refers to the world as a "composite whole brain". He elaborates, "Teachers must change their assumptions about who is in the classroom". Pre-service teachers were encouraged to ensure that each child enjoys a whole-brain experience in the classroom rather than streaming them into right-brained (creatives) and left-brain (analytical) groups. There must be heterogeneity. Therefore, pre-service teachers must encourage learners to work in mixed-ability groups so everyone can have a fair share in contributing content and their opinions. Imagineering approaches are technical, critical, analytical and creative.

Pre-service teachers were given box templates to create their boxes. Examining their deftness in the skill is a whole-brain experience. However, some were weary because of a lack of training in problem-solving skills, knowledge of following instructions, design knowledge, visual clues, and ideation. Pre-service teachers' lack of exposure to technical skills created gaps in their skills, values, and knowledge exposure. It must also be remembered that there was a social disparity based on the discourse of past social injustices. There was also a sense of complacency and entitlement that they did not have to do the task, and education was compulsory only to earn a better wage and the benefits of teaching. "Would it not be positive if we could merge Imagineering and education as a transformation of education? We could enrich curriculum studies, creativity, and citizenship education by increasing students' creativity in developing and implementing new and existing ideas and advancing innovative practices in schools and society." (Nilsook et al, 2014, p. 19). The transformation in education includes the Internet of Things and leading the pre-service teachers into the Fourth Industrial Revolution through engagement rather than passive observers. We have not yet become immersive in the metaverse for an overall learning experience. Pre-service teachers understood that they must envision a future of gamification, immersive, engaging learning and teaching experiences, and machine learning without the chalk and board. They realized that virtual reality could compromise the future of teaching unless there is proximal development in education. How do we change the teaching and learning experience into a more engaging and real-world experience so learners do not escape to home schools, machine learning and virtual reality learning?

Considering the WBCTP is based on the living theory, (Stoll & Fink, 2000) mentions teachers rethinking strategies for improving performance, taking risks and encouraging spontaneity in communication in the education process. The gap in knowledge for pre-service teachers is an opportunity for a multi-disciplinary, multicultural, constant restructuring of the education curriculum and the gaps in literacy, literature, and language. A paradigm shift is a change in mindset, and in this research, it is the voices and experiences of the pre-service teachers to empower themselves. The realisation for restructuring rural education, creating sustainable futuristic green cities, to embrace the world of a 5G or the Fifth Generation Technology of iPhones, handheld devices, and mobile networks connecting everyone virtually, for

the inclusivity of Smart Cities, the WBCTP sparked the curiosity and inspiration of pre-service teachers.

Disney created fantasy as a stretch of the Imagination through layers of whole-brain creativity in Imagineering; however, based on constructivism, the use of the imagination stretches beyond the confinement of a classroom by examining previous knowledge with the present and repackaging it into new knowledge, by making dreams a reality and exploring the unexplored. Imagineers created Imagineering, who takes imagination and makes it into a complex reality through artistic creativity. In a 5G future, Imagineering is business in virtual reality. Every child in every classroom deserves a holistically knowledgeable teacher to translate and empower them with that knowledge.

Chapter 7

Cycle 3

WORKSHOP 3: Whole Brain Creativity and Thinking Programme:

7. The (W)holistic Teacher: Back 2 Basics: Human 2 Human Interactions

7.1 Introduction

Having designed and implemented Workshop One and Two, I moved on to Workshop Three and established the basics of STEAM education through the Business Model. Kolb's (2014) experiential learning cycle is a critical aspect of the learning process in the workshops. We examined a whole teacher with holistic values. We went back to basics (Back 2 Basics) to affirm our roles in being human. Human-to-human (Human 2 Human) interactions are integral to our daily interactions, whether in or out of the classroom. Socio-environmental interactions impact conscious and subconscious daily activities in value-based education. Pre-service teachers' experiences within the programme and their previous knowledge change how their views and perspectives of the future would be. In this workshop, we remind pre-service teachers that the situation in a lecture hall is almost the same as a learner in the classroom. Professional development and team building are central to the platform for STEAM education.

7.2 Design of cycle for Workshop 3

Plan: Cycle 3

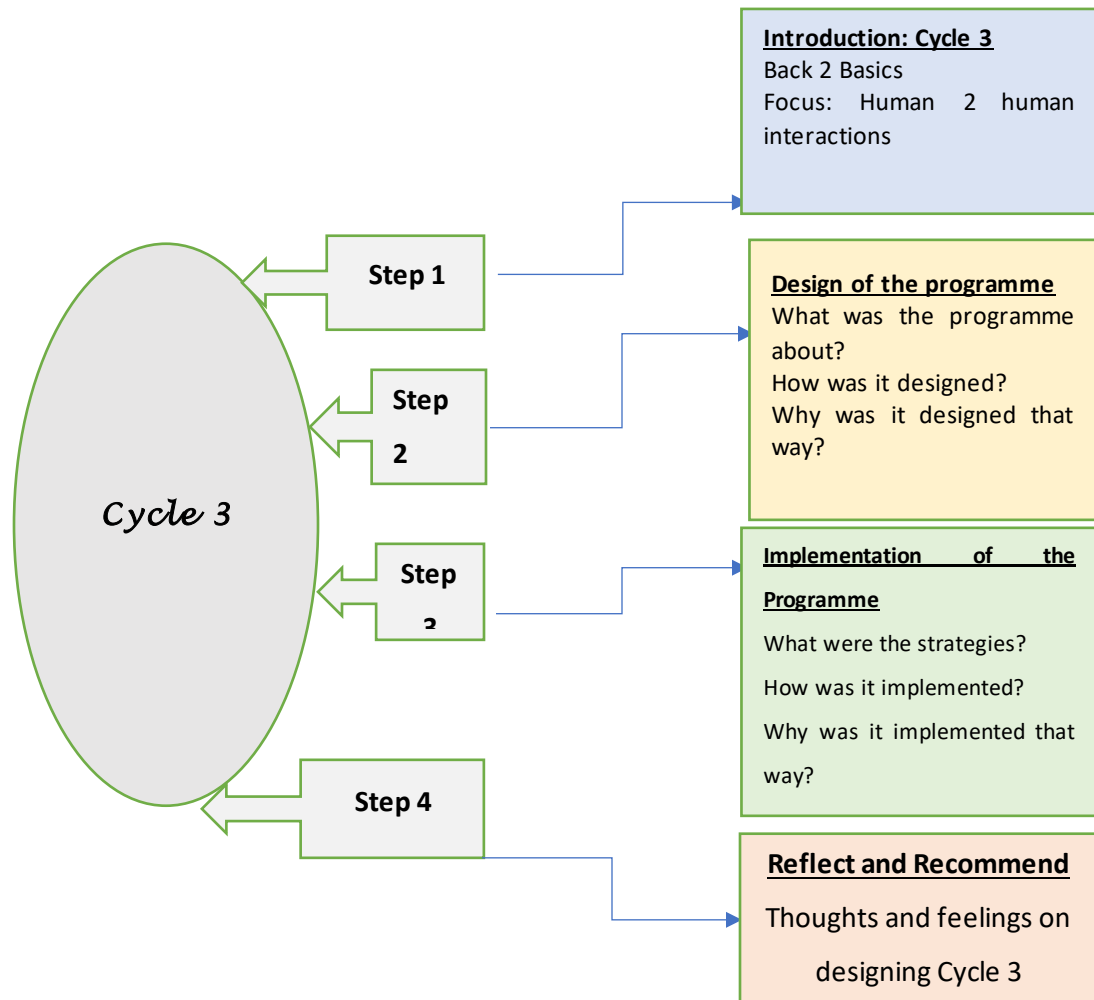


Figure 18: Cycle 3, Workshop 3 on the Whole Brain Creativity and Thinking Programme Business Model. Fiona Khan (2022)

7.3 Introduction to Design Cycle 3

STEP 1

By examining and strengthening the essential connections between education and personal development, the experiential learning model aims to provide a framework. The significance of formal education is emphasised as it contributes to the

lifelong learning and development of individuals as citizens, family members, and human beings. By understanding and articulating the themes of these traditions, we will be far more capable of shaping and guiding the development of exciting new educational programmes based on experiential learning. In Cycle One and Two, I introduced three essential concepts to empower and engage pre-service teachers: environmentally Sustainable Development, Imagineering and the Business Model. I introduced SEL, EQ, and Mindfulness conceptually to support these concepts to enhance pre-service teachers' psycho-social and mental capacity in Back 2 Basics. Human 2 Human interactions, I examine core values and SKAVS, which pre-service teachers require for holistic teaching and whole learners. Pre-service teachers must explore their potential and capacity as facilitators of knowledge and see teaching as something other than egregious or as a safety net to care for their financial and social needs.

The psycho-social and emotional needs of the teacher and learner must be met for a successful and high-performing class of learners. Learners must believe in the teacher's capacity to empower them and raise their value in achievement. With machine learning and Artificial Intelligence, human contact is the life source for emotional needs.

Focus

The focus of the design is the Human2Human relationships that must be valued as a human-centered approach that values a collective need rather than individual needs. Going Back 2 Basics explores the values and ethics instilled in pre-service teachers, the culture, traditions, and Ubuntu for the community, and the sustainability of those communities, as mentioned in SDG 11. Like most later theorists like Dewey (1938), human development and learning experiences depend extensively on emotional development. Therefore, the four workshops encourage social-emotional learning, EQ, and Mindfulness. The focus remains on the workshop encompassing the WBCT programme and developing a model. Thus, technology and AI are integral in informing pre-service teachers of their responsibilities as visioners and Imagineers and their development as teacherpreneurs to embrace the rapid change that will thrust them into inclusive classes and blended teaching.

7.4 Design of Workshop 3

STEP 2

7.4.1 Concepts of the Design

7.4.1 a) VAK Learning

Visual, Aural (auditory and oral), and kinesthetic learning styles are vital in inclusive education. I have included aural than only acoustic because of SEND learners who lip read and because some learners comprehend and remember content better orally. This is an important finding and recommendation for VAK learners and teachers. The template of schools for the future is inclusivity. But VAK learning is not just for learners but also for pre-service teachers. The VAK model allows teachers and learners to adjust their teaching and learning styles with a preference for more effective and affective objectives. Depending on differentiation, teachers and learners respond differently to resources, activities, and content. VAK stimulates emotions and mental imagery, e.g., storytelling. VAK aids in recalling memory and concepts, and ideas; even the imagination becomes more concrete. If we examine Bloom's learning styles, VAK is a higher-order thinking style with lower-order motivation using the five senses.

Adults and children have better spatial and whole-brain experiences through VAK. It is easier to remember and recall through association.

7.4.1 b) Coding and Robotics

Coding: it is a unique language for Robots. Robots follow instructions through programming. Programming Robots interpreting and following instructions is called coding. Coding is software.

Robotics: is built through electronics, coding, and mechanics. Robots interpret the language of coding and follow it. Robotics is software and hardware.

Robotics and coding are tools for pre-service teachers and learners to be whole-brain creatives with critical thinking and analytical skills. They are functional in a digital and technology-driven world. Coding and robotics encourage mobile and digital literacies, augmented and virtual reality, artificial intelligence and machine learning, and the Internet of Things. Countries. E.g., Japan has invested in robotics for day-to-day activities. In schools, there is collaborative thinking and learning, problem-solving skills, and active whole-brain engagement of innovation and creativity.

7.4.1 c) Professional Development

Back 2 Back and Human 2 Human experiences impel professional development in various ways, particularly with technology. Firstly, always take care of yourself as a professional. Pre-service teachers must always be at their best, which has mental strain and fatigue. Secondly, as professionals, pre-service teachers dream of their careers, hoping it will fulfil all their aspirations, but the priority is the health and care of the learners. Their construct of the future is based on the pre-service teachers' construct as a professional. If pre-service teachers as professionals project the vision of light, love, and beauty, learners will continue to see it even in their success. However, if pre-service teachers project an image of bleakness, gloom, and problems, those learners will struggle to rise due to a negative construct. Professionals must never walk into the classroom unprepared, and without dignity and respect. Learners will lose respect. I used their experiences in the classroom for teaching practice to emphasise this point. The difference is between the student who is always encouraged, motivated, and praised to the one who is demotivated, told how stupid they are, and will never make it in life. They will slump into failure and despair because teachers are their last hope. So, the power of words, charisma, compassion, and thoughts change children's EQ and self-image. With the workshops, I ensured pre-service teachers were respected and everyone was a high achiever.

For a successful classroom and dynamics, there must be communication and collaboration that is honest and geared toward enhancing knowledge and wisdom. It must be positive and filled with hope and love. Classrooms must be the hub for creativity. Children must explore, examine, draw conclusions, re-examine, re-imagine, and recreate. Learning is not only in textbooks but from Life and the experiences and

the unexplored. Most importantly, critical thinking skills where pre-service teachers and learners can reflect, redefine and create understanding. Personal observation and understanding of the world are essential skills in holistic children. However, as must as learners can be critical thinkers, they must also be encouraged to be emotionally intelligent to interact with peers and educators. There must be passion, empathy, and courage for decision-making. Many of these skills are acquired through reading and storytelling.

7.4.1 d) Computer Literacy skills

Another challenge was computer literacy skills. Pre-service teachers had computers but basic skills. Most were computer literate; however, some needed help with using computers to its full potential as they were clueless of the various software. Socio-economic and environmental factors were stumbling blocks on the educational journey. However, a determined mind always overcomes and achieves. They were too cautious in exploring software and applications to enhance studies and creativity. I invited them to do a PowerPoint presentation, and the results were terrific. They created poems and wrote about their journey. It was exciting and compelling to their satisfaction on milestones of achievement. Mastering the ‘search’ button was the art of unfurling knowledge. They understood the different features of Microsoft explicitly designed for the end user, and they thrived on their presentations and creations. A little nudge and belief, motivation, and inspiration opened another dimension of achievement for pre-service teachers. Therefore, primary research and computer skills are essential in the first year of undergraduate study, even if it is a refresher course. We take for granted our prosperity and assume others are blessed with the same abundance until we understand that even society has its strata. The experiences of pre-service teachers impact learners with compassion and empathy.

7.4.1 d) Social Emotional Learning

Self-efficacy for pre-service teachers is believing they can successfully learn new skills. The vicarious experiences of self-efficacy are, according to Bandura’s (1997) social learning perspective “Observers who believe they too can master activities by continuously and with much effort observing people who are similar or

doing similar to themselves”. Bandura & Hall (2018, p. 63-65) elaborate on children who would learn because of their pride, the feeling of excelling and their accomplishment, and raising their emotions and ego in satisfaction. I applied this theory to pre-service teachers’ learning in this sense is intrinsic, but the external stimuli motivate their external accomplishments too. They are modeling and they feel accomplished. I reinforced the positivity of experiences within the workshop to ensure their learning environment was a positive one. Researchers may find no congruency between observational learning and self-efficacy, but in the WBCTP, I have observed a unified theory. It is evident in their responses that they enjoyed the culture of collaboration, following social-emotional learning, monitoring, and modelling from the facilitator and other group members. More so, there were behavioral and cognitive changes from these learning approaches because there was a social motivation for change.

7.4.2 What is the design of Workshop 3 about?

Education (SDG 4) in all forms is the cornerstone of any community that started with storytelling and folklore in the earliest times and continues until today. Books and digital media are the present and future of maintaining the resources for future generations. However, the question to be asked is whether Artificial Intelligence and the virtual world threaten pre-service teachers through the Metaverse, or can we still redefine our traditions by conjoining tradition with futuristic alternatives? Face-to-face contact and touch are still more vital to growth than robotics and technology. The incongruency in education is the language incompatibility presently. But there is a possibility of Man and Machine sharing the same platform. Therefore, it is vital for preservation that pre-service teachers maintain their traditions, culture, and values for future generations with interactions in different environments. Person-centred communities and classrooms are still crucial for holistic teachers and learners because emotional needs and goals are considered. Robotics are not inclined to be human-centered or person-centered.

7.4.3 How was the workshop designed?

Back 2 Basics and Human 2 Human interactions are new concepts I introduced to pre-service teachers to keep them grounded and holistic. Irrespective of technology and digital knowledge, the grassroots and the SKAVS through lifelong learning must always be remembered. They must never allow themselves or the learners to become so submerged in a virtual and machine-learning world that they forget themselves and humanity. The humaneness of humankind is the essential quality that makes us human and gives us the spirit of Ubuntu.

VAK learning and using the Five Senses have yet to be given the importance it deserves in pre-service teaching. I have redesigned it to focus on being human in preserving our knowledge economy and upgrading our goals to reach higher standards. Artificial Intelligence may be the vehicle of education for the future, but can AI give humanity and future learners humaneness? Can AI sustain the human brain that is my primary research, the WBCT, using the whole brain as the best computer, intelligence, and creation in humanity compared to AI, which is an enhanced imitation - knowledge on steroids? We now have SMART cities with 5G connections and 5G devices; even our foods have become genetically modified. The digital economy has skyrocketed to create a false reality by pushing the boundaries of human existence, but can we defy the natural process of Man and Nature? Professional development has been wrapped in IQMS and curricular and co-curricular activities. The WBCTP now brings tertiary education for pre-service teachers into a digital age of wholeness. Through changing thinking and creativity, teaching and learning is now a business model.

7.4.4 Why was it designed that way?

Pre-service teachers feel threatened by machine learning technology and feel their positions as human teachers are in jeopardy for the future. They must understand that change is inevitable. If change is resisted, growth is stunted as no growth mindset exists. Business and Imagineering are taking risks and having a growth mindset. Sitting through the four workshops of the WBCTP indicates a growth mindset and a wise choice. They want to unlearn, relearn and redefine knowledge. Reimagining the future is intimidating, but allowing change to be gradual and embracing change in the

knowledge economy is the core of socio-emotional learning and professional development. A growth mindset also examines behaviour and behavior patterns to change. Using mobiles and computers, we communicate through technology in technical language. The future is communication in technology, but do pre-service teachers allow the digitization of socio-environments to change their humaneness and humanity? This behavioral change can be seen in learners presently. They live in assisted virtual reality because parents, peers, and teachers allow this paucity of falsity. It is a travesty of truth because it is available in small doses. The propensity for immediate gratification is because the demands are higher and the supply is limited due to parents always being busy and employed; the human touch is lost. The subversive and subversive world is a temporary escape devoid of human emotions but evokes emotions that can be released and shut on demand. Pre-service teachers and learners must not be euthanised against their feelings by making choices of impermanence.

7.5 Tools for the Design?

7.5.1 Slides: The presentation included concepts and context for professional development and Socio-emotional learning.

7.5.2 Reflective Journal: Reflecting in their journals in Workshop 3 was an integral exercise for pre-service teachers, delving into who they are and their purpose in teaching and learning. It was not easy, as the objective was the transcendence into an uncertain future and the preparation to embrace that future.

7.5.3 Videos/ Animations: Some were funny, and others discussed matters at the tertiary and school levels. They were chosen specifically to represent different aspects of the school environment impacting professional development.

7.6 Reflection on the Design

In most schools, teachers are automatons. We institutionalize our children for fourteen years, starting at grade RR. For teachers is the same curriculum, routine, identical learners and classes each day, and the exact times like clockwork. It's like running on a treadmill. There is no benefit unless you change the speed, momentum,

and time. Children, the learners, have learned behaviour. Teachers teach them how to think, to behave and enslave their minds into thinking the thoughts they are prepared by... teachers. Their education and edification are in teachers' hands and mental and emotional capacity. Is it not imperative that pre-service teachers are enlightened, educated, and Agitators who bring change? They are the visioners who can encourage thought leaders and leaders who tend to change the world for the benefit of sustainability and futurism. They know the path must be pitted with stones before the road is smooth. Pre-service teachers are now faced with an opportunity to explore new avenues through skill and knowledge and to impart such wisdom and knowledge to future learners. Collaboration and correction are the first steps to reflection. My supervisor asked me to revise with many edits. Similarly, pre-service teachers were asked to revise their work and use mind maps to create coherent ideas and thoughts. I, too, had to self-reflect on my design to assess my SMART goals, and journaling was a part of it, enhancing mindfulness and efficiency. Discussing my work with my supervisor reaffirmed my convictions in my thoughts and actions. Pre-service teachers collaborated and reflected on their designs, even concerning their challenges and how they overcame them. The reflection reminded me of my identity and purpose in creating the WBCTP. The pre-service teachers' feedback assisted with reflecting on and validating my assumptions and theories.

7.7 Implementation of Back 2 Basics and Human 2 Human Interactions

STEP 3

Addressing pre-service teachers with the intention for self-awareness included self-image and their contribution as professionals to Professional Development. Investing in the future of the country and the world as global citizens requires dedication to the profession. A teacher or educator will always remain a teacher, whether pedantic, in mannerisms, psych-social habits, and pathos. Instilling the SKAVS for pre-service teachers at the undergraduate level is peremptory. They must believe in their objectives and their different learning styles.

7.7.1 What were the strategies for implementation?

It is similar to the Batho Pele principles of service, without discrimination, inclusivity, and to the best of their abilities. Pre-service teachers' persona to be impactful, or is it *laissez-faire*? One's persona or personality radically changes the classroom and the learners. Back 2 Basics in the WBCTP incites pre-service teachers never to forget the traditions of pedagogy and methodology. There may be a buzz about the latest in 5G technology and the Metaverse, but they will flounder if they do not live and practice in the reality of pedagogical content knowledge (PCK). To redefine education, there must be a welding of technology and PCK. That includes the human touch emotionally and mentally. There has been a radical shift in curriculum delivery and analysis. Understanding that the curriculum is performance and competence-based, the change is for a societal reality as we move into the future of e-learning, intelligent cities, devices, and lifestyles.

The argument is the change in the development of individuals, as mentioned by Alsubaie (2016, p. 106-107). He states categorically, "It is a useable tool to assist teachers in the development of individualized strategies and the methods and materials necessary for them to be successful". The shift is for the professionals; although they have changed, they must maintain the teaching and learning status quo. The slow progress makes them restless because change cannot be affected quickly. It's a vertical reality of prescription in a virtual space and process, and everything relies on chain management in education. There is no congruency.

7.7.2 How were the strategies implemented?

I aimed to promote a positive and inspiring learning environment with a Wholistic pre-service teacher. Experiential learning theory was the strategy for ensuring a memorable positive practical, and affective learning experience. Pre-service teachers could retain the content imparted from the WBCTP. Knowledge acquisition and learning experiences through the WBCT programme was the objective through the Cadence of Imperfection and Affluence of Knowledge. My intention with the programme and workshop 3 was to develop social understanding by encouraging effective and affective learning experiences through socio-emotional learning.

Therefore, I promoted professional development for career goals and continuity of learning experiences significant in the Zone of Proximal Development.

I included a video of storytelling to remind pre-service teachers of the power of literacy in any form, to drive the focus on raising readers and the culture of language, literacy, and literature. In the workshops and under discussion, I observed the language and literacy challenges among pre-service teachers who struggled with reading texts for studies. I introduced the topic through storytelling, and there was profound feedback on pre-service teachers' difficulties. Pre-service teachers, in journaling, were now conscious of becoming self-reflective. They were confident and could now discuss because trust was established. They were now adapting to a changing social structure by digitising information, performance, and innovation. With design thinking still within the design of Workshop 3, they now viewed education as human-centered and collaborative. They also learned that with the right mindset, knowledge, and motivation, they could use their knowledge and skill to be enterprising and budding teacherpreneurs. In Workshop 3, they viewed practical examples of classroom management and dynamics. They could now view and consider learners, the classroom, professional development, and their studies from an ethnocentric perspective. The reality of teaching and learning was inclusivity, and the validity of the diversity was within the classroom. In Human2Human interactions, I discussed empathy mapping as in design thinking, feel, think, do, then say.

7.7.3 Why were the strategies implemented this way?

The UNESCO SDG goals, SDG 4 and SDG 11 are the goals I chose for the research on Whole Brain Creativity and Thinking. Gazibara (2013), "Because Action Research is a methodology that closely involves participants in a social situation, it is necessarily strongly influenced by their values and culture ... action research projects". SDG 4 ensures "inclusive, equitable quality education and promotes lifelong learning opportunities for all". SDG 4 drives progress, policy, and accountability. I address the responsibility by asking pre-service teachers to reflect critically as observers using the technology we want to embrace. They were given videos of scenarios to analyze and reflect on the theory and policy. SDG 11 informs the making of "cities and human settlements inclusive, safe, resilient and sustainable". There must be an understanding

of the microcosm of society within the classroom. Pre-service teachers and in-service teachers must remove the shackles of knowing and inferences of their past to embrace positive change.

Can our classrooms be safe, resilient, and sustainable? In workshop three, pre-service teachers must experience and enact the change they aspire to see in the classroom, or it will continue unchanged through the circle of life. They cannot afford to be encased in racialized knowing and social knowing dictated by their past. With Technology and the impetus of global citizenship, they explore and challenge social knowing by acquiring and providing social knowledge. There must be gender equality, respect, and an openness to change. The quest for curious minds starts within the classroom facilitated by teachers untainted by bias.

7.8 Reflection and Recommendation

STEP 4

Language, literacy, and literature are enablers of education and knowledge acquisition. Workshop 3 provided the platform for pre-service teachers to address any shortcomings internally and personally or professionally. I was taken aback when one of the pre-service teachers remarked, how he wanted to learn English so severely in matric just to pass, he stole an English dictionary and a book from the teacher's table at school.

It may sound audacious, but I admired the tenacity and determination of the pre-service teacher. More so I admired his honesty about being dishonest with a purpose, not for vanity. More so, he established a moral within himself of passing it forward by committing to teach his learners and children English. I was saddened by the colonization and the enslavement of our minds into believing English is the most extraordinary and only language for communication. As all the other pre-service teachers discussed their extraordinary experiences and circumstances to get to where they were at that time, we all understood and concurred that we will go to great lengths to achieve our goals and aims. It is the **art of self-preservation**. Their stories shaped their realities. By interpreting the lives of the participants and how they interpret their

realities without displacement of memory, or altered realities. My interpretation of their realities is to encourage a positive outcome. In every situation whether good or bad, a lesson must be learned. If the participants take heed, the lesson will not be repeated.

Language, literacy and literature are components of daily literacy and for pre-service teachers it must be almost perfected. Fortunately, through the **Zone of Proximal Development** pre-service teachers can be guided and once the task is mastered, they continue to develop abilities on their own. Vicariously, this theory is translated in the classroom. **The Zone of Proximal Development, The Cadence of Imperfection and the Affluence of Knowledge** converges as theories I created or hypothesized in the WBCTP raising the ability of pre-service teachers and the processing of information to Wholistic teachers and global citizens.

7.9 Conclusion

Workshop 3 was a virtual contrast of lived realities and those videos projected online was an example of hybrid teaching and learning. The duality was interpreting and constructing the lives and experiences of pre-service teachers with virtual reality and technology. I always feel some of the most challenging lessons can be conveyed through humor in the classroom. I did the same in Workshop 3. As they watched videos and were enthused, their emotions were reflected by their expressions. They laughed, they were sad, and they sat with avid attention and that was what I hoped to achieve. As I pointed out this behavior to them, it was reminiscent of the experience within a classroom which I pointedly mentioned.

It was essential to capitalize subjectivity within the WBCTP because of the focus on curriculum delivery as a shared experience however objectivity was based on improvement and change in classroom practice. The WBCTP pushes boundaries and raises the criteria for personal and professional development in the context of global citizenship. The experience must be hands, heart and head. Hands for hands on experience, heart for passion, grit and drive and the head for a whole brain experience. Previous knowledge may be an enabler, culture and tradition may be subjective, but the aim was to allow pre-service teachers to be objective through the WBCT programme and their experiences within the programme for professional development. Their

experiences informed their objectivity in classroom practice as it linked to the South African Council of Educators (SACE) policies and the CAPS curriculum.

Chapter 8

Cycle 4

WORKSHOP 4: Whole Brain Creativity and Thinking Programme

8. STEAM education

The Long and Winding Road for a Holistic Whole Brain Educator/ Mentor

8.1 Introduction

Chapter 4 encompasses the three previous workshops and how it encapsulates STEAM education for a Whole brain experience. McNiff, and Whitehead (2011, p. 12) extrapolate, “The focus of your research will be your action to achieve the purpose you set for yourself”. The primary purpose of this research was the experiences of designing and implementing a WBCTP for pre-service teachers. Within the programme, Workshop Four encapsulates all the elements of the previous workshops for the vital importance of teaching STEAM at tertiary institutions and including STEAM in the curriculum within the model of the Whole Brain Creativity and Thinking Programme.

We are constantly rethinking strategies of restructuring education. With the rapid change in technology and its advancement every day, we require Wholistic teachers in a holistic environment to implement holistic education with cognitive, spatial and motor skills, which is STEAM. The subjects guide critical thinking, communication, inquiry-based thinking and tasks, whole-brained thinking, innovation and creativity. Innovative learning experiences in inclusive environments is the new design for learning environments. STEAM is excellent for inclusive classrooms and learners to understand content and concepts better. It must be introduced to tertiary institutions as various teaching methods can be used interchangeably. The Arts support STEM subjects for a more interactive learning experience and style.

8.2 Design of the Cycle for Workshop 4

Plan: Cycle 4

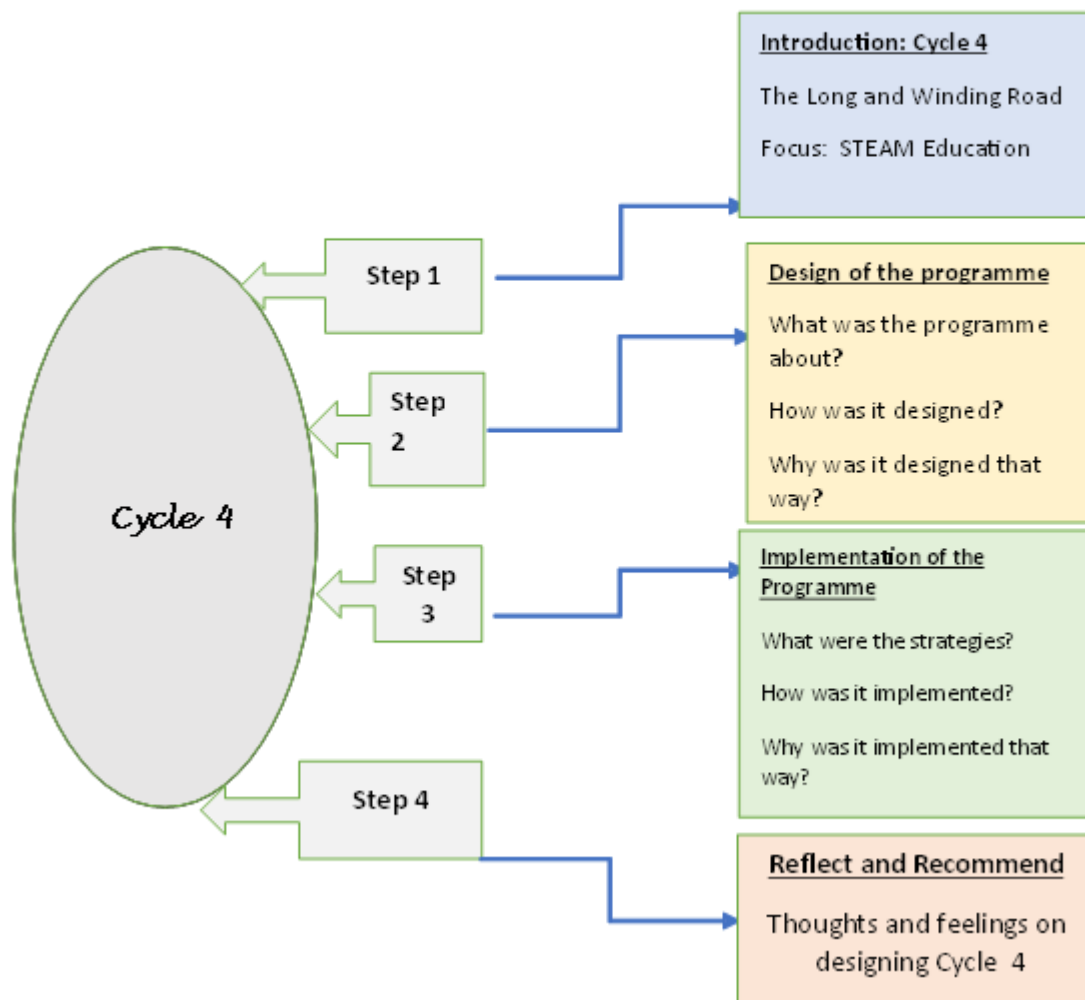


Figure 19: Cycle 4, STEAM Education in the Whole Brain Creativity and Thinking Programme. Fiona Khan (2022)

8.3 Introduction to Design Cycle 4

Step 1

The previous workshop focused on holistic teacher and professional development within a social-cultural, human-centered, and experiential learning theory. In Workshop Four, the previous workshops are assembled to align the pre-service teacher with the Whole Brain Creativity and Thinking and STEAM education, a whole-brained education system. Everything learned in previous workshops, and professional development empowers the pre-service teacher to be holistic with knowledge, skill, attributes and values across disciplines for an integrative pedagogical approach. In South Africa, the focus is exclusively on STEM education. STEM education is Left-brained thinking. STEAM is a whole-brained approach integrating Arts as support and creativity with the Right brain. Education is a holistic approach to teaching and learning. Dewey (1938), 'should never come to an end'. It is a continuously evolving cycle responding to societies and the planet's needs. Teachers take ownership of their experience and knowledge; they develop skills and competencies and are collaborative rather than competitive. There is **synchronous teaching and learning**.

STEAM is inquiry-driven with critical thinking skills, collaborative and innovative learning, creative imagination, and skill-based. It includes group work, design thinking, project-based, and integrating digitization and AI into practical skills. STEAM education consists of the artistic side of creativity and is a whole-brain creativity and thinking approach, e.g., creating mathematic concepts with animation. STEAM combines ancient knowledge with collaborative thinking and designing to create new knowledge. The whole-brained ability includes observation, innovation, creativity, Imagineering, design thinking and curiosity.

8.3.1 Science: combines the technical aspects of Science, with the arts for a more skills-based practical approach. The amalgamation of visual, physical, and sensory arts with chiefly factual content is evident in the Science subject. Critical thinking skills and design thinking contribute to evidence's structure and validity. Research is crucial in STEAM. As one of the core components of STEAM education, an interdisciplinary approach integrates Science, technology, engineering, arts, and mathematics into a collaborative, cohesive and engaging learning experience. Science in STEAM teaches scientific facts and concepts and develops scientific skills and attitudes, such as curiosity, creativity, critical thinking, problem-solving, and collaboration. In the WBCTP, Science is a whole-brained experience of logic and

design. Science in STEAM education is a powerful instrument for pre-service teachers in the 21st century. By teaching and learning Science in an integrative, inquiry-based, creative, and innovative style, pre-service teachers can inspire learners to become lifelong learners, visioners and innovators who can contribute to integrating Science and society by understanding the natural and human-made world and their role and purpose. Science being interdisciplinary, challenges and provides evidence through various modes to real-world problems and challenges. Integrated with other subjects help pre-service teachers see the relevance and applicability of Science to different contexts and domains.

Arts accompany Science through visual representations, creative writing, musical compositions, or artistic performances. Arts into Science express scientific understanding and emotions and stimulate the aesthetic sense. Technology supports Science through digital tools, online resources, simulations, games, and virtual reality. Pre-service teachers can access and process information, conduct experiments, model phenomena, visualise data, or collaborate with others. Authentic tasks are meaningful to pre-service teachers' lives and interests, involve real-world problems or issues, require higher-order thinking skills, and have multiple solutions or outcomes. Engaging pre-service teachers in authentic tasks helps them apply their scientific knowledge and skills to actual situations and develop their agency and ownership of their learning.

8.3.2 Technology: Creativity, problem-solving skills, and critical thinking for unique learning experiences are unlimited for Pre-service teachers. Communication and collaboration are key factors. Innovation and creativity are the two essential principles of technology. Technology includes Artificial Intelligence, Virtual Reality, the 5G technologies for communication, hybrid communication, mobile and digital literacies, e-learning and the Internet of Things. In school, learners create and use simple tools.

Technology in STEAM education is an investment because technology enhances STEAM learning outcomes. In the challenges and opportunities of the 21st-century workforce, technology is crucial. Technology enables students to innovate, create, and share information with tools and resources to explore, experiment, and express themselves in STEAM-related fields. It facilitates collaboration, communication, and feedback among pre-service teachers and learners.

Technology learning outcomes provide pre-service teachers with personalized, adaptive, and engaging learning experiences. For example, artificial intelligence (AI) help design intelligent tutoring systems that tailor instruction and assess pre-service teachers' needs and preferences. Data analytics monitor and evaluate progress and performance in STEAM subjects. Virtual reality (VR) and augmented reality (AR) create immersive and interactive learning environments that simulate real-world scenarios and phenomena. Technology is paramount for developing pre-service teachers' knowledge, skills, and attitudes in STEAM subjects, especially now that technology has become innovative in surfing the Internet of Things and the Metaverse.

8.3.3 Engineering and Environmentally Sustainable Development: The main focus is engineering; however, ESD is an element of humaneness for sustainability. Engineering includes creativity, innovation and design thinking and lends itself exclusively to Imagineering. Engineering recognizes problems, creates and strategies solutions, and then tests them for elucidation and validation. Engineering is a vital component of STEAM education and aims to integrate these disciplines into relevant educational faculties. Another feature is teaching pre-service teachers how to use engineering or technology creatively and innovatively to build a world that beguiles. STEAM education also builds on students' mathematics and science base while incorporating arts subjects to enhance their reasoning and design skills.

Environmentally Sustainable Development in STEAM integrates science, technology, engineering, arts and mathematics. Eco-friendly development requires the comprehensive integration of STEAM nurturing creativity, innovation and problem-solving abilities. One of the critical challenges of STEAM education is how to incorporate environmental sustainability as a core value and a guiding principle. It involves a wise and responsible use of natural resources to balance human development's social, economic and environmental aspects. Environmental sustainability is a moral duty and a strategic advantage to thrive in a changing world. Pre-service teachers explore the causes and consequences of climate change and environmental issues, inspiring them to take action for positive change. Fostering creativity, innovation and problem-solving skills in pre-service teachers of all ages and backgrounds assists in incorporating environmental sustainability as a core value and a

guiding principle. It involves a wise and responsible use of natural resources to balance human development's social, economic and environmental aspects.

Engineering is not only a technical skill but also a mindset that involves curiosity, inquiry, collaboration and critical thinking. Collaboration and communication are essential for addressing complex and multidimensional challenges. Cultivating pre-service teachers' empathy, respect, and appreciation for nature and other cultures fosters a sense of global citizenship and responsibility. By integrating environmental sustainability into STEAM education, we can prepare our pre-service teachers for the future and empower them to make a positive difference in the world. Pre-service teachers understand the machinations of everything, how they are enhanced, and how they serve different purposes. Engineering also encourages applying knowledge and skills across various domains, e.g., Designing and building robots, machines or structures using various materials and tools. Programming and coding software applications or gamification using different languages and platforms and creating and testing prototypes or models of products or solutions using 3D and 4D printing and design or other methods and exploring and experimenting with energy, such as solar, wind or hydro. Developing and implementing engineering projects address social or environmental issues, such as water quality, waste management or renewable energy. Engineering in STEAM education prepares pre-service teachers for inspiring future careers in various fields that require engineering skills or knowledge, aerospace engineering: designing, developing and testing aircraft, rockets or satellites. Biomedical engineering: applying engineering principles to medicine, health care or biology. Civil engineering: planning, designing and constructing buildings, bridges or roads. Computer engineering: creating hardware or software systems for computers or devices.

Engineering in STEAM inspires pre-service teachers to be creative, curious and confident as learners and teachers and offers many opportunities in different disciplines. The least pre-service teachers require basic or foundational knowledge of processing engineering. By integrating engineering into STEAM education, we can help pre-service teachers develop the skills and competencies they need to succeed.

8.3.4 Arts: Creativity and imagination integrate with STEM subjects. Pre-service teachers and learners can perform and use the five senses. The arts include presenting, performing and producing artistic endeavours. One of the main arguments for including Arts in STEAM education is that they foster creativity and innovation as they are the catalyst behind scientific discoveries, technological advancements and social changes. Arts centered on the right side of the brain can stimulate pre-service teachers' creativity and innovation by providing them with different modes of expression, such as visual, musical, literary or performative.

Arts can also expose diverse perspectives, cultures and histories, broadening their horizons and inspiring them to divergent thinking. Pre-service teachers' cognitive and affective skills are enhanced. Cognitive skills are related to thinking, reasoning and problem-solving, while affective skills are related to emotions, attitudes and values. Thus, pre-service teachers engage in complex and challenging tasks that require higher-order thinking skills, such as analysis, synthesis and evaluation. Arts can also elicit pre-service teachers' emotions and feelings, motivating them to learn and connect with the content. Moreover, Arts can help them develop their aesthetic sense, which is the ability to appreciate beauty and harmony in nature and human-made creations.

Arts are vital for STEAM education is that they promote collaboration and communication. Collaboration is the ability to work effectively towards a common goal, while communication is the ability to express oneself clearly and persuasively. Both collaboration and communication are essential for success in any field of study or work, as they enable people to share ideas, exchange feedback and build trust. Collaboration and communication involve them in group projects or performances that require coordination, cooperation and negotiation. Arts can also enhance communication by teaching them how to use various forms of language, such as verbal, written or visual.

Arts in STEAM education is an invaluable subject and a crucial component of the approach. By integrating Arts into the curriculum, educators can provide learners with a holistic and balanced education that nurtures their creativity, innovation, cognition, affectation, collaboration and communication. These skills will help pre-service teachers in their academic studies and professional development.

8.3.5 Mathematics: Learn creative ways of solving math problems. Pre-service teachers use cognitive skills for critical and diverse thinking. Mathematics is for technology and solving problems. Mathematics is a crucial component of STEAM education, providing the tools and methods to explore and understand the natural and human-made world.

Mathematics in STEAM education can help learners develop various skills and competencies from pre-service teachers. Logical thinking and reasoning: Mathematics teaches pre-service teachers to use deductive and inductive reasoning, construct and evaluate arguments, and apply logic to different situations and domains. Numeracy and quantitative literacy: Mathematics helps them understand numbers, quantities, measurements, data and statistics. It also allows them to interpret and communicate numerical information in various forms and contexts.

Spatial awareness and geometry in Mathematics enable students to visualize and manipulate shapes, figures, patterns and structures in two and three dimensions. It also helps them understand the properties and relationships of geometric objects and concepts. Algebraic thinking and modelling in Mathematics allow pre-service teachers to use symbols, expressions, equations and functions to represent and analyze patterns, relationships and change. It also helps them create and use divergent models to describe and explore real-world phenomena. Computational thinking and coding foster the ability to formulate problems, decompose them into smaller components, identify patterns, abstract general principles, design algorithms and test solutions. It also helps them learn the basics of coding and programming languages.

Mathematics inspires curiosity, creativity and interest in learning. It exposed them to the beauty, elegance, and diversity of mathematics. It can also show them the connections between mathematics and other disciplines, such as Science, technology, engineering, arts and humanities. Moreover, it prepares them for the challenges and opportunities of the 21st century, where mathematical literacy is essential for many careers and fields of study.

Mathematics in STEAM education is a vital and enriching part of the curriculum. They develop essential skills and competencies and spark their imagination and passion for learning.

8.3.6 Structured Learning: Structured learning examines pre-service teachers' methods and skills in their learning programmes and their lesson planning based on the curriculum. Structured learning is the experiences and procedure of learning and how pre-service teachers can encourage learning within their experiences and in the classroom. As previously discussed, and understood, emotional intelligence (EQ) and socio-emotional learning (SEL) are critical components of skills-based learning and teaching while surfing the digital divide. For those skills to be enhanced, advanced and elevated, pre-service teachers must be mentally stable and robust to withstand the rapid changes and adaptability. For the skills to be upskilled and for pre-service teachers to be lifelong learners, STEAM education is an approach that integrates and fosters interdisciplinary skills, creativity and innovation. STEAM education in higher education (HE) to prepares pre-service teachers for the complex and interconnected challenges of the 21st century so they can impart that knowledge to learners presently and in the future.

8.3.7 Language, literacy, linguistics and Literature: There is no universal definition of the implementation of STEAM education. Different institutions and disciplines may have other goals, methods and outcomes when adopting STEAM approaches. Moreover, various challenges and barriers may hinder the development and adoption of STEAM education in tertiary institutions and schools, such as curriculum design, assessment, collaboration, evaluation and recognition. Thus, language, literacy, literature and linguistics are the foundation of all literacies in all modules and subjects. In this workshop, I discuss holistically the importance of holistically being whole and literate for a whole-brained STEAM experience.

8.4 Design of Workshop 4

Step 2

8.4.1 What is the design of Workshop 4 about?

To guide and inspire pre-service teachers interested in STEAM education, develop new STEAM methods, and create evaluation frameworks for STEAM education. It is interdisciplinary and transdisciplinary. Following the living theory, there are always new synergies between the different disciplines, new knowledge and experiences. STEAM has collaborations with design thinking and innovative, creative solutions. Inquiry-based learning thrusts the pre-service teachers into a world of curiosity and exploration encapsulated in questions, methods and hypotheses. The 5Ws and H became the core of discovery, enhanced by the five senses. STEAM in Education had social relevance and social impact. STEAM education addresses real-world issues relevant to pre-service teachers, communities and societies and aims to generate positive change. Visual literacy and VAK are contributing concepts and factors to STEAM education. Renewable energy sources, recycle materials, reduce waste and adopt eco-friendly practices in their daily lives and projects.

8.4.2 How was Workshop 4 Designed? STEAM in artistic expression and creativity incorporates artistic elements such as aesthetics, design, storytelling or emotion into the learning process and outcomes. Inquiry-based learning for the pre-service teacher-centered approach involved asking questions, exploring phenomena, drawing conclusions, and communicating findings and hypotheses. Inquiry-based learning fostered scientific and technological literacy, inquiry skills, motivation, and interest. I designed the workshop where each slide provokes inspiration and innovation, each concept and process inspire neuro-divergence and learning styles and thinking patterns are a source for experience and exploration. Mathematic concepts using building blocks have yet to be explored. It is the first step in children starting the foundations of Engineering and Design. In STEAM, I envisioned pre-service teachers creating their teaching modalities and adapting teaching methods according to the needs of the learners within an inclusive environment. Pre-service teachers were given templates to cut, paste, and create. Moreover, they were encouraged to use the templates to develop games for any learning area. Gamification is crucial in the innovation and creativity within Whole Brain creativity and thinking.

8.4.3. Tools of the Design

8.4.3. a) Gamification: applying games designed for motivation, competitiveness, and critical thinking to enhance educational instructions and goals. The aim is to make teaching and learning more engaging with collaboration and creativity. Gamification is dynamic, and it can be boisterous through interaction. When there is joy in learning, it is memorable. It imbues emotional intelligence and the intellect, but it is also creative and encourages design thinking. For pre-service teachers, it raises the goals for intervention. The main objective is to capture the imagination to spark interest and a passion for continuous learning. The strategy is essential because the purpose must be defined, and the outcomes must define the goal. In education, we speak of gamification as a tool to make learning more accessible and the assimilation of knowledge memorable. There are set goals, time limits, rules of engagement and social-emotional learning in the context of social engagement. Their rewards can vary from points, badges, and duties on the leader board and contribute to the continuous assessment, especially the learners with SEND. Gamification could translate into a progress board for marks in the classroom for each learner or a leadership board for improved overall performance. There could be rewards for the most books or literature read for a term with a reward and the most funds collected for a class project. The pre-service teacher must learn the technique of strategizing and designing a tool to improve teaching and learning.

8.4.3 b) Journals: recording their challenges, emotions, and thoughts was significant within the socio-cultural experiences. I was most fascinated by the incongruency of those who are nimble with technology and those still learning and the difference in their enthusiasm for learning technology. The journal helped with sifting their discussions, thinking styles and confusion while completing the questionnaire.

8.4.3 c) Questionnaire: The questionnaire summarized the workshops and higher-order thinking skills for different scenarios and opinions. There was a prompt and I wanted to understand their maturity and beliefs. Most significantly, did they apply what they had learned in the workshops?

8.4.4 Why was the Workshop designed this way?

STEAM education is flexible and adaptable. With the Arts in STEAM, the approach is whole-brained. It is tailored to different contexts, needs and objectives. By adopting STEAM approaches, tertiary institutions can enhance their students' learning experiences and outcomes and their innovation, potential and social responsibility. Pre-service teachers understood from their experiences in the workshop that STEAM is a test of their flexibility, adaptability and creation. The real boost to the programme and approach in STEAM is gender equity, allowing the four domains to work with synchronicity and encouraging the use of the digital economy. For Whole Brained potential and productivity, we need whole-brained holistic teachers. Their training and experience start with the programme and model. De Bono (2017, p. 6-7) transcends 'what is' to 'what can be' and 'what if' as constructive and creative thinking. He emphasizes designing the way forward. Herrmann (1996, p. 217) encourages assimilation and translation into active experiences to solve real problems.

Creativity and innovation in WBCTP challenge pre-service teachers with original and novel ideas that can solve problems or/and meet needs. Communication and collaboration require working in teams and groups, sharing ideas, giving feedback and presenting their work to others. Critical thinking and problem-solving involve analyzing data, evaluating evidence, making decisions and finding solutions. Persistence and resilience teach coping with failure, learning from mistakes and improving their work. Curiosity and lifelong learning spark the interest in learning new things and exploring new possibilities.

8.5 Implementation of Workshop 4

Step 3

8.5.1 What were the strategies for implementing the workshop? The actual test of leadership and success for pre-service teachers to acknowledge is the learner's success in the classroom. It mirrors their success within the higher education institution. A good lecturer will inspire them to aspire, motivate and calibrate their success. Similarly, that seed of inspiration planted as a pre-service teacher will unfold within the classroom. It

is the circle of life, the knowledge economy, and the circular economy for education (SDG 4). Therefore, they experienced my role as a whole-brained, erudite facilitator and the ease with which I inspired and motivated them as pre-service teachers to unpack the same energy in the classroom. Besides, by goal setting and focus, pre-service teachers were more motivated and independent. I must add that the emotional experience within the workshop was an awakening. The senses, the jarring of taking risks and being a leader, in believing in inherent skill, attributes and values. Our pre-service teachers have all the tools of the knowledge economy within them but, did not know how to use the tools of learning and teaching effectively and affectively. They needed mentoring and coaching into social entrepreneurship as I identified as teacherpreneurship. The philosophy links with John Dewey (1938), as pre-service teachers invest in their learning experience through “discussion, debate and decision making”. There is a knowledge-sharing between the pre-service teachers and the facilitator through discussion and debate. Dewey (1938) drives imagination for thinking and learning and encourages the process of endless possibilities. In Workshop 4 on STEAM in Education, I elaborated on the Disciplines of John Dewey (1938), mainly learning by doing or experiential learning, discussion, and interactive and interdisciplinary. I followed the Cycle of Kolb’s experiential learning. STEAM is interdisciplinary in having an active, holistic experience, reflecting on the experience, concluding or learning from the experience and planning or trying again what was learned. Past experiences, together with the present experience, creates a new experience.

8.5.2 How was it implemented? The programme for pre-service teachers was created through new knowledge driven by the gaps at tertiary and higher education institutions. By adding to the knowledge economy, through experiential learning and social-cultural theories, the Whole Brain Creativity and Thinking Programme and Model accentuated the conceptual framework. Creating and designing a WBCT programme and model, the intent was to establish a formalized sustainable programme, to build a model and to share the experiences of the participants. In the 4th workshop, the quest for gaining more knowledge and pushing personal boundaries intensified. There were more questions, open mindedness with ease of trust in imbibing as much knowledge as they could and they enjoyed the ease and comfort of the workshop. Ensuring collaboration, the pre-service teachers were enthused in working with groups

and exploring new avenues to express their creativity. They were shown fun but mind engaging games of teaching STEAM subjects. Exploring their ability to take risks and experiment with innovative ways with eagerness, expand their knowledge intake and to be accepting of others' opinions, perceptions and inclusions. All concepts and contexts provided in the CAPS curriculum to enhance teaching and learning were implemented in the workshops especially workshop 4. Principles and goals identified for learners, were used in the design of the WBCTP for pre-service teachers. Some of the examples are as follows, adding significant changes in higher and primary education. To equip participants with SKAVS, understanding that every learner must fulfill the necessary requirements in each grade, facilitate transitions from one grade to another by filling the gaps, critical and active thinking and learning, incorporating social transformation and gender equity by redressing the inequalities of the past, inclusivity, Indigenous Knowledge Systems being acknowledged as the source from the rich culture, heritage and history and bringing quality, credibility and efficiency in education that is incomparable.

8.5.3 Why was it implemented this way? For effective and affective efficiency to collaborate and create as a team, pre-service teachers must be responsible for critically evaluating and recommending information and they must demonstrate flexibility, agility and tolerance as a visioner and Imagineer. Pre-service teachers were engaged to ensure they can apply their skills and knowledge that is meaningful to their lives and the learners' lives. Social emotional learning was also a crucial factor in implementation. The mental and emotional health of all pre-service and in-service teachers, whether at tertiary institutions or schools, are of critical importance due to the stress of teaching, especially in South Africa. The climate and the socio-environmental conditions dictate the structures in schools. We know the challenges of discipline and unpacking the curriculum, and we are familiar with the endless administration. However, embracing Big Data is a challenge that must be addressed urgently. Pre-service teachers must be empowered to enter a classroom well-prepared and equipped with the necessary knowledge to agitate change. For inquiry-based teaching and learning, gamification was a brilliant tool to entice learners for cognitive development. Similarly, the examples included in the presentation of that particular slide indicated the chance for whole brain creativity and thinking.

8.6 Reflect and Recommend

Step 4

Workshop 4 delivers a programme for holistic, whole pre-service teachers to be mentored in teaching and learning in a holistic programme and model. The goal and vision were to empower pre-service teachers to be the teacherpreneurs and visioners who can take teaching and learning into the digital age. South Africa needs competent teachers for a smart future embracing the rapid changes in teaching and learning, and blended teaching is the way for the future. Smart cities are an exciting way to observe and recommend the blueprints for the future of higher and primary education. Teachers may not be redundant in the future because we all need the human touch, but technology need teachers to unpack the content in the context of learners for a future in a cyber and objective world. Our emotions have become subdued due to the smart devices becoming the babysitters and the creches of the future nut; nothing stops the human intellect from making the content in the smart devices worthy of human consumption to improve cognitive and emotional development and to enhance the entire human experience in a 5G world of metaverse, artificial intelligence and artificial reality. Gamification is creative, innovative and challenging. It is the inspiration for the rule of engagement with pre-service teachers and in the classroom that engages whole brain activity and keeps the participant engaged, spurring higher-order thinking skills, design thinking, collaboration and interaction. Most significantly, it builds team spirit and engagement while building a solid self-image.

8.7 Conclusion

Technology is revolutionizing education. However, the humaneness of humanity is still required for the human touch and the meaning of our existence. Technology and the 4th Industrial Revolution have left a glaring niche of what can be achieved and what possibilities can be anticipated by embracing the meteoric changes in the tools for enhancing education. It is also a reminder to maintain the human touch. Back 2 Basics remind us of our thinking and creative skills without the machinations instilled in robots and computers. We are focused on the ‘what can be’ as De Bono (2017) mentions, but we have waylaid the ‘what is’. Presently we have teachers and

pre-service teachers who are untrained in technology. Our schools, because of security and loss of property through theft, use tight security to lock away handheld devices rather than learners using them. Computer rooms are under lock and key and steel bars. Metaphorically our pre-service teachers and our learners are 'locked out' of technology at schools. Socially the handheld devices are the only sophisticated technology they encounter daily. Mosley et al (2005, p.371) define thinking as "a human activity that involves cognition (knowing), affect (feeling) and conation (wanting and willing). Technology has yet to replace thinking and the power of choice through technology.

Chapter 5

Cycle 1

Workshop 1: Whole Brain Creativity and Thinking Programme

5. Environmental Sustainable Development

5.1 Sustainability Slide 1: The Four Domains of the Brain



SS 1.1 Planning

What is the slide about? Introduction to the Whole Brain Creativity and Thinking Programme and Model was strategized to raise the self-esteem and morale of pre-service teachers. Increasing their general knowledge as holistic and raising the awareness of a whole brain experience was crucial to the programme and model. The theory was based on what our brain resembles and how it functions as a whole brain.

How was the slide designed? I wanted pre-service teachers to look at the different domains of the brain and the characteristics. Then they were to decide what qualities describes them the best and how they can use that to their advantage. We are in the information and technological revolution. Interpersonal skills of affective learning for effective teaching within our discussion added impetus to the analysis of the findings. The RHS and LHS of the brain must work in co-ordination for full cognition and metacognition. Gaining the trust of pre-service teachers in raising their awareness and imparting knowledge was an essential aspect of mindfulness and a

demonstration of how this can be translated into the classroom as their professional development.

Why was it designed this way? We have a design plan for WBCT and wanted every slide to reflect that core knowledge. The necessity of lifelong learning was and is quintessentially the relevance of knowledge over time for a whole-brain experience, as quadrants of the brain cannot work in isolation. Pre-service teachers understood

SS 1.2 Implementation

What was the strategy? The Slide indicated the brain in its two hemispheres and four quadrants for cognition and creativity. For pre-service teachers, it was visual clues to the domains and quadrants and was vitally important to upgrade and uplift the knowledge economy. They impart knowledge over many generations and are role models for the future of education and thought leaders. Pre-service teachers drive classroom knowledge ecosystems based on their experiences and education, their general knowledge and Just in Time (JIT) training based on the different variations and upgrades to the curriculum.

How was it implemented? Just In Time originated in Japan. I translated business terminology into the education faculty within the Business Model of the Whole Brain Creativity and Thinking Programme. Through the demonstration of touching the head, they could identify the Right side and Left side of the brain. I then indicated the division of the brain into four quadrants and their purpose and explained how it affects our daily lives through every task done. It is significant in whole-brain thinking and creativity as we don't think in isolation. Hutchins (1999) describes Just in Time as a management strategy for responding instantly to demand. The concept works perfectly when learners ask questions in lessons that are higher-order thinking, and the response is based on higher-order thinking according to Bloom (1964). In business, goods are received as and when required and replaced immediately from stocks. Similarly, in education, the knowledge economy, on demand, is presented as and how needed as actionable ideas, thinking and strategies. This process never stops.

Why was it implemented that way? Pre-service teachers must have good research-based knowledge for their point of reference for themselves and within the classroom. It was also an opportunity to bring new solutions and challenge existing policies and trends in Sustainability.

In transforming education with the WBCTP, adjacent to SDG 4, we explored methodology, the use of technology through digital resources and the precipitating infrastructure in education.

1.3 Reflection and recommendation:

When shown the different quadrants of the brain, pre-service teachers could relate their thinking and experience to the quadrant most dominant for performing a specific task or use all four quadrants as a whole brain experience. They first experienced within the programme which part of their brain they used predominantly and how they could now balance their brain experience. This is most significant as we take our brain functions for granted. We forget thinking and learning, and all body functions reside in the brain.

SS 2: The Earth in Crisis



SS 2.1 Planning:

What is the slide about? Environmentally sustainable knowledge development was an opportunity for pre-service teachers to weld the tacit knowledge from their past experiences of subsistence farming with newly acquired knowledge to create synchronicity in their understanding of environmental education. The slide shows Earth in distress. Our actions must be questioned for the future of humanity and for the role pre-service teachers play in education.

How did I design this slide? Foremost, there must be humility and no ego to be at one with nature and the planet. We are one with the Earth because of the religious, traditional and cultural narrative we carry with us. Consciousness and emotional intelligence like empathy and

compassion are required to understand the content of Environmentally Sustainable Education. Pre-service teachers were encouraged to use the heart (emotion), hand (touch) and head (cognition) as an introduction to understanding the content.

Why did I design it this way? Love is a universal language that defines us. I tapped into the emotional, creative side of the brain first before I could compare the logical and analytical side of the left side of the brain. We often consider love an emotion, but love is logical and analytical. Thus, love is a whole-brain concept and can be manipulated. Pre-service teachers had to tap into their inner truth to test their feelings about being in a present situation of food security, sustainability and climate change. They are the visioners of the future. The mantle of change is with the current generation, instruments of either positive change or destruction.

SS 2.2 Implementation:

What was the strategy for implementation? Climate change is presently the talking point in ensuring the preservation of the earth. Organizations and governments are raising questions about their roles in Climate Change, weather patterns and temperatures due to human demands. The picture is very evocative. Responses from the pre-service teachers were based on their experiences, cultural values and upbringing and no background knowledge of the subject.

How was it implemented? Human consumption shifts the temperature of the planet. Burning fossil fuels, e.g., coal and oil or gas, affects the temperature because those gases are trapped in the atmosphere. They questioned their basic understanding on of stainability and motivated the discussion on balance between Man, Earth and the Planet.

Why was implemented this way? Rodgers (2001) expounded on learning through play. Vygotsky (1936) proposed social-cultural theories, and Piaget (1936) suggested intelligence changes through growth and development. I combined all the theories to create wholeness and holistic awareness in pre-service teachers. I believe whole teachers who are holistic are an important aspect and must be recommended for the future of teaching and learning in tertiary institutions and schools. We need global citizens and leaders who are whole and holistic.

2.3 Reflect and recommend

Introducing Sustainability or ESD contributed to the pre-service teachers' social-emotional learning (SEL). They questioned unknown or new ideas and concepts and provided suggestions of how vital programmes as the WBCTP are to undergraduates across tertiary institutions. The discussion also focused on the culture of Indian and African traditional religions, traditions and cultural practices and their relevance in modernization. Historical backgrounds historically, culturally and presently shape future knowledge. They were reminded and I suggested that past knowledge and Indigenous Knowledge Systems were the platforms in understanding the delicate balance in securing a future by maintaining their present and taking steps for immediate intervention for the future. Climate change led to a discussion about our contribution and that of industrial affluence in the global carbon footprint. Their responses were based on their experiences of climate change and what it meant in their cultural context.

SS 3: Word Bank



SS 3.1 Planning

What is the slide about? I examined socio-ecological changes and the congruency through SDG 4 in education and SDG 11 for sustainable communities and cities. Pre-service teachers with the WBCTP were conduits of expression and change for innovation and creativity in the classroom. To delve into sustainability, they required the necessary vocabulary. More so, they familiarised themselves with key concepts for discussion.

How did I design this slide? I chose the most common phrases and terminology Pre-service teachers require. These phrases are given strategically as each phrase or term can be a particular topic and theme in classroom and lesson planning. Classroom planning includes charts and pictures to suit the theme and the vocabulary.

Why was it designed this way? Sustainability and Sustainable knowledge extended to all subjects within the CAPS curriculum. Pre-service teachers had to familiarize themselves with relative terminology used in sustainability and environment sustainable development for their knowledge and the knowledge they impart to future learners. Climate Change is an eventuality due to human consumption over generations and the emission of greenhouse gases affecting the planet's temperature. Adger *et al.* (2009, p. 13) argue for the deliberate changes and decision making about resources, values and priorities within any ecosystem.

SS 3.2 Implementation

What was the strategy for implementation? The word bank is used to access long-term memory and to refresh Short-term memory. Recycle, reduce, reuse and recover are the circular economy of production and consumption without losing energy and value. The context of a circular economy impacted both the knowledge economy and the green economy in pre-service teachers being changemakers to the future of knowledge acquisition. Moreover, pre-service teachers understood that they must be creative and innovative in the classroom especially in rural areas where resources are limited and inclusivity is encouraged.

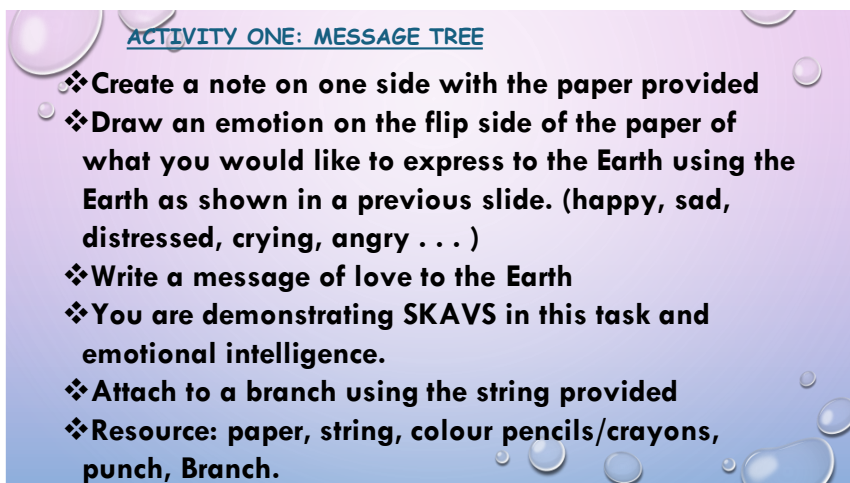
How was it implemented? They were led into a discussion on extinction, preservation and the reasons driving climate change. We compared patterns of the past and present and the use of fossil fuels that increased the level of carbon in the atmosphere. They were conscious of climate change and the damage climate change causes. This changed weather patterns and the climate. The discussion led further into the expansion of the Kalahari Desert, the intermittent spells of drought, unusual rainfall and storms, the fluctuating coastlines and seasonal damages from tropical storms, and the flooding mainly in 1921, 1987, and 2021-22.

Why was it implemented this way? In discussing any subject, implementing the what, who, why, where, when and how, or 5Ws and an H, assists with comprehension and assimilation. Terminology within a particular topic or theme helps with comprehension and long-term memory.

3.3 Reflect and recommend:

Every pre-service teacher and learner in the classroom is guided by collaborative thinking. Divergent, innovative and creative ideas are synchronised into coherent and logical thinking skills, laying the foundation for STEAM education and understanding the environment around them. I invited them to write a message on a card and hang it on a branch to remind them to be grounded and be at one with the universe. The motivation was raising the levels of empathy and mindfulness. The message was an affirmation to make a difference in the commitment to change attitudes and values. It must be noted that I did not find the necessity to include themes because each slide is a theme, and each cycle and workshop was a theme.

SS 4: Message Tree



ACTIVITY ONE: MESSAGE TREE

- ❖ Create a note on one side with the paper provided
- ❖ Draw an emotion on the flip side of the paper of what you would like to express to the Earth using the Earth as shown in a previous slide. (happy, sad, distressed, crying, angry . . .)
- ❖ Write a message of love to the Earth
- ❖ You are demonstrating SKAVS in this task and emotional intelligence.
- ❖ Attach to a branch using the string provided
- ❖ Resource: paper, string, colour pencils/crayons, punch, Branch.

SS 4.1 Planning

What was the slide about? The Message Tree was more than a message or skills for drawing a face of the Earth showing an emotion. It is a whole brain activity of brain dominance. It pointed to the creatives and the logical thinkers. It also revealed the emotions of the pre-service teacher because their picture will be a revelation what they feel and think at that moment. Considering the activity was done at the workshop, brain dominance was clearly revealed to the pre-service teachers. Emotional intelligence, Socio-emotional learning and mindfulness were important to their confidence.

How was the slide designed? Pre-service teachers were given instructions to complete the task. I set the instructions out as one would use a lesson plan. The following was included: What had to be done, why it had to be done and how the task needed to be completed. I included

the resources, the purpose and outcome. They were at one with the spirit and nature. The activity was a cognitive and emotional response or expression of their personal bias on the sustainability of humanity, the planet and knowledge. Messages were attached to a branch. The purpose was raising the level of emotional intelligence and aligning themselves to social emotional learning through empathy, their relationship with themselves, the facilitator, the environment and social awareness. Pre-service teachers' self-awareness was within the framework of identifying emotions, their perceptions and bias, and their understanding of their relationship and thinking with their environment.

Why did I design it that way? A whole brain activity with thinking and learning skills. A holistic approach to classroom practice and as persons of wholeness. One cannot be holistic, which is extrinsic, without being whole intrinsically. The meaning of this translates to healing, self-love, compassion and forgiveness. Apart from a whole-brain exercise the activity involved the mind, the body, the heart, the soul and the spirit. The tree played a vital role in African and Indian cultures, and its significance is timeless. Trees are the lungs of the Earth. Its importance cannot be minimized.

SS 4.2 Implementation

What was the strategy? Breaking the ice and making pre-service teachers comfortable were essential criteria in the WBCT programme. As adults, we forget the joy of being children. Making a card and writing a message was a commitment to their journey on the programme in Workshop 1. Reading about their motivations to be in the workshop made me understand that pre-service teachers sought inspiration for something different. They came without expectations because they wanted a spark to light their way. They wanted something that was beneficial and inspirational.

How was it implemented? I reminded pre-service teachers that they must assume the role of teachers with their learners. They were in a classroom and had to complete an activity without inhibitions. I set a time limit of twenty minutes. Setting a time limit was a tool in assisting with a simulation at school. They were given resources and instructions.

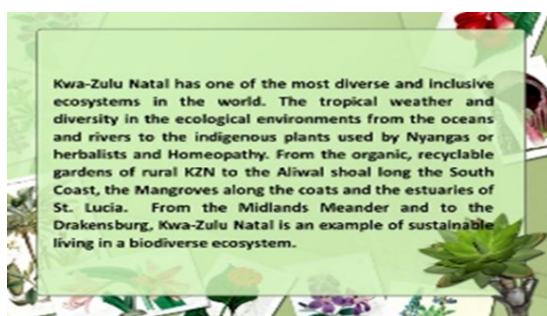
Why was it implemented this way? Initially, pre-service teachers were shy, citing that they did not have a message or that it was a very long time since they drew pictures and were at one

with mindfulness and grounding. As soon as they started with paper and coloured pencils, they were all smiles and enthusiastic. I aimed to coach pre-service teachers who were confident and who could lead their classrooms with confidence. Leadership is a chain reaction. They were like children, eager to try their drawing and creative skills. The activity enabled whole brain thinking and creativity on an emotional and social level. It also revealed the knowledge they own with the knowledge they are gaining from the word bank.

SS 4.3 Reflect and recommend

“It was the best task I could have given them as an ice-breaker. They looked like children back in Foundation Phase, drawing and colouring and being so intense in their expressions in conveying a message.” Khan (2019). This task brought creativity and abstract thinking to the fore. Pre-service teachers understood that the simple task related to the bigger picture. They were subdued when they entered the hall and expected it to be a lecture. They were pleasantly surprised that it was interactive and enjoyed the task of drawing emojis of different emotions superimposed with the Earth. Some left a message of regret for destroying the earth while others expressed hope and joy. In the future, I will use a lesson plan template for the activity to encourage them to be more familiar with completing lesson plans.

SS 5: Local destination: Durban



5.1 Planning

What was the slide about? Durban as the city was familiar for pre-service teachers in a place where they reside and trips to the city center. There are four seasons, four different climates,

different weather patterns, agriculture, wild life, commercialization, the gateway from the harbor or port to all the major cities and the list is endless. The welding of African, Indian, White and Colored cultures provides a unique peak into indigenous slang or colloquial languages, lifestyles, tradition, culture and religion and, more so, the fusion of them all to create diversity in unity. Traditional healing and indigenous forests were major lifestyle enhancers to alternate, traditional medicine in KZN.

How was it designed? In the design of the programme my focus was Kwa-Zulu Natal. Although pre-service teachers reside in KZN, they were fully aware of the potential within the province's geography. I found it imperative to localize the discussion as a comparative study with other parts of South Africa and the world. The design included knowledge of the city's maintenance, the fauna and flora, and the various municipal structures and districts. I also reminded them of the city removing alien plants. Alien plants are invasive and spread very quickly.

Why was it design this way? KZN's diversity provides opportunities from the coast to the mainland and the mountains. Pre-service teachers must be comfortable and knowledgeable about the familiarity of the environment to open the discussion on sustainability. Durban is a metropolis of diversity

5.2 Implementation

What was the strategy? I asked pre-service teachers to examine natural resources and forestry in the industry and for domestic consumption. It was a curious journey as we tapped into indigenous knowledge systems (IKS) and alternate medicines like traditional African medicine and Indian herbal medicine. I discussed why we used them and what they were used for in our ecosystem. I led the discussion on the positive and negative impacts of indigenous plants.

How was it implemented? The discussion was a lively repertoire of the importance of herbal medicine but in a controlled environment rather than destroying the natural environment. We further explored ecosystems on land and in water and the importance for these symbiotic ecosystems for the survival of species: Man, animals, and plants co-exist. We discussed tropical storms and the devastation, flooding, shacks or informal settlements, poverty, and the impact of not taking responsibility for our environment. The effect ripples through marine life, our

waters, and daily living. Our shorelines are abused by regurgitated plastics which is contributed by Man. The discussion centered around the coastal ecosystem and Kwa-Zulu Natal as a major economic player, and Durban as the largest port in Southern Africa. In conclusion, Man can benefit from sustainably managed environments. Global impacts of various phenomena, contextualized the global issues locally in the province of our residence, KZN. The impact of active citizenship starts locally where the impact has a ripple effect on global conservancy and activism. KZN hosts a coastal and geographical diversity in weather, indigenous and multimodal ecosystems, its inhabitants, climate and economic status.

Why was it implemented this way? Pre-service teachers discussed rural and urban scenarios to understand their need to save the planet for the future. In a circular economy, there is less pressure on natural resources and on the environment but, more responsible behaviour patterns and accountability from humanity. A circular economy is the circle of recycling while maintaining the green economy is based on environmental principles.

5.3 Reflect and recommend

Complacency effects our status quo and affects the planet for the future. Medicine treats symptoms and alternate medicines rooted in our culture and history, heals the source of the problem. There are no chemicals but herbal natural goodness. Furthermore, the importance of Mangroves, Aliwal Shoal in Umkomaas along the South Coast that is a hub for scuba diving, the Durban Harbour as a major harbour and port in Africa and South Africa for trade (export and import, fishing as a hobby and a leisure sport, and the Sardine Run, a unique phenomenon exclusive to Kwa-Zulu Natal shorelines cannot be ignored. Trading changes the economy, knowledge systems and social dynamics. “They realized that knowledge in the classroom is not about fundamental theory but also a reflection of the microcosm of society”. (Khan, Fiona. 2019), *Diary Notes*, WBCTP (2019) [unpublished].

SS: 6: Aliwal Shoal and the Sardine Run



6.1 Planning

What were the slides about? The Sardine Run is a major natural resource for the people of Kwa-Zulu Natal (KZN) and contributes to KZN's eco-tourism. The Sardine Run is also the most unique phenomenon in the world. It also contributes to the livelihood of many in the fishing industry. In reality, the fish or sardines swim from the Eastern Cape upwards towards Mozambique along the warm Indian Ocean. However, it is also an exploited commodity with other countries' offshore poaching of natural resources. Aliwal Shoal is also a tourist attraction and a local destination for diving and snorkelling in South Africa.

How were they designed? Two aspects need to be addressed. First, ecotourism and second how ecotourism locally and internationally contributes to the socio-economic conditions of local and the country's Gross Domestic Product (GDP). GDP is the country's reflection of the national economy against the global economy. If the GDP is low or shrinking, then it means the economy is shrinking too but if the GDP is high or increased, it means the economy is flourishing. There is more employment, and people can afford food and consumables.

Why was it designed this way? I showed pre-service teachers the diversity in the tourism sector bringing in the blue economy of the seas and oceans and the green economy with our export of food and drinks and natural resources. It is crucial in the diverse ecosystems and to the economy of KZN. It is also a major tourist attraction

6.2 Implementation

What was the strategy? Subliminal knowledge expanded into an awareness of extraordinary proportions as pre-service teachers recognized the importance and dynamism of the socio-

environmental and socio-economic trends and the message they carry to the schools. They also acknowledged their role in the preservation of the planet.

How was it implemented? The sea contributes to tourism and supplements daily lives. They learned about the Aliwal Shoal and diving off the coast of Kwa-Zulu Natal rather than some exotic destination. The sea also contributed to the circular economy. They validated and appreciated unexplored local destinations. They learned of sharks and shark diving, which is tourist activity. The ecosystem of the KZN coast is unique and diverse in species but also hosts dune mining in Richards Bay. One of the most extraordinary finds on the East Coast of KZN (South) was the Coelacanth. The fins of the dinosaur fish believed to be extinct 60 million years ago, resemble legs and appear to be walking, were found at the iSmangaliso Wetland Park.

Why was it implemented this way? The Sardine Run: Africa Wild Forum (2018) indicates the worldwide phenomena and pre-service teachers were unfamiliar with the phenomena. It is an aspect of local content, including Aliwal Shoal, that needed exploring and communicated with pride. It also boosts local tourism. Natural resources contribute to a country's Gross Domestic Product (GDP). GDP measures the economy, and the value of goods in this country. The output of natural products and the currency it brings will determine how rich or poor a country is. The sardine run contributes to formal and informal trade.

6.3 Reflection and recommendation

“The Aspect of ecotourism is vital for pre-service teachers. It contributes to many themes in the foundation and intermediate phases and is also very topical in the different learning areas”. Khan, F. (2019). *Diary Notes: WBCTP* [unpublished]. University of Kwa-Zulu Natal. There is the aspect of resources and daily living within these ecosystems, which are readily available for study in the classroom.

SS 7: Rural Women's Assembly on GMO'S

Mansonto and GMOs: Africa Centre for Biodiversity (2018)

Grain.org (2004)

Education and Sustainability



7.1 Planning

What were the slides about? Organic farming is vital to rural communities as subsistence farmers. “It is “chemical free” farming that is holistic, environmentally friendly and aimed at improving soil health through natural inputs” (Seufert. *et al.* 2017). The discussion on organic farming revolved around permaculture, “a method for designing sustainable land-use systems” (Mollison, 1988), maintaining balanced soil and land use, and ensuring that pesticides and genetically modified (GMO) seeds are not used. The slides also indicated social activism. I raised the issue of Monsanto in the dispute over chemical sprays as pesticides, herbicides and price fixing in GMO seeds and food. Brought to the fore was the issue of human frailty in the hands of global agitators. It is, therefore inevitable that education through poverty suffers.

How were the slides designed? They had to be impactful. The pictures raised issues of gender, role reversals and social activism. They were designed to raise questions in the minds of pre-service teachers in critical thinking and divergent thinking skills. How can they change the future as agitators and visioners? How can education be sustained through poverty and align

with SDG 4? We accept it is a ripple effect on everything as a human; according to Maslow (1943), basic needs must be met to transcend to a higher order of thinking and living.

Why were they designed this way? They convey an impactful message of what Africa is about the constant competition between itself and its people. Tradition and culture were vital in an inclusive, indigenous knowledge system maintaining biodiversity within rural and urban communities. I acknowledged women's proactive role in rural communities as single parents and sole providers for their families. They are the first observers of the decline of crops, the effects of climate and weather conditions affecting crops and seeds, and the manipulation of pollutants in pesticides. They are also the first in line for social activism.

7.2 Implementation

What were the strategies? Global economics is critical to understand Africa, especially its politics and survival. There is an enormous manipulation of resources, and cheap labour, manipulated by the international market of supply and demand. It includes exploitation and human rights abuses. The strategy aimed to raise awareness of global economics and the political manipulation of resources. They are proud of being African and a son or daughter of the soil. Raising their patriotic dreams and hopes will allow them to dream of changing the future.

How was it implemented? I explained to the pre-service teachers (PSTs) about economics and the global monopoly of food, crude oil, water and electricity in controlling humanity and using the same for civil unrest. South Africa is the only country in the world allowing staple food with GMOs. Much of the demand is based on poverty and the demand of basic food products with reduced prices. The Alliance for Food Sovereignty in Africa (AFSA) (2018), "A pan-African civil society platform championing food sovereignty in Africa, calls for an immediate ban on the importation into South Africa of Monsanto's high-risk second-generation gene-silencing genetically modified (GM) maize intended for human consumption". AFSA rejected and condemned Monsanto's plan in exploiting Africans as "human guinea pigs". GMO seeds are used for cassava and maize, the largest food chain in the world. The biggest use of maize is Africans in the entire continent of Africa. Recently, they have observed the decline of pollinators e.g., bees, birds and other insects. In Africa, because of the education within rural

communities and forums, women have taken the fight to UNESCO and the United Nations, as much of their funding come from government organizations.

Why was it implemented this way? Pre-service teachers were familiar with proactive citizenship in South Africa and could identify with the broader narrative of challenges faced by subsistence farmers. I pointed out the advantages of having a school garden for both supplementing income and encouraging entrepreneurial skills. They were very enthusiastic about the prospect of joining organizations that can help them at schools to promote permaculture. I referred them to the Eco-Schools programme organized by Wildlife and Environmental Society of South Africa (WESSA). The Economies of Scale as defined by Investopedia is, “the increase of production and the lowering of costs”. Companies benefit from the large-scale production and manipulate the supply and demand of products driving prices higher or lower. Subsistence farming encompasses organic farming as a healthy alternative.

7.3 Reflect and recommend

Pre-service teachers (PSTs) had to expand their point of view to a world view and their worldview into daily living in understanding capitalism. “Every economic system has a supply and demand. In the case of GMOs, the genetic mutation. This threatens food supply and the resultant impact on humans and animals”. Prices are set to serve society however; private investors monopolize the system to serve their interests through profiteering with or without government participation or intervention. It raised the issue of new diseases, changing environments, and with Mansonto chemical sprays, the impact is lethal.

SS 8: Poverty in Africa



**POVERTY IN AFRICA:
CONTROL OF THE MIND,
THE ECONOMY
AND THE PEOPLE.**

**FREE SCHOOL
UNDER A BRIDGE**

**EDUCATION
AND
SUSTAINABILITY**

An Indian man has become a hero as his brother fills in for him at his day job so he can teach New Delhi's poorest children under a metro bridge. He's been doing it for three years and hopes to equip these children with the tools necessary to help overcome their poverty.

8.1 Planning

What were the slides about? “GMOs are all living organisms that are genetically modified and have received foreign DNA/RNA through modern biotechnology methods or cell fusion (except when the results can be made through traditional breeding methods)”. I raised the issue of colonialism and its impact on Africa’s poverty and the gaping chasm that exists on human survival between those who have excess and those who do not have. Drought, manipulation of the economy by oligarchs, despots literally monopolising civil chaos through the squandering on monies, bribery, and corruption have driven Africa to poverty.

How were they designed? I brought into discussion the manipulation of the masses through politics keeping citizens poor so those in power will remain in power because of the dire need for the number one monopoly and that is food and water. Pre-service teachers were aware of the negative effects of Genetically Modified Organisms (GMO) foods and the impact on the ecosystem to birds, bees and other insects. They focused critically on impact awareness. To combat poverty, GMO seeds are used for food production. There is malnutrition and a lack of medical facilities. Education is neglected because of poverty and climate change contributes further to neglect and death through poverty. As the Whole Brain Creativity and Thinking Programme I coaxed the discussion around how we are using our whole brain when discussion topics of global impact.

Why were the slides designed that way? Slides were designed to create impact through social emotional learning and mindfulness. Pre-service teachers observed that there are different levels of poverty just as there are different levels of wealth. Climate change is a constant threat, socio-economic statuses are challenged and the ripple effects on everything cascades down to the environment and the people. Food is the most basic need according to Maslow (1943). And, that basic need impacts everything else on the hierarchy, especially wanting to be a holistic person.

8.2 Implementation

What strategy was implemented? I raised African consciousness and pride in Africa. Subliminally they were questioning their roles for the future of South Africa and discussed their part internationally as global citizens. Pre-service teachers must be well read and literate

in all aspects of national and global affairs. They were reminded of the multiple uses of the newspaper in language, literacy and literature and teaching learners the importance of staying well informed.

How was it implemented? The slides were vivid. Poverty is a reality in every country however, humanity always rises above their needs and wants into self-preservation and what they need to survive. As a whole-brain programme, the sectors affected are food, education, water and sanitation and resources. Applying Maslow’s hierarchy of needs, safety and security or safe environments are a priority. The slide also raised the concerns of urbanisation and the need for Smart safe cities that are technologically advanced. *Durban’s Climate Change Strategy 2022- eThekweni Municipality (DCCS)*, describes the following, “Build governance, social environmental and economic adaptive capacity and resilience to climate change while achieving net-zero greenhouse gas emissions by 2050.”

Why was it implemented that way? In impact studies, the impact always encourages divergent thinking and design thinking. Because of empathy, pre-service teachers will always resort to ideation. They will seek solutions to end the problems, and social activism packs more power in schools because of social and vicarious influences.

8.3 Reflect and recommend:

“Pre-service teachers will always use metacognition to rise above that which has impacted their cognition and emotional intelligence”. Khan (2019): *Diary notes* [unpublished]. University of Kwa-Zulu Natal. Fear will drive them to success and be their motivation to never succumb to poverty. Considering most of them understood and identified with poverty, they remembered and articulated, through their education and edification, they will never return to that status of living under impoverished circumstances. Hence, awakening an awareness, an intrinsic activism, also raises pre-service teachers’ consciousness.

SS 9: Durban’s Toxic Trail



9.1 Planning

What was the slide about? Pre-service teachers had not learnt of, nor were they aware of, the Toxic Trail in South Durban. SAPREF and ENGEN are companies in the heart of Durban that run their chemicals, gas and oil pipelines under the South Durban Basin. This is catastrophic in any apocalyptic scenario, with residential and commercial business areas zigzagging across this trail. The slide was a reminder that Durban holds the oil and gas supply for the rest of South Africa. However, it affects the ecosystems and is a health risk.

How was the slide designed: SAPREF is Durban's largest oil and gas station. The discussion extended to renewable energy and various mechanisms and interventions which can be implemented to save the planet from overheating due to Green House gases. The pollution from the plant is also toxic and a health hazard. "The excessive global emission of greenhouse gases (mainly carbon dioxide, CO₂ and methane, CH₄), especially due to the burning of fossil fuel for energy and power generation, is the main cause of the air pollution and greenhouse effect" Jeffrey *et al.* (2021). Further in their discussion, they examine the impact of these global warming through the gases, "This has eventually brought many issues, such as climate change and global warming, that will affect the standard life of human beings".

Why was the slide designed that way? Constant school closure and extended health diseases because of toxic smells and sometimes poisoning of residents through toxic fumes was indeed an environmental and humanitarian disaster. Oil and chemical spills and overspills in rivers and streams are an abomination to the abundant and diverse marine, flora and bird life along the coastline. We are aware of the many fires and environmental disasters within the area.

Sustainability and climate change are important for pre-service teachers and future changemakers in the classroom. The flooding in the South Durban area in the past presented unparalleled proof that the future of our planet is at risk, and so is humanity. We have had repeated patterns of tropical storms along the Durban coastline due to many environmental factors, i.e., pollution, climate change, change in the coastlines façade, dredging, Durban as a main trading port in East Africa with constant sea traffic and poor waste management.

9.2 Implementation

What was the strategy? Due to environmental impact and the policies that are ignored concerning health, the Toxic Trail reminds pre-service teachers to take the matter of environmentally sustainable education for future generations very seriously. The ecological collateral damage from the toxic trail will be catastrophic if it were exposed to sabotage, floods and environmental disasters. Information dissemination to empower future leaders within the WBCTP so knowledgeable decisions can be made and social activism can assist in shaping a better future for learners.

How was it implemented? Geographically they were reminded that SAPREF and ENGEN are situated along the coastline of KZN. The South Durban Basin has become a thriving industrial site with Durban being an international port. Following the Toxic Trail is interspersed with various ecosystems. Whale watching, sharks and dolphins and the Aliwal Shoal. Therefore, we can have sustainable environments with minimal damage to ecosystems. Much of the pipelines run underground. Explaining to the pre-service teachers about carbon footprint and the absence of clean energy as an environmental impact is empowering them with knowledge and the power of choice.

Why was it implemented this way? I raised the issue of the pollution level in the MEREWENT/ JACOBS areas or the South Durban Basin, which contributed to the endless health and respiratory problems among the residents because of ENGEN and South African Petroleum Refineries (SAPREF) emissions. Pollution was a major factor in harming the environment with chemical spills from the factories into rivers and streams.

9.3 Reflect and Recommend: When tourists speak of Durban being “the world in one city”, they are absolutely correct. Its potential and the beauty Durban holds is beyond measure. The

people and the melting pot of culture, history, traditions and languages creates a warmth where the “Sun never really sets”. We must reflect on our environment due to SDG 11. We cannot have safe cities and inclusive cities sitting on an impending ecological and environmental disaster which we are exposed to in small mishaps time and again. Considering the infrastructure has been in place since 1961, Not much has changed apart from the political landscape. Much has aged in an ailing toxic trail. We know for sure the Port Dug Out Project has been placed on hold due to political chess but, industrial establishment and expropriation has begun in the areas affected. Durban is poised to be an industrial and economic hub. The question to be asked is, how large is our carbon footprint?

SS 10: Renewable energy



10.1 Planning

What was the slide about? Introducing renewable energy was generally a new topic. I hoped to establish the vast extent of beneficial solar power and wind energy. Some heard about solar at school, and they have completed projects. The topic was not new, but introducing technology to an ancient alternate energy source was the core element. Wind power uses more technology in its design and harnesses wind through turbines. Solar panels for household and industry are the future in climate change strategies and in renewable energy. **How was it designed?** I introduced the topic of lowering costs through solar and wind energy yet, being kind to the planet. I discussed alternatives to electricity like solar farms (solar energy), wind energy for farms and rural communities, desalination plants (using chemically purified seawater alternative to groundwater), especially in urban areas and rainwater harvesting for daily use. With rainwater harvesting, special containers are constructed to catch the runoff from roofs. The water is used for household purposes while saving on the cost of using water channeled from the city’s water works.

Why was it planned this way? I took the information to a higher level of business and corporate but encouraged home use of solar with geysers, rainwater harvesting and electricity. The inflation is very high in South Africa and many live in informal settlements or Reconstruction and Development Programme for housing (RDP). RDP is a government initiative of providing subsidized housing in their socio-economic policy. Wind energy was the other alternate clean energy for industry, commercial and home use. Solar panels on rooftops are the easiest way and invertors to change from electricity to solar. For subsistence farmers, wind and solar energy saves on costs.

10.2 Implementation

What was implemented? Solar and wind energy as an alternate energy source. Cost-effectiveness and reducing the carbon footprint.

How was the content implemented? Comparative discussions on rural communities using solar for many daily activities compared to the large capacity of electrical devices in urban areas. The circular economy was a considerable deterrent in raising the levels of the Earth's temperature. Alternate renewable energies are wind energy and solar energy. South African businesses, corporate and governments have invested in solar farms and solar roofs at very large business outlets, and the eThekweni Municipality used solar for street lights. Large companies use solar to cut costs on electricity. There are fewer costs incurred and alternate energy sources contribute to sustainability of the planet. Wind Energy is used in urban areas for water and irrigation systems.

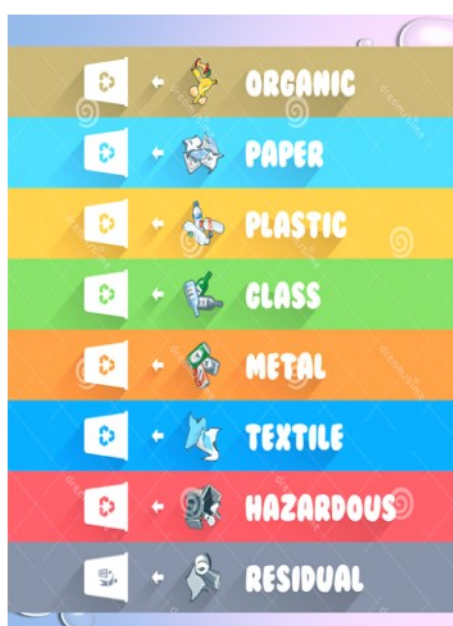
Why was it implemented that way? Sustaining the future of the Earth and humanity means using clean energy. Clean energy is also affordable especially to rural communities, which sustains communities through social cohesion. Solar power and wind energy does not contribute to Greenhouse gases. With the pressure of social upliftment in the different strata of society, the needs and wants have changed. It relieves the stress of exorbitant electricity bills and defuses the carbon footprint. The solar energy in homes is most beneficial during load shedding and power outages.

10.3 Reflect and recommend:

Their investment in solar for geysers and general electricity is holistically beneficial to themselves and the planet. In industry, solar farms and wind turbine farms decrease electricity bills and reduce the carbon footprint through clean energy. Urbanization through solar and wind turbines release the stress on hydroelectric power, coal power, nuclear and gas turbine stations where natural resources are used. Using more natural resources leads to more emissions of gases into the atmosphere. As a coastal city the benefits and contribution in reducing the carbon footprint is ginormous.

Raising the topic of clean energy also raised awareness of thriftiness. When living in a country where the cost of living rises each quarter due to fuel price increases, there is always the alternative which is cleaner and safer.

SS 11: The Circular Economy



11.1 Planning

What were the slides about? Three slides were presented individually to explain the details of recycling. An essential aspect of the school curriculum, the slides were used to inspire and ideate divergent thought processes of creativity. There is no wastage within the circular economy, from production to consumption. In many countries, food is a weapon! Food is political expediency! Food is a socio-political determinant. Therefore, in circular economy products are used for as long as possible and those products are biodegradable. I used vectors representing food, transport, energy and diet.

How was the slide designed? Africa has taken to recycling to sustain the poor not businesses. Businesses, policymakers and consumers contribute to an ecosystem of less wastage and more sustainability to decrease the pressure on the government for social assistance. However, businesses still are the major contributors to Greenhouse gasses and pollution. A circular economy as defined by principles, “Eliminates waste and pollution, products and materials are circulated to their highest value and they are biodegradable, contributing to nature”. Ellen MacArthur Foundation (2016). The circular economy embraces design thinking in every aspect of the cycle to ensure the final product is at one with nature and that every product is used to its maximum capacity in the circular chain.

Why was it designed that way? It was vital to consider the socio-economic standard of living in South Africa. In this narrative, the importance of clean energy, reducing the carbon footprint and ensuring the saving of costs to most households in South Africa was crucial in imparting knowledge to pre-service teachers and for them to translate this message in the classroom. Before throwing away domestic refuse or packaging, is it reusable and biodegradable? In other words, is it eco-friendly? Can organisms within an ecosystem break down any material naturally and be reabsorbed into the environment without pollution? Focusing on a WBCTP, we must combine logical thinking with creative ways of substitution. Fortunately, we have packing solutions to ensure renewable, biodegradable and compostable. Using recycled material at schools, teaching learners about recycling and reusing, and saving their environment is an integral part of the curriculum.

11.2 Implementation

What was the strategy? As consumers of the circular economy daily, we have become complacent. To save costs we recycle. However, considering most of the consumers of take-outs and restaurant foods use disposable containers, we need to pay attention to our responsibility towards recycling. As consumers, we do not ask if the containers are recyclable or made from recycled material. We shy away from the relevant topic and thus raise awareness of the circular economy. There is a social indifference to recycling, an insidious apathy.

How was it implemented? I discussed waste management by bringing forward day-to-day uses and expenditures. What does our conscious dictate? How can we save the planet for our children? Examining daily packaging and uses, pre-service teachers became conscious of the overwhelming packaging we use each day only due to promotions and marketing. It is an individual right to refuse what we accept or not. Then I discussed the discarding of packaging and reusing by recycling, a strategy which can be implemented for projects at school. The discussion expanded to the disposal of kitchen refuse, manure, and organic home gardens. The very same can be applied to school gardening projects and permaculture. I reminded them of their rural homesteads with organic and depression gardening. The same can be created for urban planning with rooftops and horizontal and vertical gardens. One must practice wholistic actions and skills for a holistic, value-based lifestyle.

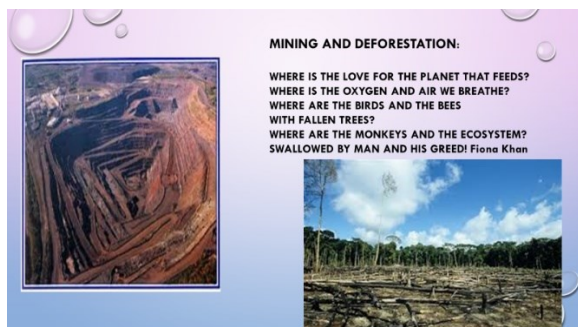
Why was it implemented this way? Attitudes and attributes reflect our lifestyles and our personalities. To obtain the attitude of social change, we must change ourselves into icons of positivity, attitudes and values. Pre-service teachers must cultivate the mindset that they are role models to their learners and reflect the aspirations of future thought leaders and game changers. Social activism starts within for positive change before it is reflected. E.g., A teacher cannot ask a learner not to use plastic, when the teacher carries books in a plastic bag. That is hypocrisy and the learner will never take that teacher seriously. Actions reflect our intentions and our subconscious.

11 3: Reflect and recommend.

I raised the discussion of planting fruit trees in schools as a supplement to the lunch learners take or do not take to school. It is a healthy option especially for learners who do not take lunch due to financial constraints. Furthermore, the sale of fruit and healthy alternatives at school tuckshops is a healthy alternative to the sale of unhealthy snacks like chips, chocolates and

sodas. Innovatively, schools can make cold pressed juices from the fruit and sell them at school. It's the WBCT way of being creative, innovative and enterprising. I recommended joining an eco-school's programme for holistic thinking and practice to raise awareness of sustainability or ESD among learners. Future leaders require skills.

SS 12: Mining and deforestation



12.1 Planning

What was the slide about? Mining in South Africa has led to deforestation and barren lands tainted by mines and chemically poisoned water. However, certain countries in the world have taken deforestation to an irreversible level. In KZN, part of the erosion along our KZN coastline is the removal of much of the forestation through urban planning and development. The expansion into the coastline for property development, the use of land for storage of containers for commercial use, encroaching on land for the paper industry and the wood industry, and import and export due to international demands depleted much of the forestry.

How was it designed? In Kwa-Zulu Natal eco-tourism, the main attractions have moved inland with different historical and cultural trails. Blending different faculties of race, religion, and diversity, ecotourism is one of the significant sources of the economics of the provincial budget. Ecotourism lends itself to entrepreneurship and self-employment. However, deforestation is a reality of urbanisation and the demand for natural resources. I took an example as SAPPI, a renewable resource company that practices crop rotation and the using entire tree for sustainability.

Why was it designed this way? The Port Dug-out project concerned TRANSNET buying a sizeable portion of land along the coastline to create an economic hub displacing residents,

businesses, culture and heritage and many indigenous ecosystems unique to Kwa-Zulu Natal. The project was created to contribute to eco-tourism and the commercial hub in the South Durban region. I have concluded that this project has been shelved due to the outrage from climate change champions. However, the possibility of the project for the foreseeable future is viable. Ecotourism defined by (Western, 1993), is about “principles of balancing tourism, conservation and culture. Its role is limitless”. A lot of the green lands have already been cleared for storage of containers because of the proximity to the harbour. Lush green fields e.g., Clairwood Racecourse have been allocated to storage. Richards Bay along the Northern KZN coast thrives on coal and dune mining, supplying neighbouring countries with resources.

12.2 Implementation

What strategy was implemented? Pre-service teachers discussed their carbon footprint, “the amount of gaseous emissions that are relevant to climate change,” (Wiedmann & Minx, 2008), through their daily activities and their consumption that contributed to the carbon dioxide in the atmosphere. We further discussed using paper and the environmental impact, knowing that trees were valuable to the planet’s future. They were encouraged to go paperless. The discussion on climate change and the digital footprint was most animated as I touched on aspects of this topic they had never encountered before. I raised the awareness through their subconscious and guilt.

How was it implemented? As we outlaid the importance of environmentally friendly products and guided them through the use of daily products from containers to household products, the foods consumed and the processing of those foods in the food chain, the energy cycle and the consumption by human standards, they were astounded because sustainability is about a way of life instilled through practice and consciousness. Because of Man’s demands, we have deforestation. They had not fully understood before and were complacent in accepting every detail as part of their daily routine. There was a shift in metacognition and their fluidity of thinking about their lifestyles with the environment and their responsibility.

Pre-service teachers must take responsibility for their actions in contributing to the preservation or destruction of the planet. Pre-service teachers were unaware of greenhouse gases and the concept and context of digital footprints. They took cognisance of their food, containers used, transport and digital footprint. “Digital Footprints are those traces left behind

online”, (Osborne & Connelly, 2015). Osborne and Connelly further discussed the impact at higher institutions and questioned whether undergraduates know the consequences of using the web.

Why was it implemented this way? Whenever we search Google Scholar, Google, Wikipedia or even the UKZN search engines, we are marked for future suggestions, spam, cyber targets and phishing or spyware and malware. Paper used in schools cannot be equated with digital technology. However, using digital in schools saves on the costs of the schools and reduces the strain on the budget. Concerns were raised on cyber-attacks and the effects of Big Data and scammers.

Khonji et al (2013), define phishing as “A social engineering attack that aims at exploiting the weakness found in system processes as caused by system users.” The definition is further explained as even though a password may protect a system, cyber-attacks can occur through hyperlinks, or password thefts, or via links where one is asked to change passwords. The list becomes endless in a trail, leaving the user scrambling with data and documents destroyed with an ultimate computer system crash. Simply explained, it is a cyber-attack on the operating system. Their response also examined the use of mobiles and its impact on technology, sustainability and the digital footprint. However, Google has now created a haven through the digital warehouse called the CLOUD to store documents.

12.3 Reflect and recommend:

Their fears were aroused at the digital footprint of their online presence through searches online, personal information and sharing their personal lives on social media, their online purchases, downloads and social media presence. Saving paper by going paperless was a contributing factor to the carbon footprint. However, we are all targets for Big Data through advertisers and marketers and tertiary institutions are included. Apart from social media, I recommended that pre-service teachers start tracking and tracing their online presence and footprint to understand Big Data and the Internet of Things. They reflected on the sites they visit, and this suggestion raised some eyebrows, especially for those who visit illegal sites.

SS 13: The Blue Lagoon River Mouth



13.1 Planning

What was the slide about? The Golden Mile is susceptible to tropical storms. Due to apathy concerning litter and pollution, the garbage finds its way to the sea. Having one of the largest co-habiting and diverse communities in South Africa within the global context, our seas are also susceptible to human indifference but contribute extensively to the Blue Economy. After a tropical storm, the deluge of litter and plastic collected along the coastline is an eyesore affecting marine and coastal vegetation. The issue of waste disposal, effluent waste, recycling, and the production of recycled materials and containers are considerations the municipality must adopt.

How was it designed? When the data was collected, there was no offshore drilling along our coastlines, making the coastline unique in its tropical warm climate. The picture raised the awareness of consciousness and being mindful. It also drew attention to their task of recycling. Tropical storms are common along the coastline. How does the planet feel about humans being irresponsible and selfish? The sea is being sullied with waste. Although free from contamination and commercialization at the time of the presentation, the presentation opened the possibility that the future is uncertain due to socio-political and socio-environmental commercial issues.

Why was it designed this way? It was designed this way for maximum impact and to affect a whole brain's response to the disaster we create. It raises how we feel in emotional intelligence

(EQ). What are our thought processes when we see a destructive path we create? Visual literacy brings to reality what the aural senses cannot. With the formation of global alliances and South Africa as a critical role player in political chess, the future of Kwa-Zulu Natal for political expediency offered a very volatile future. Our Blue Economy, beaches and marine life, must be saved from human irresponsibility.

13.2 Implementation

What was the strategy? Urbanization has led to complacency and taking the municipality's role in service delivery for granted. Pre-service teachers were encouraged to express their roles as contributors to the regurgitation of waste along our shorelines. Discarding plastic and waste, even sewer into the oceans and rivers, contributes to diseases and contamination and poorly reflects our responsibilities as citizens of KZN. Discussing the importance of their contribution in keeping the city clean reciprocated in raising learners with social consciousness. They must be aware of the consequences of their actions.

How was it implemented? Pre-service teachers considered living in a very holistic and Smart environment filled with possibilities and opportunities. In South Africa we are plastic royalty. Our lives revolve around plastic even though we know its toxic for the planet. Possibilities for recycling are always there but that does not eliminate the problem that we have become indifferent to the planet's needs for sustainability. Asking pre-service teachers to use recycled material to create their tasks and projects raised awareness of social-emotional responsibility.

Why was it implemented this way? Higher-order thinking, or metacognition, allows the brain to filter information and apply logic. The creative brain immediately construes creative solutions. While adults apply logic to decision-making with the right brain, children are highly and emotionally intelligent. Therefore, raising the awareness of social activism in a classroom of learners is more effective and affective than verbal communication. This can be done with posters, slogans and projects for classroom assessments.

13.3 Reflect and recommend

I firmly believe our convictions and consciousness are raised when our minds are inundated with stories of saving the planet for our future. We want to shape and mentor global agitators.

All the social responsibility and creativity in creating a more viable city stems from raising the awareness in our children. Once the mind and imagination are spurred onto metacognition, learners are critically aware and feel the need to make a difference for themselves as I was doing with the pre-service teachers.

SS 14: Blacks Do Caravan. Fikile Hlatshwayo (2016)



14.1 Planning

What was the slide about? Blacks Do Caravan, written by Fikile Hlatshwayo reveals a tremendous transformation in South African tourism. The history of blacks indicates migrants who reversed the South African landscape. She writes of the adventures and escapades of a family caravanning around South Africa. The group of pre-service teachers were guided into understanding sustainability diversity in ecotourism. South Africans in their diversity, have now embraced the freedom of exploring the land of their birth, of traversing the beauty and landmarks of a country that belongs to them.

How was it designed? Pre-service teachers were reminded of the pride of their inherited culture, tradition and history. Their history meant exploring beyond what they are comfortable with in their surroundings. It instils within them patriotism and pride and provides a greater platform for discussion. I designed the slide within the ambit of the living theory (Whitehead, 1989). The importance of language, literature and sustainability provides a holistic outlook to pre-service teachers for ecotourism and sustainability. Examining a value-based approach to sustainability, pre-service teachers can enjoy a sustainable future, especially one that offers so many avenues of opportunity and prosperity. The people of KZN have places to visit, contributions to make as active citizens and enjoy the myriad of travel and vacation spots we have as a community that echoes the 17 Sustainable Development Goals from UNESCO.

Why was it designed this way? It is the bias and stereotype we address that blacks or Africans do not camp, or travel or enjoy the breath-taking panorama of South Africa. We must remember that migration was a significant contribution to our history. Like migration, camping is migration on wheels as a modern version through technology. But travel itself is also significant the tourism and the economy in South Africa. The idea was to instil pride and the importance of exploring the country so that the elements of the country can be understood and appreciated. What is being experienced in the WBCTP is the holistic and mindful appreciation of the living theory. To understand the dynamics of a global system the nucleus is studying the dynamics of the home country first. We know for certain that many pre-service teachers travel abroad for residencies and exchange programmes. Do they know their own country to discuss it extensively and promote it as an ambassador and can they contextualize it on a global scale?

14.2 Implementation

What was the strategy? Raising social activism and sustainability through eco-tourism. Reminding the participants of the role as visioners and agitators for change and benefit.

How was it implemented? Ecotourism explores the symbiosis and sustainability of all communities through tourism and support of local communities. It also encourages the landscape and its biodiversity however; we cannot be blinded to the various socio-environmental challenges. Whitehead (1989) discusses the living theory as rethinking strategies for performance and change. The coast and inland of Kwa-Zulu Natal has the most diverse ecosystem in the world. Furthermore, the ecosystem is synchronous with the weather

and climate. Adeleke (2015), “It was also found out that preference for ecotourism trips was significantly influenced by the various barriers to ecotourism activities including high level of unemployment and high level of illiteracy.” Tourists visit rural areas, game farms and indigenous regions driven to increase the income in these areas by supporting local trade in the hope of uplifting the socio-economic conditions based on education, social status and income.

Why was it implemented this way? The discussion focused on the environment, sustainability and land use with all the possibilities of living within a holistic ecosystem. The visible signs of a disadvantaged past did not avert the discussion of a bright future. We must break the mental mirage within and without ourselves of Black discrimination and limited opportunities. Pre-service teachers could view the situation through divergent and holistic thinking and analysis that they were the changemakers and visioners of the future. The use and cultivation of traditional medicine in a controlled environment to prevent species extinction focused on our social responsibility in planning for the future. Past generations protected our present by living in synergy with our environment. However, being irresponsible towards our environment limits our gift to the future. The impact of ubuntu is a social-emotional responsibility associated with culture in practice and thinking skills. KZN is the world inside a province within a country. Tradition is a significant facet of every individual’s life. Education is the turning point in social responsibility.

14.3 Reflect and recommend:

Socio-economic conditions among the pre-service teachers raised a lively discussion on access to digitization through computers, access to their study material and academic books, computer hubs in rural areas, the jealousy and violence they experience as future leaders in their families and communities, support or lack thereof from family, the hunger and struggle with campus life. The discussion raised the question of debt, and being in debt for most of their lives because of lifestyle choices, paying off student loans and the interest on those loans, and the pressure of living up to urban living standards. They also raised the concern of gender disparity in the workplace and in the home and the vulnerability of sexual encounters in the workplace. Pre-service teachers were aware of the gender bias and positions and jobs only available when they were compliant with sexual favours from members in higher positions. They were not afraid to mention that they walked a double-edged sword and were constantly under the pressure of sexual favours. Discussing their social experiences was the foundation of social-emotional

healing and learning. They became aware of their social skills and their response to their experiences. By expressing their emotions, they developed coping mechanisms and normalised the verbal expression of their feelings by being proactive and mindful. This was very significant in understanding their contested knowledge.

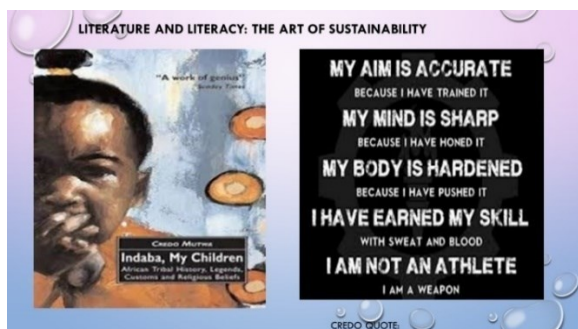
The discussion raised a social theory i.e., contested knowledge theory by providing the latest perspectives through the experiences of the pre-service teachers within the WBCT programme. Pre-service teachers could speak with clarity and conviction about their daily experiences on an open platform without fearing being marginalized. Seidman (2016, p. 46) discusses the following observation on his experiences. “The world is always experienced as meaningful. We can never get around our preconceptions to get to a world that exists as raw experience”. Seidman (2016) elaborates on value-based systems, “To the extent that our social experiences are guided by our interests and pre-conceptions, our social ideas are structured by our particular social interests, values and culturally biased assumptions”.

SS 15: Indigenous Knowledge Systems in Sustainability:

a) Cover of Indaba My Children written by Credo Mutwa. (1964)

b) Hoodia Gordoni (2019)

c) Rooibos (*Aspalathus linearis*). (2019)



b)



Indigenous knowledge among the Khoi-San, Africans, Afrikaner and Indians helps to maintain the diversity and sustainable living. Much of the indigenous knowledge is based on ancestry and the oral histories carried from one generation to the other. This included oral tradition in storytelling, poetry, indigenous languages and written literature.



c)

15.1 Planning

What were the slides about? The validity and the necessity of oral tradition, language, literacy and literature for the future blends itself in self-preservation and the sustainability of Indigenous knowledge and ecosystems. In conserving the future, regular examination of the past raises the possibility of mistakes not being repeated. Writing books on indigenous knowledge and systems preserves the expertise and socio-culture, history and traditions of the past. The Khoi-San preserved the past in their language and skill for us to emulate. Heritage is our inheritance. There must be a sense of pride in the people of the soil. Choosing Credo Mutwa as a son of the soil and a Sanusi added credence to the importance of knowing who one is as an African and as an indigenous inhabitant. All people born in Africa, irrespective of race, color, religion or the diaspora, are African.

Why did I design it this way? Pre-service teachers observed the similarities in concept but the differences in time and space with the past. They could identify with the responsibility and the vision of preserving culture. We preserve our future through creative expression within the living theory. Raising the awareness of capitalism and exploitation, commercialization and destruction of the environment, tradition and culture exposed the divergent thinking of the pre-service teachers.

How was the slide designed? They had to think divergently and holistically to understand indigenous knowledge as their birthright and must always be conserved through controlled commercialization. The economics of the world is based on profit and exploitation and is preserved by the elite and wealthy. Whitehead (1986) mentions “The uniqueness of each individual’s living educational theory in improving practice and generating knowledge to improve knowledge and practice within historical, social and cultural contexts.”

15.2 Implementation

What was the strategy? Advocating active citizenship through lived experiences was the best way to create holistic consciousness. Pre-service teachers were given examples of *Hoodia Gordonii*, Rooibos (*Aspalathus linearis*) and Sugar Bush (*Protea*) as examples of traditional and indigenous heritage exploited for commercialization globally without the proper remuneration. Has commercialization improved the living conditions of the indigenous people? It is because indigenous knowledge, culture and tradition is undervalued that there exists exploitation called cultural appropriation. Globally exploitation of IKS can be compared to the Amazon, Native Americans, and the IKS of South America, India, and Mexico.

How was it implemented? They were asked if they knew the commercial value of the product and if they are aware that the product is available in South Africa. They were clueless. Raising the awareness and social consciousness of indigenous knowledge and flora raised their level of pride and ownership in what the value of their country is internationally. Indigenous knowledge if not protected, can be abused and exploited by foreign investors. Therefore, investing in business knowledge is advantageous.

Why was it implemented this way? Credo Mutwa’s extensive indigenous knowledge has been extolled through literature. However, our youth has undervalued his contribution. Most

of the pre-service teachers had to be introduced to a brilliant author and a Sanusi who captured IKS through literature to be preserved among the pages of a book for future generations and for sustainability. His knowledge of African traditional medicine is incomparable. Pre-service teachers were clueless on South Africa's indigenous flora and its impact on the global demand for alternate therapy and remedies. They were familiar with African indigenous medicine for home use and its colloquial names but unaware in its identification and value. Two examples were given, Rooibos and Hoodia. We discussed the significance of maintaining soil health by being kind to the environment and ensuring that future generations know the value chain of knowledge, education and preserving culture and heritage. Returning discarded kitchen waste to the ground, creating an ecosystem of growing organic food, taking care of the soil for planting, ensuring recycling, reusing and reducing within a circular economy that is conducive to healthy living.

13.3 Reflect and recommend: “I enjoyed the discussion on Mutwa. It was inspiring to watch the amazement in the faces of pre-service teachers as they became acquainted with the greatest architect of indigenous knowledge systems in South Africa and the world. I noticed a few squirms because of religious beliefs but it was important to remember, history cannot be obliteration without a witness.” I love this African proverb and it is most apt for pre-service teachers, “Until the Lion tells his side of the story, the tale of the hunt will always glorify the Hunter”.

SS 16: Insects, the pollinators. Impact of GMOs on Insects. (2009)



SS 16.1 Planning

What were the slides about? Bees and Birds and all insects are threatened because of inorganic farming. Insects a vital in our food chain. Without insects there will be no food supply because there are no pollinators. The idea of ‘soul food’ is being at one with the environment

which has been forgotten due to migration from the rural areas to urban living. Monsanto was a contributor towards the dwindling numbers of insects because of genetically modified seed and the use of pesticides that were not ecofriendly.

How was it designed? However, the purpose of holistic living was a reminder that the pre-service teachers are still tied to their homesteads in rural areas as they return annually to associate themselves with tradition, culture and rituals. Bees and insects are reduced in number due to pesticides and GMOs. Plants lose their taste and fragrance due to genetically modified seeds which do not attract pollinators. Awareness of the impact of inorganic pesticides and genetically modified seeds encourages solutions for the future and the use of design thinking.

Why was it designed this way? Pre-service teachers found mindfulness and social homeostasis by returning to their roots. Pre-service teachers could identify and understand their intrinsic purpose in bringing understanding into their daily lives through the knowledge and inspiration of topics they had never considered but were pertinent. They also resonated with the cycle of socio-environmental awareness attached to their rural identity by their lifestyle and purchasing power in the choice of foods, clothing, and personality and individuality as South Africans.

16.2 Implementation

What was the strategy? I asked if everyone had tasted honey. Moreover, they remembered school lessons on birds or bees as pollinators and how pollination occurs. They were asked to imagine a world without insects, a somewhat dystopian narrative, or one filled with lushness and beauty. All due to the harmful pesticides being sprayed on crops.

How was it implemented? Painting a picture of a dystopian world was a shock to their imagination. They believed it could never happen, but through evidence of Man's quest for power and dominance, the possibilities exist. We draw from the example of using nuclear power in Hiroshima and Nagasaki during World War II.

Why was it implemented this way? The importance of ecosystems cannot be tampered with as everything in the world works with rhythm, synchronicity and the laws of the universe.

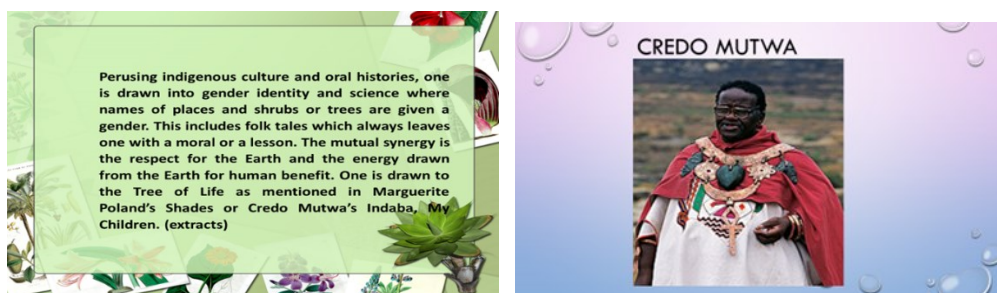
When one ecosystem is destroyed and tampered with, it affects the entire planet. Scientists around the world discovered the catastrophic

16.3 Reflect and recommend

The importance of our ecosystems cannot be emphasized enough. We live by synchronicity, when disrupted it has a ripple effect. As much as I introduced the topic, it was necessary for them to read further on the topic to expand their general knowledge and for the reality that teeters on the fingertips of megalomaniacs.

SS 17: Indigenous Culture and literature

South African History Online: Vusamazulu ‘Credo’ Mutwa. (2003)



17.1 Planning

What are the slides about? Oral tradition and history are vital aspects of maintaining a social and historical perspective of the past. Indigenous Knowledge Systems are an integral part of oral tradition and continue today. As an essential aspect of record keeping through word of mouth, preserving historical events depended on people's knowledge of past events. "In the oral tradition, African myths are stories passed along from generation to generation by word of mouth. They are inexorably linked to religious traditions, tribal customs and idiomatic expressions dealing with their belief systems" (Jacob, 2008, p.178).

How were the slides designed? The African identity is the lifeblood of Africa. The recordings of events, lifestyles, traditions and culture were from documents, cave drawings and written narratives of travellers. Within the aspect of storytelling, there was always a moral lesson to

preserve identity and morality, ethical values and attitudes. Credo Mutwa was the first person whom the elders of African Traditional Medicine consider the soul of an ancient Prophet *African Hidden Voices* (2020), who raised the status of an African identity in South Africa. Credo Mutwa (2020) from <https://www.credomutwa.com> says in *African Hidden Voices*, “I weep even now when Eurocentric education is being fed to our children, fed in order to make them Afrophobes, creatures that hate and despise their motherland”. He further explains the rising need and restlessness in youth. “...look down in contempt upon their people because this is all European educated black people do.” He makes a significant point of African Identity, “They despise Africa and all she stands for., And they are in contempt of the culture of her people,” The importance of the Self, the African identity and patriotism are themes that must be addressed for self-actualization. The need for human libraries is an integral aspect of traditional narratives and oral traditions transcending to the future. Modernisation is encapsulated in Storytelling and World Read Aloud Day (WRAD). It is designed to weld the past to the future.

Why was it designed this way? These expressions of philosophy from Mutwa (2003) in *Dreams, Prophecies and Mysteries*, expose the self-destruction of a nation, of a social structure which stood strong against apartheid. We apply his philosophy to the Tree of Life. The roots and the branches may be there but, the fruit of modernity, the children of the future Africa, have scattered. The Tree of Life is symbolic of personal growth and development. It represents family integration in its uniqueness, wisdom, and experiences. The Baobab Tree in South Africa represents the Tree of Life because of its sturdiness and resilience to climate change. It symbolizes rebirth and connectivity, connecting the world of humans to that of the spirit world. The Baobab Tree which many believe is the Tree of Life, stands strong today and is the mark of sustainability.

In Marguerite Poland’s *Shades*, the Xhosa traditional beliefs are the roots giving one a purpose of identity and belonging. I explain this further as symbolic of a family and the branches within a family and the extended family. Whereas the roots and trunk are the ancestry and the core family, they include the traditions, culture, family history and practices. It is the foundation of what keeps them grounded where they can claim lineage. The main branches are the children with new fruit and seeds. Those seeds fall and grow new families while the branches diverticulate further into the children and grandchildren, the branches that reach higher into the sky for the light, the acclaim and the aplomb. Jacob (2008, p.103) brings it to a profound

conclusion, “(Poland 1993, p.102). He was also fully aware of the Xhosa belief that when a person dies away from home, his/her spirit turns to ‘shades’, and is left wandering the land. He was also aware that the ‘shades’ could be led home to find peace by another individual by touching the body of the dead with a branchlet of an Mphafa tree, which carries the spirit”. A perfect metaphor for death and the wandering spirits when they are not returned to their roots.

17.2 Implementation

What was the strategy? Credo Mutwa was a spiritual and traditional healer and leader, a shaman who worked, promoted and helped people through African Traditional and Indigenous Medicines made from plants and animals. His epic book *Indaba, My Children* was published in 1964 filled with history, poetry, storytelling, folklore and philosophy. Most importantly it fills Africans with pride for their homeland, country and continent. Chidester (2002), mentions, “The indigenous authenticity of Credo Mutwa added value because he represented the "pure voice," untainted by modernity, of an unmediated access to primordial truth”. It was quite significant for pre-service to take ownership of their lives despite their culture and religion or New Age choices based on socio-economic and environmental status. They needed affirmation of their self as South Africans with a vision and purpose, an equation and ecosystem of many lives and lifetimes and raising their self-esteem and self-value.

How was it implemented? A few poems from Credo Mutwa and discussing the importance of being proud Africans, whether from the diaspora or not, will make Africans value the treasures of indigenous language, literature, culture and history. I chose Mutwa as a credible repository of indigenous knowledge and Shamanism. Due to lack of resources, and not having access to books it was imperative to raise the topic of learned South African authors.

Why was it implemented this way? The sense of belonging after a disenfranchised past was evident among the pre-service teachers. They wanted ownership of who they were and where they belonged. All of them belonged to the lineage of being displaced and some remnants of apartheid. They were compelled to return to their homes, giving back to their rural families and communities when they returned during holidays and weekends. Some spoke of having children already and the painful decision of leaving them with grandmothers to raise. They discussed the obligation of sending money from their loans to parents and grandparents because that was the price to pay for furthering their education and the responsibility of being the smart

one in the family. The **Zone of Proximal Development** applies here in theory. Once the pre-service teachers were awakened to their consciousness in identity and self-value, they knew their responsibilities to their families and their communities. The awareness created an avenue to acknowledge the spirit of Ubuntu and social responsibility.

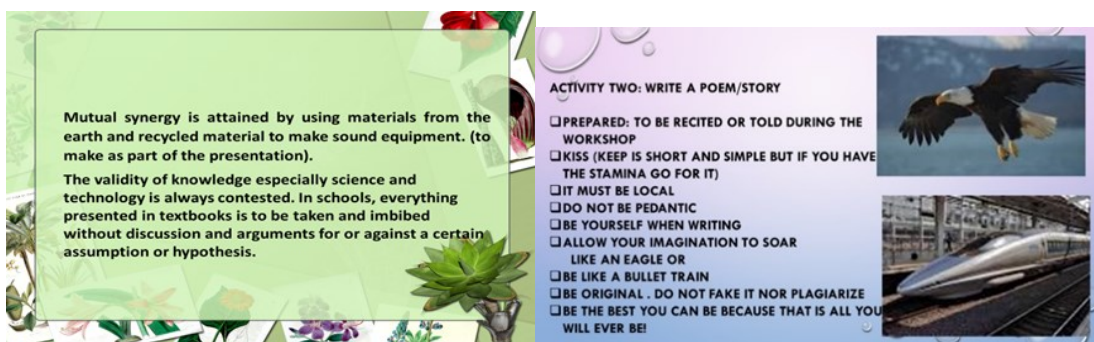
Pre-service teachers were filled with a sense of pride and admiration of having knowledge of a Sanusi, a traditional healer in Zulu of the highest order with the WBCTP. The Collins English Dictionary describes a Sanusi and its origins in the North African Bedouin community as a member of the Islamic Brotherhood. It was important for pre-service teachers to note that even though Credo Mutwa used traditional medicine for healing, he ensured it was in a controlled environment and the environment was not destroyed nor was his medicine commercialized. The sanctity and respect for Nature was always maintained as he mentioned in all his books. Mutwa (2003) firmly believed that any nation taught to hate themselves, will continue to self-destruct. This has been the *modus operandi* of colonization and apartheid.

17.3 Reflect and recommend: Pre-service teachers understood subsistence farming is an inherent skill that is part of their tradition, culture and history. Even living in urban areas, it is possible to maintain small gardens and go back to nature. Permaculture, organic farming and food security are the lifeblood in sustaining our future. Urban gardening and farming are dependent on self-reliance. The supply and demand affect and effects the environmental, social and economic benefits for communities especially if we are examining the sustaining of the food value chain. Therefore, encouraging involvement of learners and becoming members of non-governmental organizations and community development projects. One such project is the Eco-Schools project managed by the Wildlife and Environmental Society of South Africa (WESSA).

Many pre-service teachers articulated the point of matric (Grade 12) having so many prescribed books. Their teachers chose the books that they understood to teach in class. There was no choice for the learner. It was a unilateral decision by management. If they did not want to teach Shakespeare because of language barriers, they chose the novel and poetry knowing that in the Literature paper for the matric exams there is a choice between each genre.

17.4 Themes: Oral Tradition, Indigenous Knowledge Systems, Sustainability in Literature, African Traditional Medicine.

SS 18: Recycling: Activity 2



Mutual synergy is attained by using materials from the earth and recycled material to make sound equipment. (to make as part of the presentation).

The validity of knowledge especially science and technology is always contested. In schools, everything presented in textbooks is to be taken and imbibed without discussion and arguments for or against a certain assumption or hypothesis.

ACTIVITY TWO: WRITE A POEM/STORY

- PREPARED: TO BE RECITED OR TOLD DURING THE WORKSHOP
- KISS (KEEP IS SHORT AND SIMPLE BUT IF YOU HAVE THE STAMINA GO FOR IT)
- IT MUST BE LOCAL
- DO NOT BE PEDANTIC
- BE YOURSELF WHEN WRITING
- ALLOW YOUR IMAGINATION TO SOAR LIKE AN EAGLE OR
- BE LIKE A BULLET TRAIN
- BE ORIGINAL . DO NOT FAKE IT NOR PLAGIARIZE
- BE THE BEST YOU CAN BE BECAUSE THAT IS ALL YOU WILL EVER BE!



I Am the Earth by Jane Yolen (2012)

18.1: Planning

What are the slides about? Activity two to write a poem or story, was to encourage different thinking styles in creativity in pre-service teachers. And to encourage aesthetic creativity through the process of design thinking. There were revisions and the use of their cognitive abilities in creating a poem or story which in turn had to be original. Logical thinking in

sequencing, creative use of emotive language, imagination and planning were indicative of a whole-brain creativity and thinking experience. Visual literacy through the poem added many dimensions to reading, writing, understanding and presenting poetry as the spoken word.

How were they designed? I took into consideration that some pre-service teachers had not done this task before. They had not written or spoken poetry, even though some had studied poetry at school. Pre-service teachers were encouraged to keep a journal and write their thoughts, feelings and creative expressions. The creative process of writing, recording and expressing themselves while using their five senses was another exercise of Imagineering. They drew pictures, played with words and rhymes, and examined an example of poetry from the internet. The poem was an example of imagery, figurative speech, and visual literacy using the five senses.

Why were they designed this way? In visual literacy with the poem, *I am the Earth*; we examined the various colours and the use of words, sentences, or phrases to reflect metaphors. I did not do an in-depth analysis because most pre-service teachers understood poetry as it was taught at school. Because of mental stress and studying, pre-service teachers require those moments of time for themselves and their thoughts. They become wrapped in the daily chaos, with unexpressed thoughts in fear of being ostracised. Poetry and journaling are the outlet for unexplored reasoning and finding logic in the illogical rigmarole of life. Poetry is a creative expression of what the heart conceives the mind perceives. It is captured in those moments of reflection but also those moments vacillating between joy and despair.

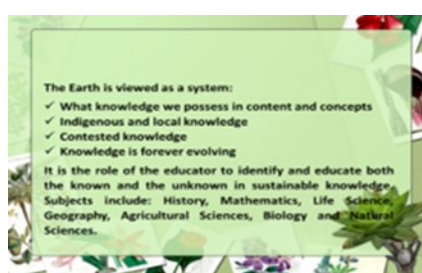
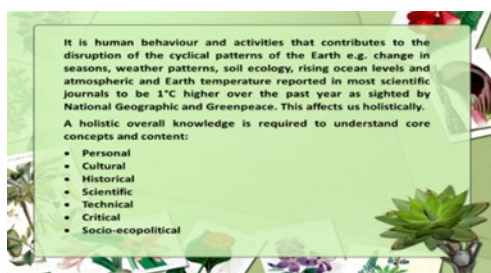
18.2 Implementation

How were the slides implemented? However, they were encouraged to keep journals and write a poem for our final presentation. The poem was an example of imagery, figurative speech, the use of visual literacy and visual imagery using the five senses. The Five senses are a prerequisite for early reading and social-emotional learning. It is based on inference and the concept of contemplation and reflection of Locke (1967). It is associated with Ned Herrmann's Whole Brain experience. The five senses, in most instances are taken for granted. With human behaviour we become complacent. I have now raised the awareness in language of being aesthetically aware through poetry. Poetry in its diversity is one of the oldest forms of communication.

Why were they implemented that way? Knowledge and experience from the past create a term of reference when inferring to a sense. E.g., “The lemon is sour”. If we read this sentence in context, we know the taste is sour because we have experienced it before. We have smelt and tasted a lemon before. This is past knowledge, and we associate it with the present to understand the referral better. The brain is calibrated and already registers this knowledge using both left brain for analysis and the creative right brain for a whole brain experience. Spatial awareness is

18.3 Reflect and recommend. Always keep a journal. They are a source and treasure trove of ideas and information when required. They are a reservoir of reflection and social-emotional experiences. Poetry is Emotion in Motion. The fluidity and nuances allow pre-service teachers to express themselves uninhibited.

SS 19: Earth as a Holistic System



19.1 Planning

What are the slides about? A holistic person understands and practices the interconnectedness of all facets of life just as planet Earth does in all faculties. A whole person understands the machinations of the intrinsic and extrinsic being of who they are before the world. When we discuss systems, we speak of synchronicity. Based on our previous discussion, how must pre-service teachers use the knowledge acquired in preparing lessons in class to synchronize learning? I presented to pre-service teachers how they can use any piece of information or theme and content in the different learning areas. Pre-service teachers must align themselves to the integration of technology into pedagogy, and the content of the CAPS curriculum. The

use of technology in the classroom raises the stakes on the teachers as one who can take risks and multitask. One theme can be used in the different subjects in synchronized collaboration and differentiation. When we view the Earth, we visualize a system of global knowledge and ubuntu. We are because they are, where knowledge has no boundaries.

How were they designed? The aim of the WBCTP is to create a holistic experience for pre-service teachers. In that context we need whole teachers who know their attributes, their skills and their resilience within the teaching faculties. Through the theory of using all four domains from both the right and left sides of the brain, I indicated the advantages of creating lesson plans with alternate, techno-friendly resources for a whole Brain experience. When pre-service teachers are equipped to manage and lead classrooms, the task of leading learners to achievement is effortless.

Why were they designed this way? Sometimes for maximum impact, visual literacy adds impetus to the lesson or the message. I wanted to send a message of why it is so important to keep the Earth's temperature low. The extinction of dinosaurs and plants was a visual feast.

19.2 Implementation

How was it implemented? Visual Literacy delves into the five senses. Screening of a video on tertiary institutions bringing the past alive to the future through science and technology using visual literacy is a new visual feast for both pre-service teachers and learners. Pre-service teachers were given a sample of the importance of bringing lessons to life and recreating scenarios for processing, comprehension and assimilation. By using technology, pre-service teachers can learn and implement the use of data, different applications and software and the use of the WIFI through computer technology.

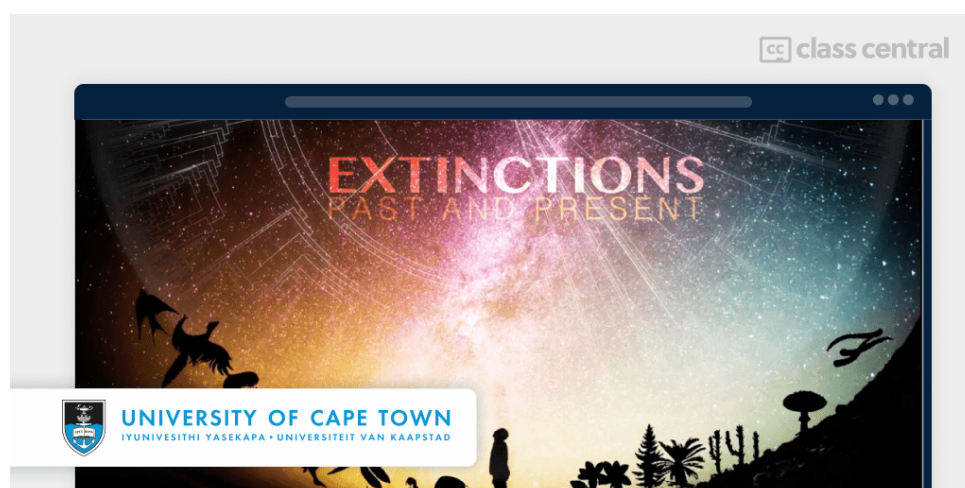
Why was it implemented this way? Resources do not necessarily have to be out of textbooks, magazines, or the internet. Engaging the five senses in a visual experience of heightened whole brain activity creates more impact. It is a whole-brain experience of creativity and logic which allows for critical thinking skills in 3-D or Third-Dimensional.

19.3 Reflect and Recommend: I chose visual literacy especially since we have at least 3 different levels of language and indigenous languages within the context of a classroom. It is best for code-switching and blending. Pre-service teachers could understand and translate information better and identify with the content. The same translates in the classroom. Children also love technology and they love a good storyline. They are basically ‘hooked’. An interesting discussion point I raised was using technology to get learners back into classrooms for the lesson. There will be fewer absconding. Learners are always fascinated and greatly influenced by technology. It is the ‘I want it all, I want it now’ mindset where they want instant gratification and solutions. This methodology has been tried and tested and is always a winner. By using videos, social media, podcasts and technology in a metaverse, it provides an alternate reality of escapism. Learners are faced with social problems every day, especially in a South African context. Escapism is the only way they deal with their reality and we must acknowledge that. Therefore, pre-service teachers must be equipped with the tools of technology and alternate methods and strategies for teaching and engaging learners. The video below reflects different tools that can be used as resources.

Pic: Science@uct.ac.za Extinction past and present. Class Central (2018)

Course review: Extinctions - Past & Present — Class Central

<https://images.app.goo.gl/EhAisXoH7eLridWJ9>



SS 20: Education and Sustainability



A LEAF

<p>LA: ART</p> <ul style="list-style-type: none"> ▪ TRACE THE LEAF PATTERN AND COLOUR ▪ MAKE A COLLAGE BY TRACING THE LEAF ▪ USE THE LEAF AND PAINT, MAKE AN IMPRINT. 	<p>LA: LIFE SCIENCES</p> <ul style="list-style-type: none"> ✓ DIFFERENT TYPES OF LEAF SHAPES ✓ ADAPTATIONS USING COLOUR, SHAPE AND SIZE ✓ PHOTOSYNTHESIS ✓ LEAF TISSUE AND A PRACTICAL USING SLIDES. 	<p>LA: NATURAL SCIENCES</p> <ul style="list-style-type: none"> ✦ WHY DO PLANTS HAVE LEAVES <ul style="list-style-type: none"> ✦ LEAF SHAPE AND SIZES ✦ ADAPTATIONS ✦ LABEL THE LEAF ✦ WHY DO LEAVES HAVE DIFFERENT SHAPES AND SIZES? ✦ A WALKABOUT OF THE SCHOOL GARDEN COLLECTING LEAVES. OBSERVE, COMPARE AND RECORD.
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20.1 Planning

What were the slides about? Once the pre-service teachers were shown the sharing of a theme across different learning areas, it was much easier for them to take notes on the details of filling out a lesson plan template. This indicated their left brain thinking using logic through critical thinking and divergent thinking skills. They were open minded about extending their deductive reasoning in the lesson plan. Creative thinking skills were added to the use of technology and life skills. Designing their lesson plans was their right brain activity.

How were they designed? Education and sustainability were important aspects of SDG 4. They cannot be studied in isolation. I discussed various ways of applying knowledge and skill for a whole brain experience in a shared synchronicity within the classroom. Furthermore, we discussed time management in planning a lesson and the distribution of resources, leadership

within the classroom with the delegation and rotation of task to learners true create an environment of leadership and leadership skills.

Why where they designed that way? I used a simple example of discussing a leaf and a few of the expected outcomes in Natural Sciences, DOE, (CAPS, Grades 7-9 p. 10). “Learners are able to organize and manage themselves and their activities responsibly and effectively and communicate visually and symbolically through language skills of any mode”. A generic template for a lesson plan was provided to engage pre-service teachers in the knowledge and skill of preparing a lesson plan for teaching and learning. The lesson plan was discussed in relation to the slide titled ‘A LEAF’.

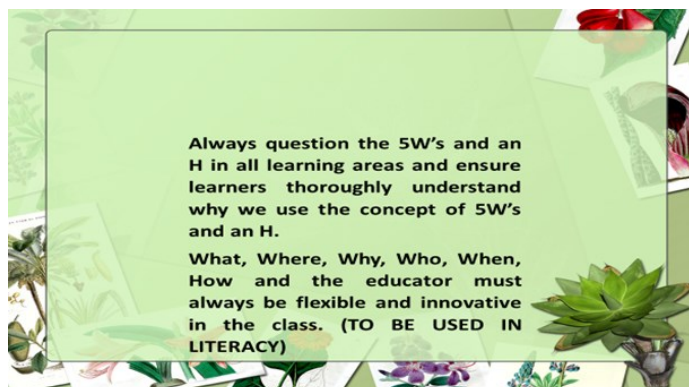
20.2 Implementation

How was it implemented? I used the template of a lesson plan to indicate how lesson plans can be filled. As a discussion and question and answer we used much of our presentation as samples for themes.

Why was it implemented that way? Pre-planning is always the best way to complete a lesson. A teacher does not want to enter a classroom unprepared as this unprofessional behaviour is wasteful for both teacher and learner. A lesson plan also articulates planning with time and covering the necessary details according to the curriculum.

Reflect and recommend: It was necessary for pre-service teachers to understand the basics of completing a lesson plan. We know as a job opportunity teachers work as teaching assistants and attend teaching practice as part of their undergraduate studies. It is best for pre-service teachers to have a template of a lesson plan and be assisted with how to co-ordinate a lesson with a lesson plan.

SS 21: 5 W's and an H



21.1 Planning

What are the slides about? To add to our previous slides and discussion, understanding comprehension was essential in understanding the unpacking of the CAPS document. One of the most significant challenges in comprehension was understanding the content. I devised the 5W's and an H so that pre-service teachers increase their literacy levels and understanding when comprehending any relevant material. These are all techniques for self-enhancement.

How were they designed? The mechanism of 5 W's and H, I used at school to help learners understand comprehension especially those who used English as an additional language. What? Who? Why? Where? When? How? They clarified the text with understanding and simplicity.

Why was it designed that way? 5Ws and an H increases comprehension and understanding. For comprehension skills at school, it was easier for learners to answer comprehension questions. Therefore, as part of SKAVS and higher order thinking, pre-service teachers were acquainted with the skill.

21.2 Implementation

How was it implemented? Our discussion informed our findings of creativity and innovation in the classroom for practice which included those learners with barriers to learning and those with Special Educational Needs and Disabilities (SEND). As much as the CAPS document promotes inclusive education through the Policy on Screening, Identification, Assessment and

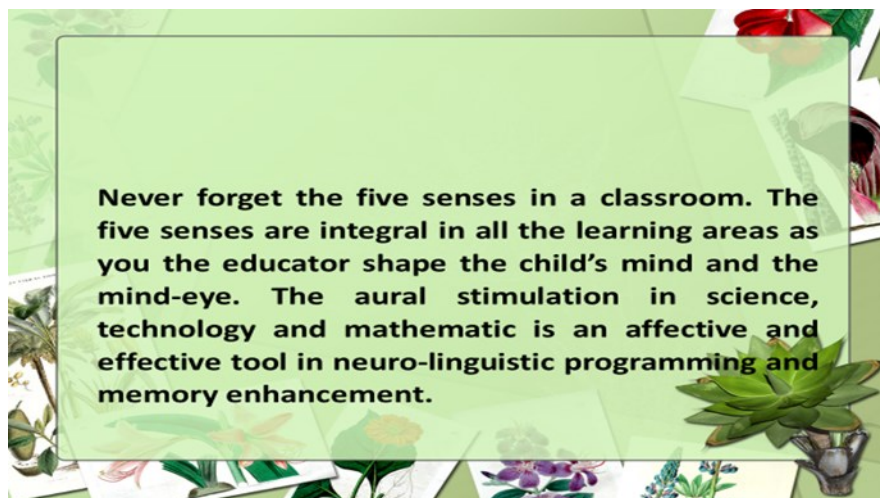
Support, pre-service teachers are not mentored into innovative ways of methodology in the classroom. CAPS (2014) “It aims at all children of school going age who experience barriers to learning including those who are disabled, will have access to inclusive, quality, free education”. I discovered that pre-service teachers who had already been for teaching practice were not given the freedom of creativity and innovation for a more enhanced and joyful experience of teaching and learning.

Why were the slides implemented this way? Pre-service teachers were reminded of the importance of literacy and visual literacy to enhance language and literacy levels for themselves and within the classroom. Not all learners are cognitively enhanced. Most learners seek alternate methods to recognize, recall and relate. Therefore, using tools for play in literacy e.g., Word games, animations, and word builder, reading games and robotics, toys and sensory games, STEAM activities and animated movies are alternate ways of intervention in the Inclusive classroom. Learners needed to activate their five senses in comprehension.

21.3 Reflect and recommend:

Senior or in-service teachers were very prescriptive in methodology. Pre-service teachers had to adhere to school policy and classroom policy as their time in a school was temporary and in-service teachers did not want their routine and methodology disrupted. They also discussed their experiences in schools with language barriers, absenteeism, lack of motivation and the lack of technology. It was disappointing to learn that even though schools received iPads from the Department of Education, they were locked away due to security. I recommended mobile news and articles, and magazines to be used for comprehension in keeping with the daily news and up to date information rather than text books because the education system needed upgrading.

SS 22: The Five Senses



22.1 Planning

What was the slide about? Neurolinguistic Programming (NLP) contributed to goal orientation in pre-service teachers' experiences. For successful relationship building and strategies that support and build pathways to achieve goals in the development of the WBCTP their personal development in an environment of professional development and competitiveness depended largely on their self-image, their communication and confidence within the environment of engagement. In classrooms, teachers' knowledge and personality play a significant role in perceptions and role modelling in children.

How was the slide designed? The positive affirmations from pre-service teachers, positive feedback and encouragement enhanced teaching and learning. The WBCTP had now become an incubator for thought leaders and achievers. Mindfulness and emotional intelligence assist pre-teachers in using their five senses for a far superior experience as a teacher. I reminded them of the sixth sense and to become aware of their 'gut instinct'. That was perception!

Why was it designed that way? The enhanced experience is awareness of the self and others, the capacity to absorb and disseminate information, the acceptance of all the responsibilities associated with the career, and compassion and empathy towards oneself and others. The five senses and the instinct are great tools for teachers in professional development. Therefore, it was important for pre-service teachers to understand themselves first in their self-awareness.

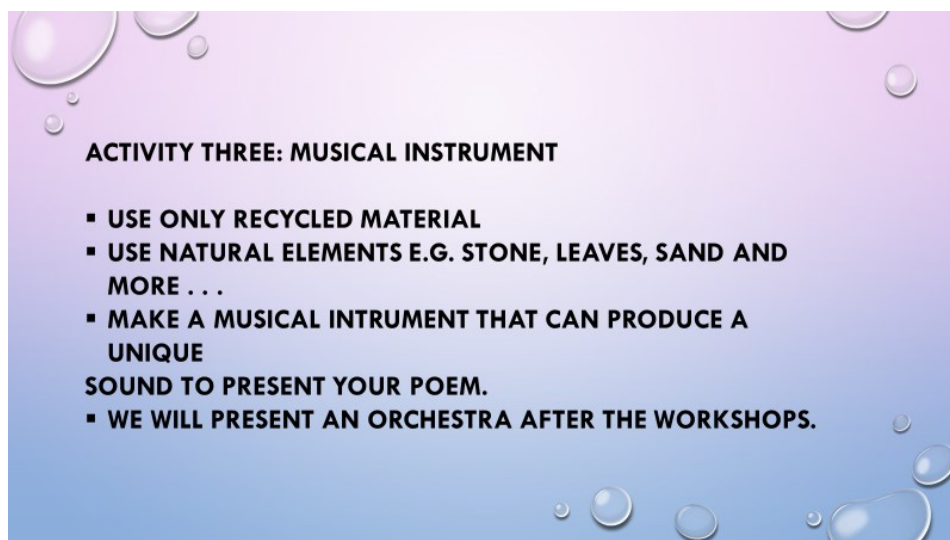
22.2 Implementation

How was it implemented? In this paradigm, pre-service teachers reflected and communicated their thoughts, actions and feelings through the process of experiential learning. Thinking styles, observation and conceptualization enhanced their whole brain experience. Interpersonal dynamics were positive experiences without negative thought patterns as we shared experiences and examined how we can transform them into positive experiences for the future using our senses. NLP explores the sensory and intellectual acuity as well as the flexibility of cognition and metacognition. The sensory experiences are triggers for positive emotional responses.

Why was it implemented this way? Pre-service teachers could recognize, understand and translate their emotions into positive poetry, expressions of interest in joining groups, sharing knowledge and being more positive knowing that they could understand and share in a whole brain experience. The senses were also crucial for a holistic experience with visual literacy. In their presentations, the senses were an integral aspect of the whole brain experience in team work.

22.3 Reflect and recommend: This slide was a precursor to the activity or task three in making the musical instrument. They had to question their design of their project, be inspired by the subject, generate tangible ideas, test to learn and perfect with partners and team members and then share. Thus, every pre-service teacher indulged in design thinking. Most importantly the activity must be a sensual, eclectic feast

SS 23: Technology in Sustainability Activity 3



23.1 Planning

What is the slide about? Task 3: Pre-service teachers were asked to use recycled material to create an instrument to use while reciting their poem. When placed in a classroom, pre-service teachers will not always have resources. Therefore, they must substitute with recycled materials for making resources and not incur costs.

How was it designed? I asked the pre-service teachers to be resourceful and remember that the end product must be eco-friendly and a reflection of sustainability, especially recycling. The making of an instrument and reciting poetry really enthused the pre-service teachers. They spoke of their experiences before in making a recycled instrument at school and those who had never done this before were excited.

Why was it designed this way? It was designed as a foundation for design thinking. Pre-service teachers had to understand the concept of creating with fresh eyes, ideation, iterative, test to learn and use Kolb's experiential learning.

23.2 Implementation

How was it implemented? The activity given was a whole brain experience. First, they had to write a poem or story then create the musical instrument. On presentation, they must be used together. They had to write story, recite and accompany the story with background sounds. Alternately, they could write and recite a poem with different instruments e.g., wind instrument

or percussion made from recycled material. Putting all of this together, they use convergent thinking.

Why was it implemented this way? Oral language, literature and literacy is more vibrant and absorbed more easily with song and rhythm. Oral tradition has been practiced since time immemorial. Cultivating these tasks allows for achievement and success in methodology and pedagogy. With the introduction of technology, the attention span of learners is shorter. However, using the senses, introducing beats and rhyme, giving learners a whole brain experience increases memory, encourages the creative side of the brain (RHS) to assist the logical side of the brain (LHS). In this way of delivery, there is logic and sequencing.

23.3 Reflect and recommend: When assessing an activity or task, any task, pre-service teachers must have a holistic view of the activity. From divergent thinking in design and tangible ideas we now have the ability to use convergent thinking skills in putting different strategies, ideas and perspectives to resolve issues in a logical and creative process.

SS 24: Rainwater Harvesting and Desalination



24.1 Planning

What are the slides about? Rainwater harvesting is basically an old concept with new terminology. It is the collection of water and its storage to be used later. Water can be collected from the run-off from roofs, in tanks or in containers and the tanks have filters to purify the

water. In South Africa, we have JoJo Tanks, which store water like a reservoir. It has a purifier and the water can be used for bathing, watering the garden, and washing cars, rather than incurring extra costs for household utilities. Desalination was another aspect of supplementing water shortage in South Africa. Arab countries use desalination extensively and the water is also drinkable.

How were they designed? The food and water interdependencies and linkages mean that we must take action for a re-imagined, sustainable future. Desalination is on a ratio of 2:1 where two parts of seawater yield one part of drinkable desalinated water. However, it must be noted that desalination contributes to the carbon footprint through chemical processing.

Why were they designed that way? Water is the most needed commodity in the world. Africa is spread across the Sahara and much of the continent is drought stricken. The use of machinery and robotics in technology is lucrative to the future of companies. Companies want instant turnaround time in chain management. The use of robots minimizes the need for manual labour. It was important for pre-service teachers to accept that even teaching could be in threat in the future and they should not be blasé about their roles as facilitators of knowledge.

24.2 Implementation

How were they implemented? They were enlightened to remember these facts against the backdrop of desalination and the importance of boreholes. Based on the information we know; the future of sustainability is lucrative to how we save every drop of water. Sewer and disposables into rivers are causing tainted waters in rivers and eventually the sea. Mindfulness and being conscious of our actions prevent these habits. It all starts with each household. Most notable was the skills with old methodology in rural communities for rainwater harvesting. However, upgrading to the Fourth Industrial Revolution meant upgrading skills and knowledge. The discussion mainly raised the awareness of general knowledge and their interest in the world around them.

Why were they implemented? We know that municipalities manage most facilities through technology. The discussion was mainly on the importance of sustainability and conservation of our water and water supply. They were further enlightened on recycling, reusing and redistributing water. We know in Africa and South Africa that water is liquid gold. Its value

is insurmountable due to the recurring droughts and the poverty in Africa and South Africa. We discussed the progression of the Kalahari Dessert and the introduction of fracking in South Africa. According to Mooney (2011), fracking is the fracturing of shale rock to recover gas and oil. In the case of the Kalahari, it was gas. This aspect was new to them. It was important for them to note the great lengths humanity goes to satisfy the needs and wants. We have now become an egregious exploitive society.

24.3 Reflect and recommend: In discussion on rainwater harvesting and desalination, the pre-service teachers were clueless with new technology and modernity. They were very eager to learn and listened in wonder to the information given and how it connected technically with Imagineering and design thinking. Old technology, skills and even design thinking were there but were in dire need of upgrading through education and edification. Eco-school projects require knowledge of sustainability and climate change. It is vital that pre-service teachers understand the impact of supply and demand by humanity on our natural resources. If we couldn't preserve the Earth from past generations, we must know it is vital for humanity to conserve future generations. Climate Change is a reality, with the KZN coast being hit many times by tropical floods and causing extensive damage to the coastline. The possibility of drought in the future is a constant reality, as it had been in the past. Water shortage and scarcity are a reality in Kwa-Zulu Natal.

SS 25: Techno-Trends



25.1 Planning

What are the slides about? Introducing the latest techno-trends was an exciting example of the future of teaching and learning. It was imperative for pre-service teachers to be on track with the latest information as the conduit for change. I foresaw a future where technology, distance learning and home-schooling become more prominent as parents now have more choices for their children. The importance of communication for self and the classroom was a tool that could never be underestimated. The classroom becomes a melting pot for communication. The classroom is a mini version of society. As much as we were moving forward, securing the communication channels was extremely important. Trendspotting is the ability to spot trends and adapt to or adopt them. Pre-service teachers can stay ahead and also create content ahead of their time through designing and creating. Leaving a digital footprint is alluding to the possibility of cyber-attacks. Protecting passwords, observing copyright laws and protecting one's intellectual property are necessary for the future of your workspace and company. Cyber security ensures that the digital presence is safe. Teaching and Learning is not restricted to the classroom but to online teaching and homeschooling. It was essential to be cautious when using the Internet of Things.

How were they designed? In specific communities, parents preferred teaching the girl-child at home after a certain age of puberty. Parents were also at a loss because even though the CAPS document allows for Inclusive Education, teachers were not trained in supporting SEND. Parents were comfortable in teaching children with SEND from home, and this aspect of education required homeschooling, distance learning, support material and intervention. One mode of intervention was going digital and using iPads, computers, and online tutoring as support material. The digital warehouse is a digital Cloud computing storage service. Due to limited email storage space, Google created a warehouse to store documents for future use and storage. Pre-service teachers were asked to experiment and use the space for their creative and innovative content. The documents stored can be reviewed and recovered from any device. A remote data centre server is used, not a local one, as we use on hand-held devices. Google assured privacy and safety; therefore, unlimited document storage space existed.

Why were they designed that way? Artificial Intelligence (AI) described by Oracle South Africa, describes AI as “Systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect”. I presented a simple example of Siri on Apple iPhones and iPads. Siri is a robot used for easy communication using a device. The Speech to Text and Text to Speech feature is another example of technology and robotics. It also dictates the future of teaching and learning, especially for younger learners and learners with additive languages. The picture of the movie AI, an acclaimed movie by Steven Spielberg is the story of a robot that longs to become human. One thing that alludes him is emotion. Pre-service teachers were engaged in AI knowledge by understanding the impact on their daily lives. Their hand-held devices have software that learns patterns and features from their data. These processing and algorithms can then predict text, patterns, speech, online buying, what one watches or reads or even searches. They are all whole brained activity. Algorithms are basically instructions for problem-solving or completing tasks e.g. The initial idea, the method, the process and the functionality of the idea. Once again, we are reminded of the design thinking process.

25.2 Implementation

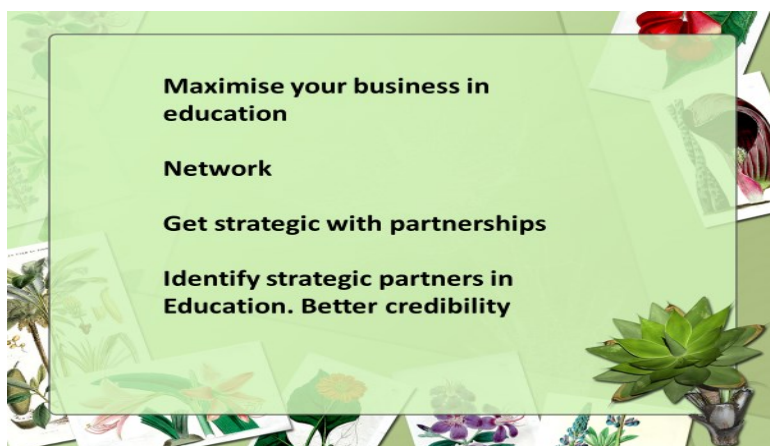
How was it implemented? Pre-service teachers were introduced to the concept of Imagineering through Disney. Cartoons and animation movies by Walt Disney and the importance of visual literacy in early learning, code-switching and additional languages were presented. Visual literacy engaged the five senses, and in Imagineering there is a layering of ideas, stories, storyboards, scenes and illustrations. Together it is well orchestrated and synchronized to present a visual feast of knowledge and information. The use of AI and engineering skills in Imagineering, different thinking and designing skills create a symphony of illusion and creativity. Pre-service teachers can now be viewed as visioners or Imagineers for the future of teaching and learning. They were more excited about being pioneers in a pilot project that determined a future in thought leadership and teacherpreneurship.

Why was it implemented that way? Learning is ongoing. Trendspotting is fashionable. Learning about the latest trends in education keeps pre-service teachers and in-service teachers abreast of new skills and more opportunities. Having a great amount of knowledge is akin to acquiring wisdom as well. I impressed upon the pre-service teachers the change in time zones around the globe, so knowledge is constantly evolving and revolving. Trendspotting is a marketing strategy in business. Brands can use memes (baby Yoda, McDonald's clown, Nando's chicken) to compete through innovation and being creative with each other. However, newer, more competitive brands can use these memes as motivation and opportunities to create their own. Trendspotting creates more competition, innovates more entrepreneurship, and encourages more risks and best practices in business and entrepreneurship. In the design, I felt pre-service teachers have the opportunity as teacherpreneurs to be enterprising in plotting their future. Creating digital content for the future of teaching was a niche they could observe and use to their advantage in their careers.

25.3 Reflect and recommend: Pre-service teachers were urged to create a digital profile with a website with their digital content, use social media profiles and platforms with caution, and enjoy the liberation of being a content creator. The content could extend from creating CAPS Lessons, Early Childhood Development projects, STEAM content and experiments. The possibilities were once again limitless. Pre-service teachers were encouraged to use social media extensively to build a public profile for professional development. To solidify and validate the importance of technology in the WBCTP, it was embracing the future as undergraduates to project themselves as future professionals. To innovate pre-service teachers must notice and observe trends. As disrupters of a system and agitators, they had to be impactful

by research, response and resolve under the SWOT analysis. They must adopt a winning mindset with unlimited opportunities that they can adapt and adopt. The recommendation for the pre-service teachers was to always stay in power with knowledge.

SS 26: Business in Education and Education in Business



26.1 Planning:

What is the slide about? Speaking of business in education meant introducing the subject of Teacherpreneurship. Allowing teachers to be trained with entrepreneurial skills. Being a teacher as a professional does not mean a 7 am until 3 pm job. Teachers can be skilled in acquiring extra finances through tutoring learners, tutoring at tertiary institutions, and extracurricular and co-curricular activities through interschool knowledge exchange and mentorship.

How was the slide designed? Teachers can be mentors and coach other teachers through a ‘buddy system’, which creates strategic partnerships. A buddy system alludes to support and counselling to other teachers who are struggling and need help. The daily stresses and pressures from Senior Management Teams (SMTs) and the need for mental stability in a very stressful environment allow teachers to help each other through support groups and teaching buddies.

Why were they designed that way? Mental health is an essential ingredient in teaching. With the stress from learners and the teaching profession, accessing counselling services and support services within the profession is vital. EQ and Mindfulness assist teachers with their coping

skills. Professional development encourages creating shared content, uplifting another novice teacher, regular meetings and team building. Networking thus is a compulsion to deregulate isolation. With strategic partnerships and entrepreneurial skills, there is better credibility.

26.2 Implementation

How was it implemented? I introduced a new term Teacherpreneurship. Using the experiential theory, pre-service teachers can enter a programme at any time during the WBCTP process. The action research cycle is also a reflective model. Pre-service teachers were encouraged to look at teaching as enterprising.

Why was it implemented that way? It is new knowledge for pre-service teachers. Teaching and learning are more than a 7:00 am until 3:00 pm job. It's a career, a profession and a lifestyle for the next 40 years unless there is a career change. Therefore, it must be a successful career with benefits from the knowledge economy. Teaching is not an institution; it is a lifestyle of vicarious teaching and learning.

26.3 Reflect and comment: The introduction was to titillate the discerning pre-service teacher. The next workshop is about the Business Model. As a whole brain programme, I wanted to prepare them for the challenge of thinking like teacherpreneurs.

SS 27: What a Wonderful World Video



https://youtu.be/4zxQ9_axkGo

Lyrics: What a Wonderful World

Lyrics

I see trees of green
 Red roses too
 I see them bloom
 For me and you
 And I think to myself
 What a wonderful world

I see skies of blue
 And clouds of white
 The bright blessed day
 The dark sacred night
 And I think to myself
 What a wonderful world

The colours of the rainbow
 So pretty in the sky
 Are also on the faces

Of people going by
 I see friends shaking hands
 Saying how do you do
 They're really saying
 I love you

I hear babies cry
 I watch them grow
 They'll learn much more
 Than I'll ever know
 And I think to myself
 What a wonderful world
 Yes, I think to myself
 What a wonderful world
 Ooh, yes

Thiele, B., Douglas, G., Weiss, G. (1968). What a Wonderful World. Album, *What a Wonderful World*. lyrics © BMG Rights Management, Concord Music Publishing LLC, Soundreef Ltd., Warner Chappell Music, Inc

Source: [LyricFind](#)

What is the animation about? The WBCTP included visual literacy within the paradigm of alternate modes of thinking and learning. I included the clip from a Disney movie called Madagascar 1.

How did I design it? The clip was an excellent introduction to visual literacy. It included all the aspects of an ecosystem and sustainability. Visual literacy and comprehension introduce the pre-service teachers to the understanding that there are various modalities of engaging learners in comprehension. After we had discussed the 5W's and an H earlier, we used them to analyze the video animation. Some pre-service teachers had never seen the movie before or video clip.

Why did I design it that way? Humanity cares about success and does not care about the consequences especially when we hurt people close to us to get to the top. The Whole Brain Creativity and Thinking experience were captured in the video clip making it a pleasurable experience for all pre-service teachers because of the concept and context. There are both literal and figurative meanings in every movement in each frame. I explained the figures of speech and the metaphors between the animal kingdom and humans. Pre-service teachers were amazed at the symbolism in scenes.

27.2 Implementation

How was it implemented? Symbolism, emotive language and seeing visual literacy as a language of metaphors were an integral part of the implementation. In the animated clip, the lion Alex, calls himself a monster because he sees a mirage or a vision of his friend Marty the Zebra as a piece of meat to be eaten. He is riddled with guilt after suffering pangs of hunger and thirst. It is symbolic of humanity who live in a dog-eat-dog world. Marty, the Zebra is scared and does not trust his friend (Alex) anymore. Marty runs away abandoning Alex. The lion, Alex consumed by confusion, is seen rolling down the edge of rocks, thorns, flowers and grass as a metaphor for humanity going through the very same process in the circle of their lives and the sound effects mimic human emotions. Sometimes we walk around with thorns in our backs from past experiences and do not want to brush it off because it gives us the motivation to move forward and at other times it reminds us of the pain we have to bear. We believe we can be alone without a support structure but life gets lonely. We live in fear which can motivate or limit us. Competition is also the name of the game in the jungle. Only the strongest survive. Giraffe or Melman sees the duckling he saved being eaten by a crocodile, is symbolic of our mental capacity and our self-image when faced with human frailties.

Why was it implemented that way? So too, in life, we try to save people. But they are either drown in their misery, swallowed by the greatness of the world around them or they can rise above everything and be successful. Alex the lion sharpens the wooden pegs, surrounding himself in darkness and erecting his barriers is symbolic of what humans do in fright or flight of the brain's limbic system. Marty the Zebra, Melman the Giraffe and Gloria the Hippo stick together as friends and eventually literally see the light. After seeing the light, Marty then asks a very prosaic question, "What have I done?" He realizes he abandoned his friend in his weakest moment and when his friend Alex needed him the most.

There were too many symbols in this short clip reflecting life. And it resonated with the pre-service teachers once the metaphors were explained. The Cadence of Imperfection theory can be applied aptly, where pre-service teachers discern visual stimulation and use of five senses through fresh eyes of wonderment and fantasy.

It was implemented to show pre-service teachers the different teaching and learning modalities. The devices we use must be creative and innovative to engage the restless minds of the youth because as professionals, we cannot understand.

27.3 Reflect and recommend: The entire group sang together as karaoke, ‘What a Wonderful World’ by Louis Armstrong and thoroughly enjoyed it. They loved the visual analysis and had never experienced a visual feast which was also a literary feast. It changed their perception of watching animations and cartoons. The value of experience was priceless as a new skill was implemented for them to take back to the classroom. The skill was visual literacy and SEL. I explored their emotions when watching the animation contributing to their EQ. Visual literacy in the WBCTP was a mechanism to get learners back into classrooms by keeping them engaged with intrinsic and extrinsic mental and emotional stimulation. I discussed the symbolism of Mickey Mouse, the first Disney character who whistled and identified the first 3-minute animation made by Disney in 1928. The same principles of analysis in visual literacy will be used for cartoons in the future. The reflection from the design and implementation is different because I introduce media and videos as an intervention in the classroom. The various aspects of language, literature, Imagineering, fantasy, play, story writing and storytelling, engineering, and digital media are encompassed in a single video. In this instance, I changed the focus to a whole-brain experience to enhance VAK principles. I changed the dynamics in strategy so the pre-service teachers are not bored while giving them an example of a whole-brain visual experience. The change of strategy is a critical aspect of the methodology.

A. Pre-service teachers strongly agreed that the natural world was a community they belonged to. They understood their actions and the consequences of its affect and effect on nature. Their welfare and their religious beliefs, their cultural traditions which reflected how they expressed themselves, were connected to nature and they played a significant role in the macrocosm to be congruent with the working world and their careers. Pre-service teachers

believed that English being the medium of instruction, learning new skills, attitudes and values placed them on a different stratum on the hierarchy. Every aspect of modernity and transformation was an additive to their home-based knowledge. We discussed the education, edification and modernity alienating them from their culture, their families and the older generation in language, literacy and professional development. Their historical background limited their exposure to opportunities of modernity however, they brought new meaning with new perspectives.

B. The response to these questions tested their soft skills and executive functioning skills which were necessary in higher and basic education. It included critical thinking skills and their analytical and convergent skills in environmental education. The questions I asked, allowed them to reflect on their interaction with socio-environmental issues and their role in a circular economy of sustainable living through divergent thinking. Examining the WBCTP, I explored and elicited their responses to enhance the programme but also raise the consciousness of future thought leaders in South Africa and Africa. The pre-service teachers reflected on their behaviour and moral code of conduct together with the impact it made to their environment. Pre-service teachers understood decision making and leadership skills in professional development. They all agreed the responsibility lies within their consciousness and their communities and were incited into changing perspectives 'back home'. Blending lifestyles between rural and urban living will reduce the environmental impact. Saving the planet was a personal responsibility first, as a global citizen.

C. Pre-service teachers examined their future behavior, experiences and understanding towards sustainability and reflected on environmental impact. They looked at engaging with nature in more personal profitable ways within a circular economy recognizing the need to spend more time outdoors and blending with the environment. Suppose the chain within the circular economy of reusing, reducing, recycling and reassessing was broken through need and greed. In that case, the planet's future and knowledge's future will be affected. Pre-service teachers understood the co-dependency of Man and Nature from past experiences and their rural residence. They showed keenness in outdoor activities like hiking and exploring. They

were vociferous about reusing, recycling and reducing the knowledge and green economy. Even though they were aware of recycling and reusing, the discussion and questionnaire alerted them to the intensity of the problems faced by humanity. They pledged their personal sacrifices to slow down pollution, learn more about a green economy and invest in their future. They wrote personal messages to the planet and hung them on a branch placed in the room indicating their feelings and attachment to the planet. The awareness of a circular economy contributed to their awareness of how to introduce it into classrooms.

D. The question on social media examined their digital footprint on the environment. It is the electronic and digital trail one leaves on the internet, including social media, emails, queries and searches, photos, passwords and accounts. All the students believed their digital footprint was vital to them though not intrusive. They agreed it was an essential tool for communication and access to information. All the pre-service teachers had more than one device, and they have profiles on various platforms viz, Facebook, Instagram, Twitter, LinkedIn, Pinterest.

E. Asking pre-service teachers to inform the researcher on aspects they would like to be discussed in the WBCTP.

It was fascinating to learn of the increased awareness in pre-service teachers who requested further workshops and more information on teaching tools after the introductory session. They were given practical environmental tasks to make objects, toys and learning material through recycling. They requested further information on making of books as resources within the classroom. Pre-service teachers looked at the concept of publishing and expanding their knowledge for professional development.

There was much gratitude for the techniques they learnt and enhancing their knowledge of ecosystems together with the teaching techniques that were offered. They found socialization and knowledge sharing enhanced their ability to imbibe knowledge through new information and collaborative discussion. Pre-service teachers committed themselves to environmental knowledge acquisition and saving the planet for their future. They also requested information

for networking and being more involved in community development. Pre-service teachers discussed their involvement with projects with Sea World and tackling the Beach Cleanup along the Durban Beachfront. They were encouraged to join WESSA (Wildlife and Environmental Society of South Africa) with the Eco-Schools Programme. They expressed their joy and enthusiasm for the workshop and expressed the desire to have more at the University of Kwa-Zulu Natal, Edgewood Campus. The pre-service teachers found the Introduction to the WBCT Programme very useful, encouraging and voicing their opinion on reasons why pre-service teachers must have more programmes to enhance awareness, provide strategies and showcase methodology in the working environment.

4.6.1 Were there any changes to the programme?

Based on the presentation of the programme we intend to continue with presenting the workshops and the programme and model for other pre-service teachers due to its popularity and the positive responses. “The *White Paper on e-Education* (2004) outlined the elements of transformed learning and teaching through information and communication technologies (ICT). It was supported by the publication of *Guidelines for Teacher Training and Professional Development in ICT* (2007), which provided guidelines for teacher professional development in ICT and educator competencies within a developmental framework.”

I reflected on this document quite extensively to bring a new perspective to teaching and learning and professional development. The ‘fresh eyes’ in Design Thinking was of particular interest and motivation to an ailing system of professional burnout. My concern was the mental health of teaching professionals and how we can change the motivation to make teaching a profession to be proud of as mentors and coaches rather than employees of the state-owned Dept. of Education. The tremendous response through word of mouth and the pre-service teachers’ experiences within the WBCTP was inspiring as there were many variations to the programme presented to suit different audiences. It must be reiterated that the flexibility of the programme was redesigned to suit many different participants and venues both locally and internationally. This particular WBCTP introductory workshop on sustainability set the foundation for the other workshops.

4.6.2 Reflections: Suggestions for the Future

The WBCT programme and model is very versatile, flexible and adaptable. Content can be added, updated or removed with necessary compliance with intellectual property rights. However, the essential literature and framework must be updated with the relevant references. Therefore, the model can be adopted at any tertiary institution for undergraduates and pre-service teachers. The programme can be used as a short, support programme and model in bridging the gaps in education and as a community engagement programme at tertiary institutions and in schools for professional development. WBCTP and model will assist SMT's at schools and SMART schools. The programme and model can be used with NGO's and tertiary institutions for Early Childhood Development and Training for teacher assistants and teachers at ECD centres. The programme and model places education within the stratosphere of the Fourth Industrial Revolution.

4.6.3 My thoughts and feelings on implementation: The summary:

I was inexorably drawn to the content I created. It was all the years working as an environmentalist, a community practitioner, as a social entrepreneur, project manager and a social activist with projects that were successful in shaping the lives through mentoring and coaching to create thought leaders and agitators, the visioners and the Imagineers. As much as we need educators, we need leaders and game changers. Personally, I believe in vicarious modelling. Pre-service teachers were in awe at how much they had learned in one workshop. The classroom must be an incubator for thought leaders and a template for the growth mindset just as it was in the WBCTP. The programme had to be ground breaking, set new trends and break the mould that narrative action research is subjective. Narrative action research can be the foundation for first hand experiences and new knowledge. With the WBCTP and Sustainability I have proven that my work can be trusted, as much of the new knowledge came from my experiences as a community practitioner and leader of many community-based projects, social entrepreneurship and the many leaders I have mentored through the years.

4.7 Conclusion

Sustainability

Sustainability was a concept pre-service teachers heard before because of the reality of Climate Change, recycling and conservation within rural communities. Pre-service teachers evaluated Educational Sustainable Development to their needs being met to the greater ecosystem. UNESCO (2014), raises the issue of citizen activism. The seventeen (17) Sustainable Development Goals is a stark reminder of comparing and evaluating urban development. We acknowledge rural migration into urban areas however, we must also acknowledge poverty and poor waste management. Therefore, we need greener cities to reduce the Greenhouse gases. The impact was also felt with water being a critical issue for rural and urban communities. Rain water harvesting is a concept expostulated as a new concept however, the practice of rain water harvesting is an ancient practice of storing water from run offs. Introducing sustainability in education was new knowledge and placing it in the context of their surrounds made a greater impact because they had not been exposed to such knowledge within the geography of Kwa-Zulu Natal. Sustainability in education extended to rural education. Pre-service teachers were reminded of capitalising on a holistic education by bringing education into the Fourth Industrial Revolution and the Internet of Things. It also meant being in the know on technology and the 5G technology. This translated into being political and socially awakened in sustainable communities and that combines the SDG 4 for education and the SDG 11 for community development and enhancement. Hence, placing the action research within Edgewood campus at the University of Kwa-Zulu Natal helped them understand that they too are a part of the bigger solution globally and they too contribute to its carbon footprint.

The participants understood what the concept of new pedagogy and methodology meant for the future of education. Pre-service teachers found that they required a more practical approach to pre-service undergraduate studies than only theory. They wanted a practical and understandable approach rather than the lecture method. They did not want the knowledge regurgitated from lecturers and books, outdated works of academics that were of little if no significance to changes, the present and the future and not in tune with the present. They needed a voice and a voice to be heard. They discussed the approach to teaching and learning in the WBCTP that was different compared to the present discourse. They argued for a new innovative approach to be more adjunct.

Pre-service teachers were not prepared for the teaching practice module owing to lack of skill and confidence. Preparing them for a practical approach in the classroom was a pre-requisite. But, joining the WBCT programme and taking a more holistic approach helped them

understand their culture, tradition and history within the context of teaching and learning. They could articulate their ideas and feelings because of their tacit knowledge and the combined effect with new knowledge they learned within the programme. The values and ethics of ubuntu, their indigenous knowledge and language raised their vibration to hope and possibilities. The overall feeling was enthusiasm for a renewed process at tertiary institutions with present knowledge that can pave the way for the future. Alsubaie (2016, p. 106-107) raises the question for pre-service teachers on what to teach, how to teach, when to teach and the impact of the teaching as a guideline for classroom management and teaching practice. The WBCTP served that purpose in its infrastructure as a model of action and transformation. They could now talk about sustainability or any of the four concepts by committing to a system that yields achievement and success through mentoring with a formula in mind. A Green, Circular education is synonymous with Sustainability and a circular economy. Discussing sustainability raised the discourse on Social Emotional Learning with emotional intelligence and mindfulness.

Every step of the presentation, it was imperative to examine the learning styles as theorized by Kolb (1984, p.38). Kolb expostulates, "Learning is the process whereby knowledge is created through the transformation of experience". The strategy of cyclical learning to improve pre-service teacher engagement was paramount to the learning experience of the programme. Life is a cycle and nature are a circle and within the two, Man's world is cyclical. The values and ethics from Ubuntu are not only a representation between family members in the Tree of Life but also within their colonies and communities. Most trees do not grow alone, but in clusters. They grow healthier when growing together through synergy. So too does the metaphor apply to communities and integrated values-based communities. Trees give shade, branches break, leaves fall, they bear and give fruit, they give support and are homes to many but, the roots are always stable. They give the strength and support, the lineage and the stability and so too our culture and traditions.

As young disruptors and agitators, the WBCTP created a platform to launch future leaders for future sustainable leadership. As pre-service teachers, they were the visioners and Imagineers to design the future they envisioned.

Section 10: Chapter 6

Cycle 2

Workshop 2: Whole Brain Creativity and Thinking Programme

Workshop 2 on Imagineering in Education.

6. Imagineering

6.2 IS 1: Introduction



IS 1.1 Planning

What was the slide about? Imagineering as a new concept for pre-service teachers raised the bar on what they can achieve. Science, Technology, Mathematics, and Engineering were subjects associated with gender bias. It is used in schools to differentiate between the higher-level thinkers and achievers to those who studied other subjects and gained lower scores. This is the area where the split-brain theory fails. We know that STEM subjects require logical thinking and are situated on the left side of the brain. However, as pre-service teachers, translating the subjects and disseminating the information through simplification requires Right Brain thinking. They can draw, illustrate, and add colours or music to create greater understanding and assimilation. Imagineering is more innovation and creativity in the classroom. It is adding the Arts to STEM subjects.

How did I design it? Pre-service teachers need their minds to be decluttered to explore and experience new emotional, cognitive, and physical experiences as visioners and Imagineers.

Where gender is concerned, women have taken considerable strides in embracing STEAM subjects and have become forerunners in achievement. Moreover, they are finally getting their recognition with research, discovery, and leadership within the ambit of 4IR. It all starts in childhood. Parents must never distinguish games by labelling them for boys or girls. Even toys symbolise how adults draw the proverbial line between male and female toys that are gender specific. Labelling and gender bias are questioned. Therefore, designing products is a matter of appropriation and universality.

Why did I plan it this way? Pre-service teachers must be techno-savvy and understand the concept of design thinking through various design stages. It applies to everything in life, as what is in nature and the natural surroundings is imitated in the concrete world. Imagineering supports visioners and is a platform for entrepreneurship in education. It is the foundation of encouraging teaching and learning to be enterprising and providing the platform for a business model.

IS 1.2: Implementation

Why did I choose the slide? New knowledge meant the pre-service teachers were enthusiastic. They were in awe with positivity and had never learned or heard of Imagineering before. They also could not believe that teaching and learning could be a Business Model through creativity, innovation, and entrepreneurship.

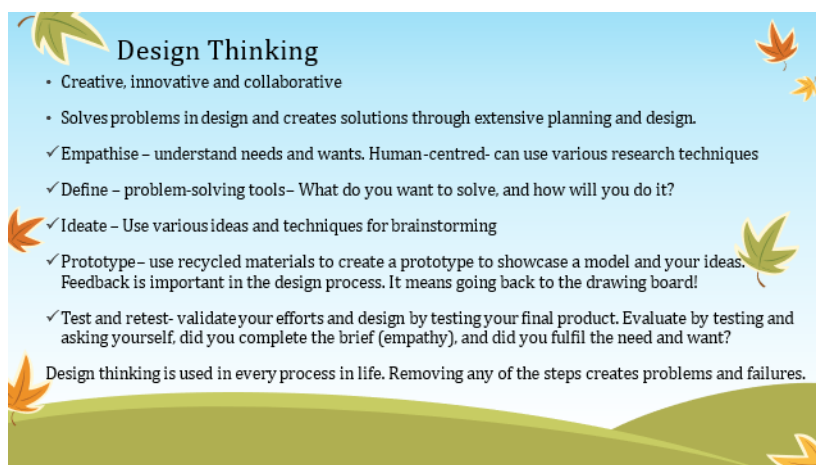
How was it implemented? The concept of Imagineering was explained with a short discussion on Walt Disney and animation. The process of creativity is time-consuming and requires planning and design thinking. Imagineering is a whole-brained process. Imagineering is predominantly created in layers and takes time by being iterative in thought and design. Speaking of layers means it is a step-by-step process with the preconceived idea that any creative process takes time and effort and can be redone repeatedly until the desired impact is achieved. It starts as a skeleton structure or framework, which are the basics, and each process after that is an added layer to enhance the framework or skeleton. Now, if we examine a Disney movie, it is a step-by-step process, starting with a story, the characters, and the setting. Then it moves onto the design of the characters, the costume, the background setting, sound effects, voiceovers etc. That is called layering. That is Imagineering.

Why was it implemented this way? Everything in life starts from the beginning. In the theory I developed called the Affluence of Knowledge, pre-service teachers require skills for the future of teaching and learning. Education requires problem-solvers who can work within a sustainable collaboration network. As global citizens, they are creatives and innovators.

IS 1.3: Reflect and Recommend

Creating and designing Workshop 2 was exciting. Three critical aspects were Imagineering, Design Thinking and the Business Model. Pre-service teachers must be comfortable with technology and its integration into teaching. There are no contradictions between the three concepts but congruency in concepts and contexts in the WBCT programme. **The Exposition of Integration** into the Business Model, Imagineering, Sustainability and STEAM reminds pre-service teachers that they can never be replaced; however, creating more integrated whole-brain content and changing its presented context creates a different and more engaging dynamism in the classroom. The WBCTP is a socially accepted model. Younger learners need contact with teachers for guidance, socio-emotional learning and spatial development. Older learners in the senior phase are an inspiration for encouraging pedagogical content knowledge and switching from teaching to mentoring by blended learning. Pre-service teachers can create virtual reality, artificial reality, and engaging resources with animations to enhance the contact time with the learners and the content from the CAPS curriculum. Remember, teachers are not being replaced by technology, nor are they replacing traditional teaching methods, but are becoming more resourceful and changing learning experiences and methodology for effective and affective teaching and learning.

IS 2: Design Thinking



IS 2.1: Planning

What was the slide about? The slide explained the process of Design Thinking. The process is iterative but mostly a whole-brain thinking and creative process. The design process is repeated to perfect the design and final product. The process is innovative and creative, exploring the imagination's machinations and right and left-brain processing. Design is done by improving and changing the final product's process until the desired product is completed and achieved.

Why did I design the slide in this way? The design process applies to any product or application that Man has access to or has created. Pre-service teachers were reminded that perfection is created from imperfection. Trying and trying again is not failure but the stepping stone to achievement and learning the lesson at every attempt. The lesson must be learnt, or else there will be errors. Therefore, the iterative process is quintessential in perfecting any design.

How did I design this slide? Most pre-service teachers, through human behaviour, will feel despondent if the first attempt does not work. I did not choose the word failure, which has negative psycho-social and behavioral ramifications. Having the courage to try again takes an indefatigable spirit and superhuman effort. If a student or learner has psychological or mental issues, especially from past traumas and events, this will not impact positively. Thus, the inclusion of SEL and mindfulness was a gentle reminder of the process of exploring their talent, their resilience as teachers and their strength of will. The slide indicates that everything built in their world is a design process and design thinking to achieve success. The process is the

fundamental ingredient in Imagineering. To ensure they understand everything in life is a process with a purpose, they must always strive to try again. The iterative process applies to our lives, skills, attitudes, behaviour, and choices.

IS 2.2 Implementation

What were the strategies? To process and experience design thinking and the design process, the pre-service teachers were tasked with designing a project or a motorized toy using a simple pulley. It must be recycled, useable, and demonstrate the outcomes.

How was it implemented? Pre-service teachers followed the iterative process and worked in pairs or in groups. For four workshops, they were given four tasks. Each design task was an example of how to follow the design process. Using Kolb's (2014) learning styles and experiential learning, combined with the design process, they incorporated previous knowledge of the theory and created their unique product. For these workshops in the WBCTP, I was not looking for perfection but instead observing the assimilation of design thinking which is also conducive to academic studies.

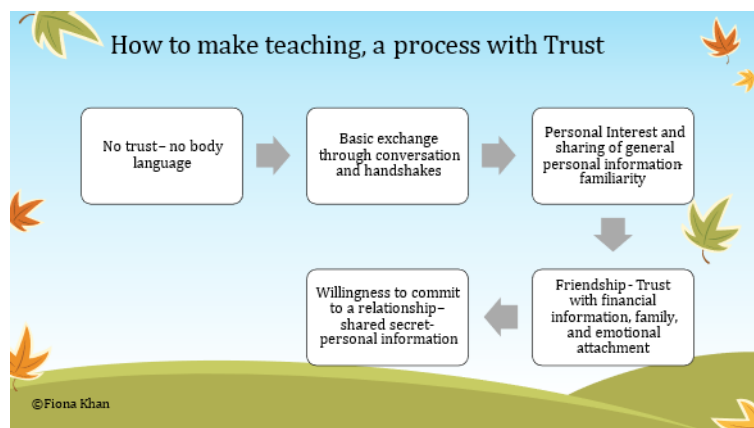
Why was it implemented this way? Giving pre-service teachers the tools for technology and business, does not mean they know how to use it. At lectures, pre-service teachers are given the notes and lectures which are the tools but, do they know how to translate those tools into relatable and absorbable knowledge and skill? In the WBCTP, I taught them new concepts, how to redefine education and edification, use technology and design thinking to expand the knowledge economy of tertiary and primary education through skills-based training and acquisition. Designing is best with collaboration and innovation. Imagineering gives pre-service teachers the possibility to expand their minds and to create new content.

IS 2.3: Reflect and Recommend

Pre-service teachers were very agile in learning about Imagineering and design thinking. Because of socio-economic circumstances, thinking and aspiration is limited. We believe we cannot reach great heights of achievement and success is unattainable because we have limited thinking and belief. But, showing pre-service teachers the tools of how success can be attained, the tools of success in technology and teaching releases the fallacy that teaching is restricting

and rigid. They are in awe when they realize that they have the knowledge and must learn the skill however, wrapping concepts in mindboggling words lead to confusion and limiting beliefs.

IS 3: Trust in Teaching



IS 3.1 Planning

What is the slide about? There must always be trust to enjoy a whole classroom experience or an experience of openness in any relationship. Learners, teachers and parents must feel safe within the environment to discuss anything. Similarly, with trust in the workspace or home, communication is easier and healthier. There must be a pyramid of trust between the teacher, parents and child in the school environment. Trusting each other means following one's instincts and perceptions and allowing another person in the personal space.

How was it designed? Trust is an excellent investment in Socio-Emotional dynamics, using emotional intelligence and eliminating doubt. Trust starts between two people when they become acquainted, and then into a level of mutual trust, personal information can be shared. At the school level, personal information is always shared. Parents trust teachers with their children; children trust teachers, and teachers trust both because they are the conduit for change. The financial and sensitive information shared within the schooling system is information and stored data on each parent and each child.

Why was it designed this way? School becomes a microcosm of the world and provides a platform for profiling and storing that information to be used anytime, anywhere and by anyone

if there is a breach. The personal information includes medical information, family dynamics and demographics, and cognitive, behavioural and emotional information. Their mutual trust as part of practicing mindfulness and EQ creates a capsule of mutual understanding rather than dissidence. Children spend more time with greater confidence discussing personal details and challenges with teachers once there is a perception of trust. Thus, pre-service teachers must be emotionally intelligent and socio-emotionally mature to invest in communication skills.

IS 3.2: Implementation

What was implemented? The issue of trust establishes the rules for communication and collaboration. Trust in any relationship, work or otherwise, sets healthy boundaries, allows the freedom to share information and opens the channels for communication. Schools invest in Big Data in creating or using software to manage, maintain and store all the information for staff and learners. The software also processes and stores reports and assessment marks effectively. This practice shows trends and patterns in learner achievement for motivation and record keeping when communicating with the Dept. of Education, parents and learners. The data captured from each report keeps track of each learner's progress. It is best practice to enhance and encourage learner achievement and incentive at a relative level by monitoring and plotting their success. Each learner will compare results from different terms, understanding their strengths and weaknesses and which areas of learning require more study time. It is the best way for pre-service teachers to implement their SMART goals to improve learner achievement.

How was it implemented? Pre-service teachers worked in pairs and in groups. Immediately it established the element of trust and the sharing of information. Could they trust each other to do their best? Could they be trusted with information? Who would get the most credit? Would they share all their information or will they be cautious? Immediately, the pyramid and chain of trust is established or not.

Why was it implemented this way? Trust for ongoing relationships and progression is essential among pre-service teachers, teachers, learners, parents and guardians, and co-workers in any business or institution. I encouraged through collaborative work groups and pairs for the value of trust in designing, collaborative thinking and sharing of knowledge and achievement. Teamwork and trust achieve greater yields than working alone. The greater the contribution of ideas and communication, the greater the possibilities for success and fewer errors.

3.3 Reflect and recommend

Walking into a room filled with pre-service teachers, my first observation was each one of them sat alone. There was no sharing of personal space and even though they saw each other every day, there wasn't any warmth among them. Each one of them were on a mission, they were isolated, some were very vocal and strong minded while others were withdrawn and sat closed. I could read their body language and I could envision a reticence in bringing them together in shared space and knowledge. Therefore, trust was an important component of bringing pre-service teachers together in leadership and achievement. The workshop was a conduit for welding together a group of highly achieving individuals with a common purpose of changing the discourse at higher levels of education.

IS 4: Computer Skills and Mobile Skills



IS 4.1: Planning

What were the slides about? I termed it romancing your device! I had reached the presentation of the fourth slide and observed that the pre-service teachers were tranquil. They were hanging upon every word and imbibing everything I spoke about as E-Learning being a connected digital education for anyone, anywhere in the world. It connects people, minds and ideas, thoughts and collaborative things. I continued discussing computer skills to raise pre-service teachers' awareness to the level of knowing the components of their computer, the different search engines, the software available and the prolonged use of the computer to increase their skills. E-Learning was the latest craze in education. And what were their digital footprints?

How were they designed? MOOCs and free open online courses to enhance lifelong learning, pre-service teachers were enlightened on taking short learning courses to enhance their language skills and the knowledge of studies they are engaged in by joining other institutions. The wider they stretched their reach to gain knowledge, the greater their knowledge bank. E-learning for pre-service teachers is learning to access online LTSM and access the curriculum. Synchronous learning is groups of students anywhere in the world connecting at a particular time. So too can learners connect with teachers with online learning. They were designed to titillate the senses of just how many functions the handheld devices and the computer can fulfill both knowingly and unknowingly through Big Data.

Why were they designed this way? In Imagineering, we can have a digital artist, an illustrator, a writer and an IT specialist working in synchronicity via the digital divide. However, work can be done independently and engaged at times of convenience. Knowing, loving and owning one's computer is a whole-brain experience of creativity and innovation. The same with the mobile or iPad. The critical aspect of e-learning for pre-service teachers was being agile and adaptive. They can design, redesign, exchange information and work collaboratively both in the context of design thinking and Imagineering. Pre-service teachers were informed of the linear line of communication, especially emails between sender and receiver. The tone and the purpose must be correct, or messages can be misconstrued. Communication and visual literacy are essential tools for online teaching and learning.

IS 4.2: Implementation

What was implemented? Tools for their online presence and the basic language used for a digital presence. What was their digital footprint apart from social media? How much more do they have to learn from Artificial Intelligence and were they using the mobiles to their full capacity of applications and software? Did they consider their online safety?

Why was it implemented this way? There was a glaring gap in computer skills. Pre-service teachers discussed the challenges of the unavailability of WIFI and computer or tech cafes where they live and their struggles in advancing their careers. They learnt basic computer skills while in their first year at university. Some only owned a computer through student funding and they had never used a personal computer or owned one before. Once again, the buddy

system of support from peers assisted with their computer skills, and they had to learn these skills very quickly.

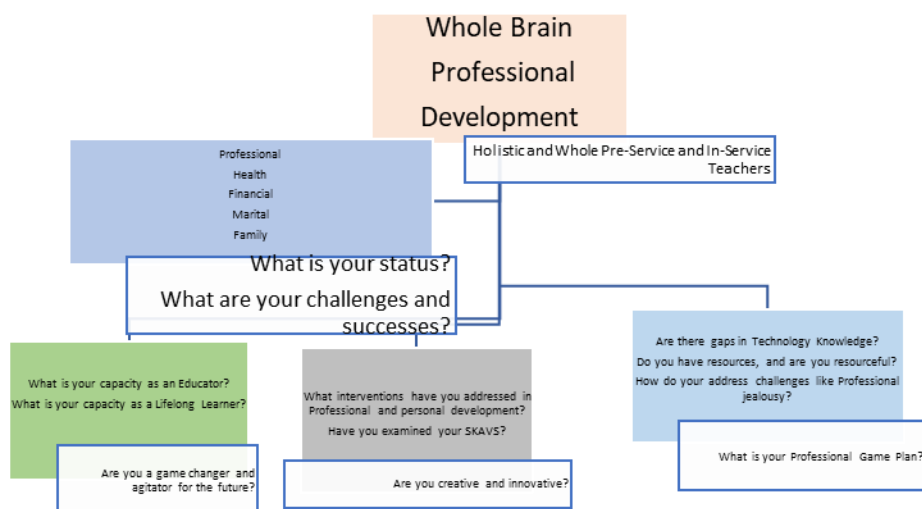
How was it implemented? Pre-service teachers were enthused after seeing the PowerPoint presentations I had used. They were animated and colorful with transitions. They were encouraged in using different digital tools and applications on their computers and smart devices. With visual literacy, they could enhance classroom practice and contribute to the knowledge economy by making videos, podcasts and video blogs called vlogs. They could also use their handheld devices for video calling and recording. Voice commands and prompts, recording lecture sessions were all at their disposal. Communication and learning were enhanced. They were introduced to sites to visit for free online courses and references.

IS 4.3 Reflect and recommend

We discussed the importance of online learning, especially for those who have never been able to study due to our marginalised past. The significance of introducing learners to technology and the digital world for the future of learning was imperative. Transition into the techno world was moving at a rapid pace. Handheld devices can be important for children in rural areas to access information. We discussed the same challenges they presently had, but someone or something had to be an agitator to initiate change. Distant learning and homeschooling are a reality presently. Children with SEND are homeschooled because parents do not want the bullying and mocking in mainstream schools.

The Mass Open Online Courses to enhance career goals included Google, Coursera, Microsoft, Udemy, LinkedIn Learning and FutureLearn, to name a few.

IS 5: The Steps to personal achievement and professional development.



Whole Brain Professional Development. Fiona Khan (2023)



IS 5.1: Planning

What was the slide about? After examining many role models in business, I decided Richard Branson (2007) with his book *Screw it, let's do it!* was a perfect narrative for pre-service teachers. He is a world-renowned entrepreneur and business magnate. He is the founder of the Virgin Group, a very recognizable brand. He drives positive change and advocates entrepreneurial and business skills. As a changemaker and Imagineer, he has his company's names as recognizable brands. He drives creativity and innovation through his communication skills.

Why did I design it this way? Pre-service teachers must start building their names, their purpose for change, and innovation in branding. **They are their brands.** They must be

equipped to market themselves and their education businesses to create profitability in creativity. Ideas exist mentally, but transforming them into tangible realities also changes the perspective from a visioner to Imagineer. Planning, finding solutions, and resolving are the trademarks of creative and innovative achievers.

How did I plan it? *Screw It, Let's Do It* (2007) is the rags-to-riches story of Branson armed with determination and positivity. It was a good story to relate to, as many pre-service teachers spoke of poverty as a limiting factor to success. Not giving up, believing in themselves, and examining different ways of attaining success instilled positivity and self-confidence in knowing they were not alone. If they can be guided into a process of what they should consider on their climb to success, they will reach the pinnacle. I reverted to the true grit every person requires to reach the height of success but, much of the success comes from rejection. When a person experiences rejection, that person will work harder for success. Not only are they striving from the subconscious, they won't allow the ego to be dented.

IS 5.2 Implementation

What was the strategy for implementation? In their experience of the WBCTP within this workshop on Imagineering, they learned that there is layering and building within personal and professional development. Success is unattainable without effort and hard work. It is an analogy and metaphor for building and attaining achievement. Every person has a story behind their success. Pre-service teachers had to be reminded of their integrity, their optimism, determination, EQ, and hope. Richard Branson is dyslexic and is part of the SEND group. Self-awareness is therefore a major quality of success. Communicating his ideas through visualization is another aspect of success. The mind maps, the storyboards, and the vision boards are also tools for success because only some things are cerebral. If pre-service teachers reach the pinnacle of success, let theirs be a good one that others can emulate.

How was it implemented? When pre-service teachers live and breathe without hope, when all they see is a bleak future and employment is not guaranteed, they need inspiration and exhilaration. They were briefly told about a simple man who became a superhero. Pre-service teachers felt anxious that job opportunities were negligible. The approach aims to inspire by reminding them of their worth, to stay motivated, to search within themselves for inspiration, and above all, failure is also an opportunity for success!

Why was it implemented this way? Richard Branson does his branding as himself through effective and affective communication. He is his brand. He became the perfect role model to study as he overcame challenges and didn't allow limitations to barricade his life. He raised himself above limiting beliefs and did not allow his past to sabotage his future. Pre-service teachers needed to hear this story of triumph.

IS 5.3: Reflect and Recommend

When we have limiting beliefs, we allow negativity to stifle our energy flow of positivity and success. Every student desire success. We discussed the change in status and circumstances. It was sad to see the burdens they carried on their faces. With no eye contact, they squirmed and spoke about their challenges assuming nobody understands. They want to leave the confines of rural subjugation, flourish in their freedom of urban transformation, and wear rose-tinted glasses. Until they face a reality check of debt, drugs, alcohol, gender interrelation, socioeconomic challenges, and pregnancy, on the other end of the spectrum, some females faced the challenge of living under patriarchy. For most pre-service teachers, understanding the discrepancies and the chasm between rural and urban life was a stab at reality. It was harsh, but it was real. All of them wanted to be legendary and role models of the future and, if so, as mentioned before. Everything is a process.

IS 6: Disney's Rules for Imagineers



IS 6.1: Planning

What are the slides about? Imagineering is a value-based strategy. Disney, in Imagineering, created a theme and design that extends to every facet of his business through ideation which is design thinking. Everything created within the brand must be the epitome of perfection and

add value to the consumer. We related to Disney's most important framework, which can be applied to every pre-service teacher or anyone determined for success. Gabler (2006) leads us with the following essential tools, which Disney expounded, "Be Amazing in something, have a broad base knowledge, have great communication skills, be passionate, be persistent"

How were they designed? Imagineering, in its concept and context is a whole brain system considering the creativity and cognition required for success. Imagineers work with electricity, energy, levers and pulleys, and magnetism. All the components come together in layers to create an object of uniqueness. Under the banner of Science and Technology, Imagineering is a strategic aspect of STEAM education because it incorporates the Arts in creativity.

Why were they designed this way? Having discussed the constructs of Imagineering and the Business Model, the concepts and contexts are not abstract discourses. They are indelible in daily chores and tasks.

IS 6.2: Implementation

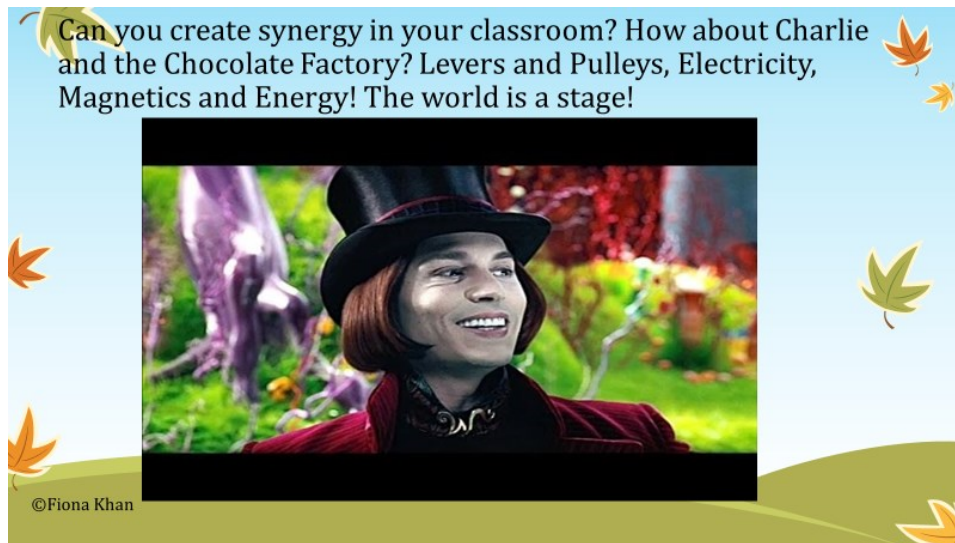
What were the strategies? Imagineering as a new concept, pre-service teachers were fascinated and could name all the different themes, movies, theme parks and concept items of Disney. I reminded them of the video clip of 'What a Wonderful World' from the previous workshop on Sustainable Development and linked it to Imagineering.

How was it implemented? They could understand the essential tools at play as they recalled the vivid colours by being creative, the passion in creating animations, the emotive language and concepts in the storyline, and the communication skills in bringing alive history, stories, tradition, and culture in a cartoon or animated movie with pictures and music.

Why was it implemented this way? Pre-service teachers needed to create their masterpieces for their lives, one that filled them with pride. To enhance their learning experience, they viewed a snippet of Charlie and the Chocolate Factory for a visual saccharine high.

<https://www.youtube.com/watch?v=OMFQtY6655E>

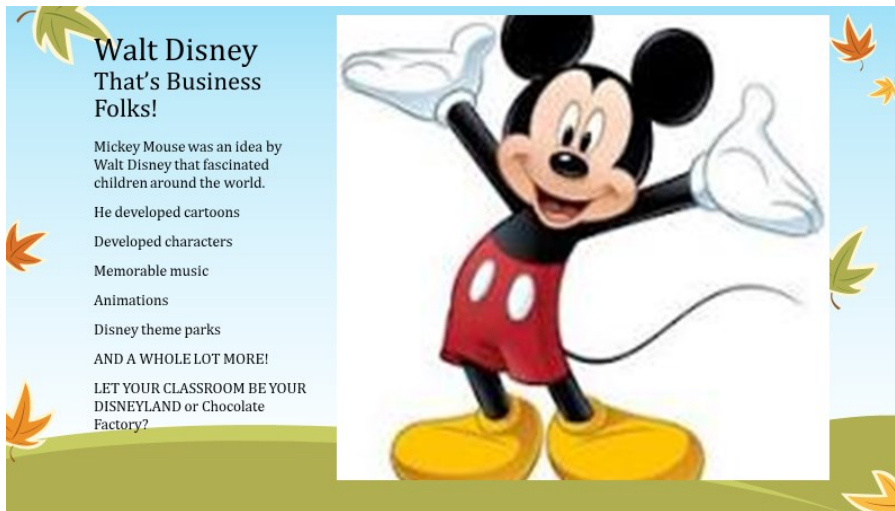
Charlie and the Chocolate Factory



IS 6.3: Reflect and Recommend:

The video of Charlie and the Chocolate Factory was an excellent example of good storytelling, sequencing, the use of science and technology, Imagineering and robotics, and the Arts for an unleash on the senses and a good measure of suspense. Each component is layered; the music, light and darkness, colours and monochrome, and the human banter makes for an interesting observation of human behaviour under different circumstances. It revealed adult attitudes tainting young children. It was enlightening as creatives do that quite often, listening to that little voice in their head which tells them most times they are never good enough. That voice must be quelled.

IS 7: Walt Disney and Imagineering



IS 7.1 Planning

What was the slide about? Disney (1955) started with an idea. “The way to get started is to quit talking and begin doing.” The idea started an empire. Every pre-service teacher or learner has the ability and possibility of being a success and starting an enterprise that can go global.

Why was it designed this way? We must never set limitations or allow challenges to stop us from achieving our dreams. And if there are obstacles along the journey, one can detour, but the destination will be the same. Disney (1956), “All our dreams can come true if we have the courage to pursue them”. I examined the personal and professional challenges when I chose Branson and Disney as role models. Their strength and winning formulae were never giving up and never believing there were limitations to what they could achieve. And that is the vicissitude of their indefatigable spirit.

How was it designed? In the classroom, children are aural, visual, and kinesthetic. The brain processes information faster through repetitive songs, dance, drawing, dramatisation, and creativity. I wanted pre-service teachers to experience this flight to be a child, so they would enjoy doing it in the classroom. Our childhood was always memorable because unforgettable moments left imprints on us. Seeing everything through fresh eyes means re-imagining and re-living through childhood and working within the framework of the **Cadence of Imperfection**.

IS 7.2 Implementation

What was the strategy? The greatest joy of living is being stress-free and worry-free. That means free of responsibility. Many sitting in the workshop, I assume, may not have even had a decent childhood. In that workshop of Imagineering, I wanted them to feel carefree and happy. The video on Charlie and the Chocolate Factory raised many socio-economic constructs. They understood they were not the only ones carrying a load on their shoulder. Every person has a load to carry, and how we carry it makes a difference.

How was it implemented? Animations are an excellent example of Design Thinking and collaborative synergy. It is an opportunity to critically evaluate the information with the 5 W's and an H. The slide was implemented as a transformative pedagogical strategy in the teaching change frame. Social theories in the WBCTP are reflective and inclusive. It must be understood, and I communicated to the pre-service teachers, that we do not ascribe to the hereditarian view of intelligence. Their parents do not determine their intelligence through heredity but through socio-genetics. How were they raised, and who were their role models? What was their management plan in being raised, what were the rules and regulations of behaviour, and who was the disciplinarian? Who instilled habits for reading, studying, and skills in the environment? The traits inherited from these questions determined the level of achievement. The video indicated the behavioral patterns of children raised by different parents with different parenting skills and environments.

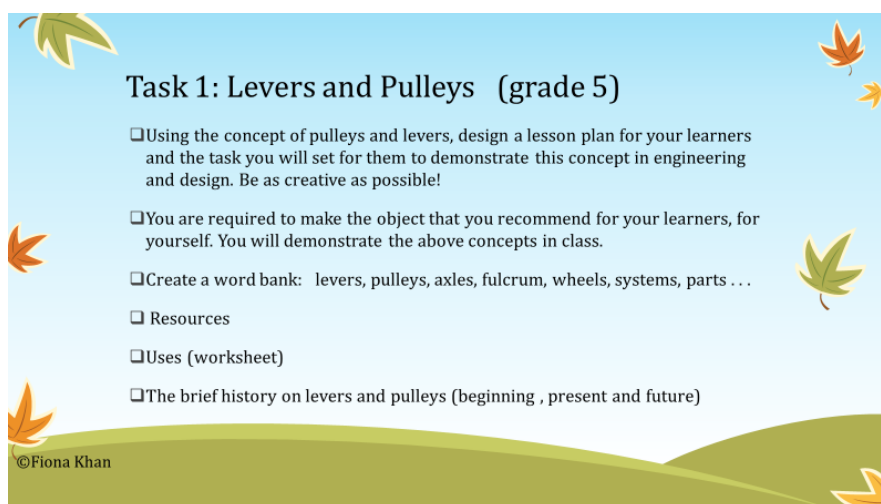
Why was it implemented this way? Pre-service teachers were guided to humanise education. They were asked many questions, e.g., What inspired you in the movie clip? What were the various thoughts based on the needs? Similarly, children in the classroom from different environments and backgrounds, with different skills and behavioural patterns, form a cohesive bond in the classroom. Can you create a video clip or movie with the mobile? Engage with the script and language and gain innovative ideas. It is called Shorties and Curlies. What was the feedback on watching the animation? What is your story that can inspire others?

IS 7.3 Reflect and Recommend

Pre-service teachers must engage in setting achievable short and long-time goals. With critical thinking skills and a holistic approach, their journey to success is structured and interactive.

Employment today is based on emotional intelligence, socio-emotional skills, and excellent communication and is mostly value-based. That is the objective reality. However, the subjective reality is the strategy for spending an entire lifetime in a particular job or moving horizontally or vertically within a company. This is the pre-service teachers' lived reality. Most will stay in the same job, same school, same position for an extended period. While the visioners, the leaders and agitators will understand that there is more to teaching and learning that is impactful. The WBCT programme is the vehicle for riding the crest of the knowledge economy.

IS 8: Levers and pulleys



Task 1: Levers and Pulleys (grade 5)

- Using the concept of pulleys and levers, design a lesson plan for your learners and the task you will set for them to demonstrate this concept in engineering and design. Be as creative as possible!
- You are required to make the object that you recommend for your learners, for yourself. You will demonstrate the above concepts in class.
- Create a word bank: levers, pulleys, axles, fulcrum, wheels, systems, parts . . .
- Resources
- Uses (worksheet)
- The brief history on levers and pulleys (beginning , present and future)

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IS 8.1: Planning

What was the slide about? The task on levers and pulleys was executed to show pre-service teachers the basics of many concepts and contexts in science, technology, engineering and mathematics. It is the basic combination used to show the transmission of energy, power and movement. Pulleys are wheels on a single shaft or axle. It is designed for movement and changing direction. It was also an opportunity to demonstrate the uses of a lesson plan.

Why was it designed this way? I had asked them to create a moving, robotic prototype or any object that shows movement. Pre-service teachers required the experience of design thinking and imagineering. I gave them a simple task that will evoke their past knowledge, with the

present theory to create new knowledge for the teaching experience. But, they had to think critically, write down a step-by-step process and record the process.

How was it designed? I applied the theory of thinking skills and imagination. I asked them to remember their first toy or even one made by themselves. What was the mechanism that fascinated them? Or to examine a well in the rural areas. What was the function and what was the mechanism? The concepts applied to them as a metaphor. If they are stagnant and there is no movement there will be no power and success will be elusive. I used the workshop as a tool to think divergently. We did the task orally using a template previously given.

IS 8.2: Implementation

What was implemented? I implemented the first step in designing and creating: to get the brief as given above. The brief stipulated the concepts and contexts. Pre-service teachers must create an object that moves. It must have the basic components of movement, as mentioned, and there must be new knowledge as one of the objectives. The process they record will be used in their lesson plan.

Why was it implemented this way? The basics of robotics and Imagineering are understanding movement and space. E.g., If they are designing a car, it must move backwards or forwards or turn right or left. Pre-service teachers do have previous knowledge; however, it is compartmentalised in long-term memory. An essential part of designing is accessing previous knowledge and how we can improve it.

How was it implemented?

They were amazed at themselves as they remembered the first cars made from wire when they were children. Others discussed carts made from planks and a piece of rope to steer it in different directions. Latching this idea, they could pace theory with practice to Imagineering and design thinking. Every piece of plank and wire had to be measured and applied correctly to the design, or the mechanism would not work. As pre-service teachers, they were asked to apply whole-brain creativity and thinking in design and application. Resources were recycled material. The objective was to show movement and direction. They had to summarize the task. The results were outstanding.

IS 8.3 Reflect and recommend

Once pre-service teachers identified what they wanted to create, they deconstructed their previous knowledge and experience. They created new knowledge with a new experience that was objective, critical and innovative. Through the whole-brained experience, they were creative, logical, techno-savvy and analytical. The experience's complexity in the WBCTP context was never explored before. They did not know they were creatives with skill. The conceptual framework of SEL, EQ, and mindfulness filled the gaps with pre-service teachers in understanding that visioners need someone to believe in them. They need inspiration and motivation through self-worth and examining their attributes. The theory of Kolb (2014) and Nilsook *et al* (2014) drives the findings of whole-brain thinking and action research through the WBCT programme.

IS 9: Social Media



IS 9.1 Planning

What is the slide about? As previously discussed, gaining a social media presence was an essential tool for success because the criteria for employment have changed. Technology, computer, and social media skills are huge factors in employment. Pre-service teachers must be comfortable with using resources from the Internet. They must also have the skills to create content and be enterprising in sharing resources as conduits for change and agitators of the future; their innovative and creative skills create the difference between mediocre and exemplary. Going digital is the way for the future. Resources are readily available, and the Dep

supplies devices for Education. Most schools are equipped with handheld devices, e.g., iPads and computers.

Why was it designed this way? I was aware that most students were on one of the social media platforms. It provides the framework for creating content, creating videos, podcasts, and chatbots that can assist learners and other pre-service teachers. Resources and free were the best form of aural and visual literacy. With AI in the mix, it was a solution for solving literacy and language problems.

How was it designed? Mobiles or cellphones were the primary resources. They looked at their profiles and digital footprint. I explained that there are online magazines, journals and AI tools to create content for education.

IS 9.2 Implementation

What was the strategy? Using social media as an intelligent tool for lesson planning is an excellent initiative. The platform is free but enterprising for income generation. Relevant topics, local news and reading strategies can be used in the classroom. If students and learners have a problem with reading or studying, various tools can be accessed and most importantly, audiobooks to help with speech and learners with SEND.

How was it implemented? They accessed their devices. If they were unaware of certain applications and websites, they were assisted by peers.

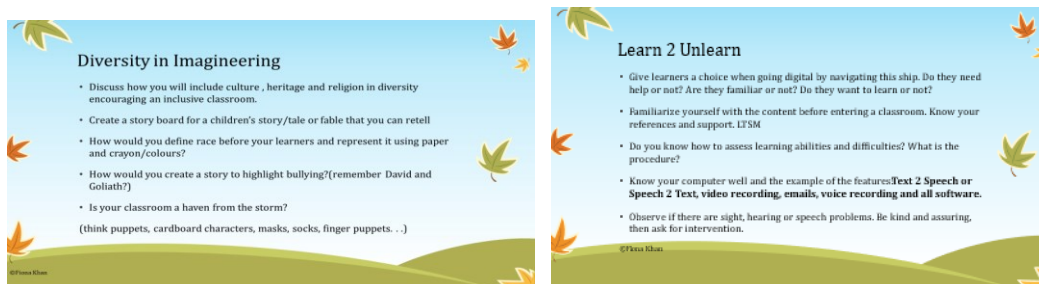
Why was it implemented this way? They must romance their mobiles and devices to ride the digital and mobile highway in technology and AI. Being familiar with technology is the only way to overcome trepidation.

IS 9.3 Reflect and recommend

The functions and use of any device in technology explored the relationship between the user and the device. With SMART technology, the language of the future is tech-speech. If one cannot speak technology and AI, investing in expensive devices is wasteful. Curiosity propels

design thinking, creativity and innovation. Most importantly, the tech language most people engage in becomes the highway for communication.

IS 10: Diversity in Imagineering: Learn to unlearn



IS 10.1 Planning

What are the slides about? The aspect of diversity is critical for inclusive classrooms. Various cultures, traditions and histories must be considered for language, literature and literacies. Language resources must include the various race groups in the class and the different indigenous languages. Celebration of festivities must include activities of different cultures, and activities must represent those cultures. Pre-service teachers must engage with diverse groups. Their EQ and mindfulness are essential tools for strategizing.

How were they designed? Understanding learners in the classroom is a skill worth mentioning. The perceptive skills of preservice teachers in their quest to teach and learn must be so sharp that they can sense if a learner has a problem. The senses must be developed, and social-emotional learning skills must be enhanced. As much as this takes practice, it is also about compassion and empathy. Reflective listening by pre-service teachers and the learners in the classroom is a strategy for reflecting on their experiences.

Why were they designed this way? Imagineering is all about designing through innovation and creativity. Children must enjoy the freedom of creativity in the company of their peers. It is adults who draw lines and define colour and race. Children understand freedom and see the world as a whole, not fragmented. It is important for pre-service teachers to understand the technique and skill of creating an inclusive classroom. Talk about the issues of bullying and working in groups within a classroom. Learners are from different backgrounds, and they are

sensitive souls too. Therefore, relationship skills within the classroom, among the staff, and the SMTs are vital for the pre-service teachers' mental health. Their social awareness drives change within themselves and others and how they respond to others. It improves responsible decision-making and maintains supportive relationships.

IS 10.2 Implementation

What were the strategies? Classroom dynamics between teacher and learner can start a mind-blowing relationship of success in a learner or failure. The same applies to tertiary institutions. The relationship between pre-service teachers and their lecturers and supervisors must be synchronous. Children need guidance to resolve conflict. The point of reference should always be the lessons learnt from emotional intelligence and mindfulness. I raised the issues of challenges with resources and mobility for SEND learners. Are they equipped to challenge social stigmas like bullying, negativity, children being judgmental and avoidance, assessing the environment and the risks?

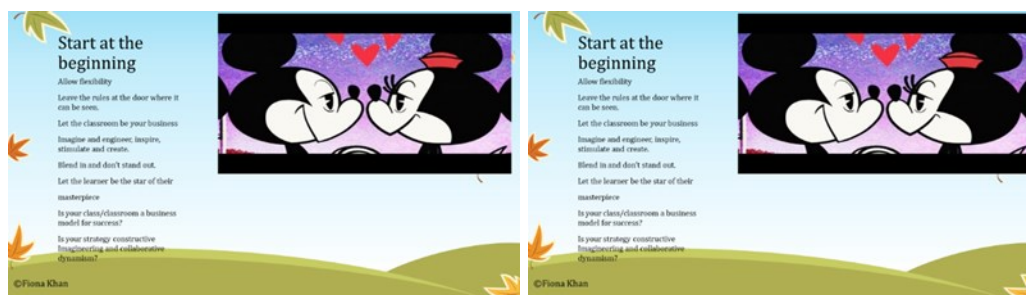
How was it implemented? Learners do not need harsh intervention. They require coping mechanisms on their emotions. So too, do the pre-service teachers. We must understand there are different circumstances for every child when they leave home. Pre-service teachers have their challenges too. The morning ought to start with breathing exercises for grounding and reading a story to relax the learner's mind giving them a center of reference. It may not be every day, but it instills a sense of calm in learners. When developing resources e.g., puppets or cut outs and collages, ensure you have instructions for them to follow. Draw the pictures on a storyboard of the different steps to achieve the objective as some learners are not logical thinkers and others are more visual learners. Inclusive education or learners with SEND are not incapacitated intellectually. They only do the very same thing in unique and different ways.

Why was it implemented this way? Pre-service teachers lacked technical skills in teaching. With no experience and fairly little understanding of being within the classroom environment, they were surprised at how much they had learnt thus far with the WBCTP. All they needed was a spark to fire their creativity and imagination. As I was guiding them and mentoring pre-service teachers, I reminded them to share the same tolerance and patience with their learners. Love is a universal language, and all learners look for acceptance and affirmations.

IS 10.3 Reflect and recommend

The skill I encouraged is journaling or journal writing. Self-awareness is the understanding of one's emotions and thoughts and how they impact on one's behavior. It is imperative for pre-service teachers to understand their triggers, their warm fuzzy feelings, their compassion, their anger and many more emotions. Positive re-enforcement builds self-confidence and aspiration to acquire success. The self- management of self-actualizing emotions of aspiring and decision making for themselves and within the classroom, is important for the synergy within the classroom. It is also important for a positive psycho-social mindset. It must be noted that any type of harassment and abuse is abhorrent and against SACE rules and all rules applicable to the profession. I have made this issue very clear from the very beginning of WBCTP.

IS 11: Start at the Beginning: Rules of Engagement



IS 11.1 Planning

What is the slide about? Under discussion, it was imperative to guide the pre-service teachers on engagement with creativity in the classroom. There must be synergy in a collaborative effort and all tasks must be constructive. As mentioned earlier, pre-service teachers must engage in a positive mindset and maintain positivity and composure within the classroom. All learners learn through experimentation and play. Fred Rogers' Social Emotional Learning encouraged inquiry-based learning and discovery. STEAM was not about teaching. He was audacious enough to call Technology tools.

Why was it designed this way? Therefore, in a metaphor, Imagineering is about getting all the tools together and starting from the foundation then building to the roof until the house is complete. The same can be said for any task as they all use ideation in design thinking. In the beginning group work was encouraged among the pre-service teachers. This translated into the classroom. As the learner becomes confident allow some measure of autonomy. Discussing SKAVS with pre-service teachers places us within the ambit of social-emotional learning. Culture, Curriculum and Adult skills create an environment for healthy learning and teaching within the circumference of learning and growth.

How was it designed? There are three critical aspects in classroom management and ensuring maximum benefit for any lesson.

A) Always ensure that rules are articulated and seen on a chart. Yes, even for the Senior and FET phases.

B) Work on a reward system; there will be no need for punishment and chastisement. All learners want to feel accepted and need acknowledgement.

C) The art of psychology is essential in managing and maintaining dignity and respect. Sometimes reverse psychology works too.

Creativity is free-spirited and flexible; therefore, learners need to be reminded of the lesson's goals to maintain the ethos of discipline. Far too often, we see teachers disrespected. A confident teacher is in control, and so will be the learners.

IS 11.2 Implementation

What were the strategies? I reminded pre-service teachers just as they see me as confident, professional, assimilated in a wealth of knowledge and experience and articulating myself eloquently without fumbling and they are in awe, these actions translate into the classroom as well. Their extrinsic profit and gain must be a reflection of their intrinsic value and worth. The classroom is then a reflection of themselves. Therefore, it is vital to remember they are a marketing device, they reflect their profession. Pre-service teachers must plan relevant intervention programmes or lessons for learners with SEND. In an inclusive classroom, not all

learners are on the same wavelength. It must be understood some learners require remedial work. Is the pre-service teacher equipped for such intervention?

How was it implemented? I used the presence and synergy in the lecture room to reflect and discuss their experiences at school, at the tertiary institution and what strategies they would use to change it. The blending of feedback at critical moments in my presentation gave the pre-service teachers time for reflection. Pre-service teachers were experiencing the reality of 21st century transformative pedagogies. Even silence is an important tool for reflection. In Bloom's Taxonomy (1956), we have higher order thinking skills like Design Thinking and Imagineering. These are processing skills. The lower order thinking skills are invariably the visual literacy and aural skills which assists with brain exercise and function. This was the whole brain experience in the WBCTP.

Why was it implemented this way? Bloom's Taxonomy (1956), facilitates thinking and creativity at different levels, communication and collaboration. He also takes into consideration contested knowledge. Bloom (1956) invariably and unknowingly created a platform for digital skills. Pre-service teachers must create a leaning environment to encourage and maintain a learning culture. In a time where teaching and learning is challenged socially and technically, the pre-service teacher must be equipped to raise the bar. I was now placing digital learning skills into pre-existing knowledge both synchronously and asynchronously.

IS 11.3 Reflect and recommend

Teaching is fun! Pre-service teachers were encouraged to use strategies that would work for them in meeting their objectives and encouraging a better understanding of the content. Allow learners to contribute to the lesson to encourage a positive synergy of their importance within the lesson. I used the example, once again, of my workshop. Why were they so engrossed and enjoying it? What was different? Examine some of the strategies I used to construct their plan. Within the four years of undergraduate studies, it is imperative for pre-service teachers to create a portfolio of interventions and strategies learnt. Therefore, journaling is an important point of initiating thoughts, ideas and creativity. The doodles or doodling spark great ideas and are a vital part of the whole brain creativity and thinking processes.

IS 12: The Business of Imagineering



IS 12.1 Planning

What was the slide about? From the previous slide we move into a more structured approach to teaching and learning as a business. The basic model for business in Imagineering is whether pre-service teachers want to be their boss or be enterprising and take risks. Are they willing to share knowledge knowing their intellectual property is safe while entering into partnerships with others? I invited the pre-service teachers to think, feel and emulate good business and professional practice. They are teacherpreneurs; therefore, it is essential to remember that the learners must profit by achieving the outcomes and growing wise in knowledge and education. The very same applies to pre-service teachers.

How was it designed? Establishing an enterprise in education can extend from online teaching to creating resources, to a content creator and more. The first point of success must be the establishment of a business. Remediation has now become a lucrative business for online tutoring and home tutoring. A business can be a sole proprietor (one owner), a close corporation or (CC) with two or more people, a partnership (two or more) owners. The question remains how competitive and how much risk one is prepared to take? Online teaching requires new resources and daily activities. Remote teaching and homeschooling also require new resources all the time. But, the resources created can be shared on other platforms like social media and/or compiled into a booklet or an activity book.

Why was it designed this way? The early childhood development and foundation phase has the greatest potential in developing creative content and resources. However, with the blending of languages and code-switching, the demand for tutoring in subjects for senior and FET phases has become alarming! What are in-service teachers doing in the classroom? Why is the system failing? How can pre-service teachers change this trend? Tutoring has become an educational statement of status. Depending on the career the learner chooses or the parent chooses. When pre-service teachers are enterprising, they see benefits and an increase in productive time.

IS 12.2 Implementation

What was the strategy? Pre-service teachers are more motivated and inspired and focus more on career goals. Teaching is a significant part of the career goal. Their co-curricular and extra-curricular activities contribute towards a wholistic professional developing profile with potential for leadership strategies and sustainable collaboration. A Business Model is a response to unemployment by creating startups. The idea of keyboard warriors must only stop if it is a profitable creative, and innovative experience. Imagineering and the Business Model is a multi-disciplinary approach to being problem solvers and teacherpreneurs. We see Kolb's (2014) learning styles in the Business model. The very same applies to Imagineering.

How was it implemented? Being Your Boss was a precursor to the next workshop and concept in the Model and Programme for Whole Brain Creativity and Thinking. After I had completed my presentation, I watched the pre-service teachers wide-eyed and utterly impressed at what they had just learned. They had learned about Imagineering and teacherpreneurship. They learned that teaching was enterprising. For the first time, they had learned that teaching could be treated as a business, not just a job. There was a look of awe because the possibilities they had dreamed of and thought could never happen now sparkled with hopes of reality.

Why was it implemented this way? Enthusiastic about the many projects that they were willing to accomplish. Some spoke of foundations and organisations, and others spoke of returning education to the rural areas to make it thrive. They wanted to give hope and belief to the many who did not have the opportunity to extend themselves from their circumstances. They were inspired to believe that a dream can have wings and can fly into reality. Teaching and Learning were not boring and mundane but were filled with endless potential and that spark was a light within themselves.

IS 12.3 Reflect and Recommend

We ended the presentation as an icebreaker with two video clips after an intensive presentation. The message, however, was well-intended and received. We must remember that some pre-service teachers had never seen the movie or the song's video. The animated video clips are a whole-brain visual feast of Imagineering. In introducing design thinking, I reiterated the aspect of viewing everything with fresh eyes. I asked pre-service teachers to review the following animation clips with fresh eyes where mind, body, spirit, Nature, and the Divine come together in a symphony. Disney's genius, and the collaborators, Imagineers, came together in design thinking to enthrall audiences as visioners. It's a visual feast, an explosion of the senses, and in the end, you must be proud to be African in all its complexities.

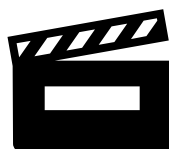
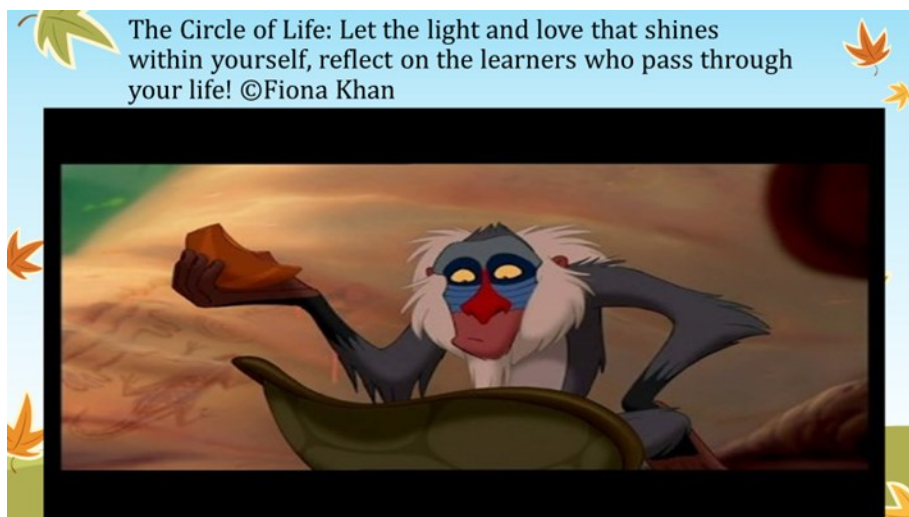
IS 13: Bare Necessities:

<https://youtu.be/9ogQ0uge06o>



IS 14: The Circle of Life

<https://youtu.be/HwSKkKrUzUk>



And that's a wrap, Folks!

6.3 Conclusion

It was most exciting and mentally invigorating to facilitate Workshop 2. The uniqueness was in empowering pre-service teachers and the enthusiasm for attaining new knowledge. The quintessential quality in any leader is humbleness and humility. They were awe-inspired to learn that creativity is a spark in everyone. That spark must be ignited to display greatness and achievement. Moreover, guided learning is a tool that has significant advantages in achieving success. Similarly, learners in classrooms have the right to be mentored with the best knowledge and the responsibility to use that knowledge to excel in all aspects of schooling.

Imagineering is finding that element in breaking barriers and removing challenges knowing that there are lessons with every challenge. The lessons learned are the values, knowledge and skills that empower pre-service teachers in the Cadence of Imperfection and the Affluence of Knowledge. These lessons keep them ahead of others as global citizens. The imagination is limitless, the creativity is boundless, and innovation is exponential. In Imagineering, we have the most critical tool, Design Thinking. Like children at play who make and break things only to make and remodel (iterate), design thinking tests patience, executive functioning skills and social-emotional learning. The whole brain functions in mindfulness and emotional intelligence

for optimum functioning skills and empathy. Experiential learning affirms knowledge acquisition, but social theory is the platform for new knowledge contesting knowledge theories and frameworks.

The issues raised most significantly were the indigenous knowledge systems and African consciousness. How can we change the narrative of African Consciousness and include African theories and frameworks to lead in the field of education? We are the Cradle of civilisation, and the Eurocentric mindset enshrouded by subliminal colonisation must be stopped. Africa thrives with untapped potential. The knowledge economy and the creative economy in Africa and with Africans are two aspects of Imagineering that still need to be explored to their full potential in South Africa and Africa. It must start somewhere, and since our learners must be trained as future drivers of change, we must start with pre-service teachers as the agitators of that change.

Section 11: CHAPTER 7

Cycle 3

Workshop 3: Whole Brain Creativity and Thinking Programme:

7. The (W)holistic Teacher: Back 2 Basics: Human 2 Human Interaction

7.1 TWT 1: The (W)holistic Teacher and Social-Emotional Healing



TWT1.1 Planning

What was the slide about? Before discussing STEAM education, it was imperative for pre-service teachers to examine their roles in the greater scheme of modernity and treading the digital divide with technology and the Fourth Industrial Revolution. In the four concepts for the programme, I have kept the thread of Whole Brain Creativity and Thinking in a holistic precept so that it is always relevant in the subconscious mind of pre-service teachers. Pre-service teachers in professional development must be whole in mind, body, heart, and spirit. Inclusivity is the cornerstone of accepting every person for who they are

How was it designed? The design for each workshop was centered on enhancing the Pre-service teachers' experiences within the programme. The subconscious mind is the brain's most active and most potent part that processes huge amounts of information

through the five senses and rallies it back to the brain in nanoseconds. However, the Whole Brain's Creativity and Thinking must be relevant in every slide to thrust them into the forefront of education, shifting its paradigm. The school system has not changed much over time. We still waffle between policy and delivery of the CAPS curriculum. Invariably, we must trust policy which categorically states that education and classrooms are inclusive. Neither has the system within tertiary institutions changed in the procedure. However, pre-service teachers, undergraduates, learners, and the world, have changed.

Why did I design it this way? Language and cognition have changed with the environment, as have the circumstances. Our CAPS curriculum needs to be upgraded to work with technology and the patterns of innovation, creativity, and the Internet of Things. In a world filled with robotics replacing machinery, coding is the future of education, and for whole-brain thinking and creativity, it's an integral aspect of the whole-brain experience. Suppose there is inclusivity, and the teaching and learning paradigm is shifting. In that case, pre-service teachers are entitled to opportunities for lifelong learning, riding the digital divide, and being forerunners in the quest for being in the SMART 5G world.

TWT 1.2 Implementation

What were the strategies? We spend endless hours on our mobiles and handheld devices and human-to-human interaction is minimalised. We must remember communication, the human element, sensory perceptions, eye contact, and touch. We are role models to little children, even though they have ascribed to keeping their heads bowed down on their screens and their ears and eyes peeled on the net. The handheld device has become the creche for mothers as children are entertained digitally, and the human-to-human interactions between parent and child are lost. Similarly, pre-service teachers are engaged online and must remember the psycho-social environment to maintain language, literacy, and learning.

How was it implemented? The idea of cybercrime and bullying are realities children and adults face every day. Admitting that our learners want to be constantly occupied and entertained attunes itself to the instant gratification of 'I want it all, and I want it

now'. Each slide with its contents in the WBCTP has been carefully selected within the design process to ensure a business model is integrated with social entrepreneurship, STEAM, Environmentally Sustainable Development, and Imagineering.

There were many narratives, both personal and interpersonal, and from their psychosocial experiences. We agreed that most South Africans live on entitlement and attempt with little effort to attain their highest potential and achievement. Most of the participants concurred about the use of handheld devices and the lack of human contact. Being entertained deludes and deceives the viewer of false realities.

Why was it implemented this way? We aspire to be replicas of others or poor imitations and walk around with masks. There are different masks for the people we encounter, environments, and circumstances. We do not live our authentic narratives and realities. Handheld devices have stunted social interactions and communications. Children are obsessed with mobiles and perfection from far-from-perfect celebrities. Pre-service teachers are slaves to this trend as well. Moreover, the stake is getting higher as they want to dress better and look better, and the artificial reality is a part of their lives. Parents use handheld devices as mobile creches. Marriages and relationships have dissolved. Trust is not valued and respected. In a world of permissible noise, there is silence.

TWT 1.3 Reflect and recommend

There is a growing concern that children and youth are being enslaved by technology. We must remember that nobody else can if adults do not have the temerity to instil discipline and rules. Technology cannot take care of children, nor can it take care of your job. Children who are more innovative and use technology better are ruling the households. Children are the masters of emotional intelligence, EQ. But the generation who will define the future will lack emotional attachments. That will create an imbalance in the whole brain experience. Attaching to digitally created realities establishes the course of the future where values, ethics, and Human 2 Human interactions are devoid.

TWT 2: Motivation and Perception in Whole Brain Teaching



TWT 2.1 Planning

What were the slides about? The power of choice is a critical factor in human behaviour. Pre-service teachers were introduced to the topic of motivation and perception. Our perception dictates our realities, but our realities are dictated by motivation and choices. The lengthy discussion whirled around the importance of early morning inspiration through motivation to get through the day. There are challenges in the classroom and among colleagues, and in the school environment. Motivation boosts confidence and the repertoire within the environment to be positive and motivated. Not every teacher comes cheery to school. Not every learner, either. Every person has a portion of the day where they are not at ease and are crowded with negative vibrations. It is quite easy to suffer mental fatigue and burnout. Having special days at school is important for socio-emotional upliftment and compassion in the junior phases. Those days are for grandparents who are human libraries and pets who are fantastic with emotional attachments and Healing. Family, history, and all the special days must be encouraged, and the knowledge economy is lost because of generational changes and modernity. The five senses are once again essential for decision-making and inspiration.

How was it designed? Mental fatigue can be overcome through positivity, support, and taking the necessary medical advice. The reality of fatigue and mental disorders is that it requires support. Pre-service teachers are also prone to depression, mental fatigue and mental disorder. Positive Support from the Dept. of Education for teachers to do their best and aiding in support structures assist teachers. There are District Based Support Teams who assist with support, directing teachers to the proper channels. Any pre-service teacher or learner requires love, support, and empathy.

Why was it designed this way? Motivation is guided through the subconscious, and creativity transcends from the right brain. Subsequently, digital literacy and being connected digitally and the 4IR affect the left brain. Therefore, teacherpreneurship is a whole-brained experience. It is a multidisciplinary approach, enterprising and problem-solving in the digital space, but it encourages the Human 2 Human interaction of support, compassion, and empathy. Engaging in special days promotes social cohesion and shared quality time for families and teachers.

TWT 2.2 Implementation

What were the strategies? Socio-emotional learning and mindfulness are two factors for motivation and taking ownership of one's emotions. Preservice teachers were reminded that it was a transitional phase to be studying. They were encouraged to seek professional help if they were conscious of any emotional, mental, or behavioral issues that impacted them negatively. Dealing professionally with mental issues helps to cope better each day. Professional life can strain the person if pre-service teachers are not mentally, emotionally, and physically fit.

How was it implemented? There was an open discussion on the challenges faced by pre-service teachers. I allowed the discussion to flow into addressing their challenges, especially in furthering their career goals. They also mentioned their goals and the reasons for the goal setting. Many felt privileged that they were studying at an institution. They spoke about the stigma of being the only one to study in the family or village, language and culture challenges, and how these descriptors affect their

emotional and mental health. The choice to study above the rest is mainly to raise the family's status and earn an income. Poverty was not an option anymore.

Why was it implemented this way? When pre-service teachers acknowledge a problem, seeking intervention and rectifying the underlying issues is much simpler. I felt engaging the pre-service on their terms with their narratives was essential. However, there are many points that one must consider. How many pre-service teachers are forced to choose teaching as a career because of the socio-economic benefits? How many choose the job because of passion and motivation? How many chose because that is all the career, they can manage to dispel the thought that all students are whole-brained?

TWT 2.3 Reflection and Recommendation

Listening to the narratives in a short space of time was overwhelming. There were too many disadvantages weighing pre-service teachers down even before they started their careers. It resonated with why the drop-out rate was so high, and failure followed. Nevertheless, the psycho-social and socio-economic status bore down heavily on the pre-service teachers. There was untold pressure to achieve and for success. We examine the slides, choices, motivation, and decisions made for a brighter future. It has been a challenging journey thus far. The light that shines brightly is from intervention programmes like the WBCTP. Human libraries are a fantastic strategy for older people like parents, grandparents, and community leaders to share their stories. Storytelling enhances language, literacy, and literature skills.

TWT 3: VAK and Kinesthetic Learning

Your mind and body needs the monkeynastics. You and your learners need kinesthetics.

Exercise mind, body and soul.
Routines in the morning
Tasks and leadership
Role model and parental guidance (en loco parentis)

Be a guardian of honor and respect, of chivalry and gentlemanliness.
Be the champion of femininity and lady-like behavior.

Never forget: love yourself first! The love for other will flow naturally.

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Visual, Auditory, Kinesthetic

- Visual (seeing)**
 - See the teacher and sit in front of the class
 - Think in pictures and learn from visual displays
- Auditory (listening)**
 - Verbal lessons and discussion
 - Listening, interpreting and Read Aloud
- Kinesthetic (moving, doing, touching)**
 - Hands on approach, rather demonstrate than explain
 - Hard time sitting still, best practice is group work

TWT 3.1 Planning

What were the slides about? As Wholistic pre-service teachers, the learners will be wholistic and whole-brained in learning. Pre-service teachers will impart the skill they learned in the time spent with learners. VAK teaching and learning styles are encouraged in inclusive classes and for pre-service teachers to sharpen their skill and resonance with classroom practice because it is a Whole Brain experience. Both pre-service teachers and learners with SEND find this an easier theory to use and absorb in the classroom or at lectures. The learning is visual, auditory, or aural and tactile. Pre-service teachers must adapt to teaching in classrooms where learners have learning challenges. Group work is encouraged, and multi-model techniques for achieving the objectives for each lesson. Older students and younger learners use visual clues for memory. Some love studying and memorizing texts, while others listen and memorize.

How was it designed? The design was based on pre-service teachers familiarizing themselves with multi-modalities of teaching and learning and catering to learners with SEND. For learners and those with special educational needs, those struggling with cognition and memory within the classroom, VAK raises the potential of the pre-service teacher to be agile and adaptable by understanding that everyone responds to resources, activities, content, and cognition in different ways. However, VAK pertains to pre-service teachers as well. If pre-service teachers had learning difficulties at the school level, those problems may not disappear but persist into adulthood. Kolb (2014) and VAK are learning styles. They are also whole-brain experiences because most learners use all three learning faculties. However, there may be brain dominance. That is when learners choose one of the modalities.

Why was it designed this way? Walter Burke Barbe (1979) proposed VAK based on perception, memory, and sensation. Visual learners read, need written instructions, and use visual literacy to retain information. Auditory or aural learners enjoy group work and discussions; they love conversations, oral directions, and instructions, while kinesthetic are students or learners enjoy the whole physical experience. They are the students who enjoy the Arts and sports and are very good with words and actions. They are tactile. The different modalities of learning and teaching are the versatility required in the classroom. The **Cadence of Imperfection** resonates with VAK. Learners with

special needs and disabilities will choose their modality of learning. However, learners with learning difficulties will choose the best modality suited to their learning challenge. Once again, we acknowledge that learners will use their senses and visual literacy for their whole brain processing without looking at perfection.

TWT 3.2 Implementation

What were the strategies? Lack of adaptability from teachers is one of the challenges in schools. With VAK, pre-service teachers will find it much easier to implement a lesson and teach new concepts. One way to improve study methods and memory is by using mind maps. I shall discuss more mind maps later. But as previously stated, visual literacy as a whole brain experience is highly recommended for pre-service teachers in study methods and classroom experiences. We have seen the impact of visuals and videos on pre-service teachers (Therefore, the slide presentation for the workshops) and the difference in perception and retention after the visuals, the videos, and the pictures, which emotionally they relate.

How was it implemented? Using the slides, the level of association and discussion was far greater than offering a lecture. Thus, PowerPoint presentations were chosen as a tool for presentation. The topic was chosen to reflect and encourage different modalities of study and tools pre-service teachers can use in the classroom for teaching and learning. There were general discussions and freedom of speech to express themselves as they wished. At the start of Workshop 3, I reminded pre-service teachers about the importance of being in my presence as a workshop facilitator. The workshop I am offering is a privilege, not a pre-requisite.

Why was it presented this way? Pre-service teachers must be empowered with knowledge. In Chapters One and Two, I discussed the importance of changing the dynamics at tertiary institutions. I also discussed the need for a revamp of thinking and curriculum change. Thus, with those reasons at play, it was imperative to empower pre-service in the first step to knowledge acquisition.

TWT 3.3 Reflect and recommend

VAK is used extensively in the Foundation phase. We fail to understand as part of pedagogy and skill, that VAK can be used for all grades and even undergraduate studies. Failure and the inability to succeed stem from teachers not understanding how to convey the message in the lesson plan. Within our resources, we can use technology, charts, PowerPoint, and many different innovative ways to convey the notification for the lesson to assist learners in understanding. Pre-service teachers must invest in this skill before teaching full-time in a classroom. It may take more effort but the results are astonishing. Using the five senses, VAK, and mindfulness in the classroom creates the setting for whole-brained lessons.

TWT 6: The Whole-Brain Experience in SEND



My Inability is not my Disability

- Learn to accept learners for who and what they are.
- You are the agent of change!
- No condescension, no name calling and no victimization.
- All five fingers are not the same, neither are the children.
- Do not have high expectations or offer false hope. This leads to disillusionment and disappointment.
- It is more difficult to lead a disappointed child than a child who has hope.
- Nurture both the best and the slowest or weakest. Remember the tortoise who won the race?
- Mixed ability groups work if you can cope.
- Your attitude determines a child's attitude and altitude.
- A positive mind-set and environment yields positive results. You were never promised it was going to be easy. Challenges build your character and teaches patience and tolerance. You are the HERO.

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The slide features illustrations of three diverse children: a girl in a wheelchair on the left, a boy with glasses in the middle, and a boy with a backpack on the right. The background is light green with faint, stylized clouds.

TWT 4.1 Planning

What was the slide about?

The slides were about pre-service teachers learning to be facilitators of knowledge rather than desk administrators. They must be active in the classroom as mentors and as support structures for the learners by being pragmatic and innovative. Through growth and development from birth, auditory and kinesthetic learning styles are included. Understanding learned information using different strategies is the objective.

How data is processed and perceived determines the fluidity of learning by reading and seeing pictures. A holistic classroom is a fully functional class where everyone is engaged in learning.

How was it designed? The most prominent challenge teachers have is control in the classroom. Pre-service teachers must take action and be decisive, believe their actions are correct and the best strategy for the learners, and take responsibility for their decisions and actions. Therefore, group work is the most tangible solution for productivity and a whole-brain experience. Minds converge, and there is creativity. Pre-service teachers are the game changers and agitators, and in group work, learners simulate leadership and delegation of responsibilities.

The conscious mind processes all cognitive and mental processes. However, it is the subconscious mind where emotional and higher-level thinking resides on this level. For the WBCTP to succeed and reach long-term memory, the conscious and subconscious levels must connect for the content to be impressive for the paradigm shift. Therefore, they must be prepared holistically to unpack the details in the curriculum without compromising on deliverables. That paradigm shift thus far has been changing the mindset of pre-service teachers in the WBCTP. The content of the curriculum objectives can be delivered in an approach that is best suited to the pre-service teacher whether it is structured or unstructured. However, the style garners the most success and makes the most significant impact that matters.

Why was it designed this way? In their research, VAK learning by Barber & Milone (1981) indicated that individuals demonstrated 30% visual strength, 30% mixed strength, 25% auditory strength, and 15 % Kinesthetic. Furthermore, they have combined cognition with language and found that they impacted the behaviour of individuals. Therefore, the Whole Brain Creativity and Thinking programme proves that pre-service teachers require knowledge of whole-brain learning for whole-brain teaching. The modalities of VAK can be used together or separately, and each pre-service teacher and each learner is different. Showing pre-service teachers video clips of animations helped them conclude that comprehension and processing of information can be done in many different ways.

4.2 Implementation

What were the strategies? Spatial learning refers to the mental representation of one's environment. Therefore, the pre-service teacher's point of reference in the WBCTP and model for themselves and teaching is the importance of holistic learning for a global citizen. Their views and knowledge must include their experiences combined with international knowledge. They cannot afford to be myopic or opinionated with biases without accessing the global bank of the knowledge economy. Language and literacy must be decolonized and become more Afrocentric. Translating this means including celebratory days where parents and grandparents participate in an inclusive environment. VAK and spatial learning as combined tools are most effective and effective for teaching and learning.

How was it implemented? The five senses and VAK assists teachers in being holistic and socially emotional. The fight or flight mentality steps into the mindset. Escape the rural background and become modern and urbanized or stay within the rural backdrop and build and develop what is unavailable. We asked pre-service teachers to create literacy games for the class e.g., grade 2 learners. Spatial learning includes games learned from the past and the present, accessing memories, problem-solving skills, accessing the repository of long-term and short-term memory, and using both the right and left sides of the brain. They could combine previous knowledge within the programme of using the five senses with VAK and spatial learning.

Why was it implemented this way? Evaluating the silent response from pre-service teachers, they had yet to be exposed to the various learning modalities. The discussion revolved around taking for granted thinking and learning, growth and development from birth to adulthood. We take for given the environment, tradition, and culture but, we do not resonate with them and our knowledge as we grow older. A socially and emotionally aware pre-service teacher or learner must be self-aware first and then confident. The subconscious mind stores every experience. The pre-service teachers experience within the programme and their actions will impact on their teaching career.

4.3 Reflect and recommend

The WBCTP is intended to inspire visioners and Imagineers but, it is also designed to create a mindset of profitability for teacherpreneurs not just in monetary terms but the intrinsic profit of satisfaction of accomplishment. My observation and interaction through discussion revealed the mentality of limited belief and travelling the path of most resistance. Pre-service teachers are socio-genetically led to believe that they cannot achieve due to language barriers, poor socio-economic conditions, and a limiting mindset, and they live it. It took these three workshops in the WBCTP for them to understand that their thoughts create their reality and subject them to limited belief. The opportunities are limitless. All they need is someone or something to show them the light, make them believe that there are achievable dreams and goals, and guide them through them.

TWT 5: Five Senses



TWT 5.1 Planning

What was the slide about? There are five senses represented. Pre-service teachers discussed their feelings of pride when complemented by guardians or attending award ceremonies with family and the emotions of inspiration and motivation to aspire to greater heights. The praise they received was an affirmation. The whole brain experience of the five senses is the interaction between senses. This interaction with

each other influences each other. They also complement each other e.g., the scent of an orange, the taste, and the colour. Senses are subjective and very active. Senses have neural pathways to the brain and very noticeable properties.

How was it designed? Our perceptions are affected by culture, context, attention, learning, and context. Perception is interaction and learning from the environment meaningfully, purposefully, effectively, and affectively. Thus, perception is very active and objective. The five senses raise awareness of being present and active participants in every body process. It is an integrated system with different domains and neural pathways to and from the brain. In a classroom, the teacher and the learners must be fully encouraged with all five senses. Pre-service teachers must engage with the following which they did with the tasks in the programme: group work for discussion, colorful charts, presentations on display, written assignments, and audio/visual presentations to encourage the use of all senses.

Why was it designed this way? Creating the awareness of sensory perception and response is an integration of whole brain experiences. If we examine the brain in its entirety, though it is not the purpose of this study, the effect of the senses is connected to all parts of the brain and all four domains in development, creating a whole brain experience. Feelings are not experienced in isolation. It is an active practice to be encouraged from grade RR, and their importance is mentioned subliminally to learners.

5.2 Implementation

What was the strategy? I encouraged them to close their eyes and describe their taste, touch/feel, smell, biting into a lemon, and reaction to the taste. Then they described the taste, the feel, and the response. Experiencing a process is the best knowledge acquisition.

LHS of Brain	Biting into a lemon And the response		RHS of Brain
Rational	D1: Analyses the taste, feel, smell, bite	D2: Takes the risk	Experimental
safekeeping	D4: Decides to bite	D3: emotions	feeling

Figure 19. The Four Selves Model by Herrmann as a practical example (1996, p.21)

How was it implemented? The video was an example of technology in the classroom and different interventions for pre-service teachers. It also conveyed the message with little conversation; however, I took the liberty of engaging them in subliminal messaging. I have discovered that pre-service teachers must use their full ability to identify their strengths. They must be constantly reassured of their abilities, talents, and potential. This is having to limit beliefs and poor self-esteem. By indicating the five senses and asking them to train, they have understood the awareness of the five senses in everything they do have. I have raised the issue of enunciation and pronunciation. For the audience to hear, instructions must be loud and clear. Of

Why was it implemented this way? Pre-service teachers need to understand that it is important for learners to hear and to listen and for pre-service teachers to learn to hear and listen at lectures. Listening skills are essential in teaching and just as critical as speaking. Excellent verbal and non-verbal communication in teaching and learning or objectives cannot be achieved. It is the art of communication. The senses are vital in the support framework of communication. When we 'hear' we perceive, which is a passive activity but, when we 'listen' we respond actively because we are attentive.

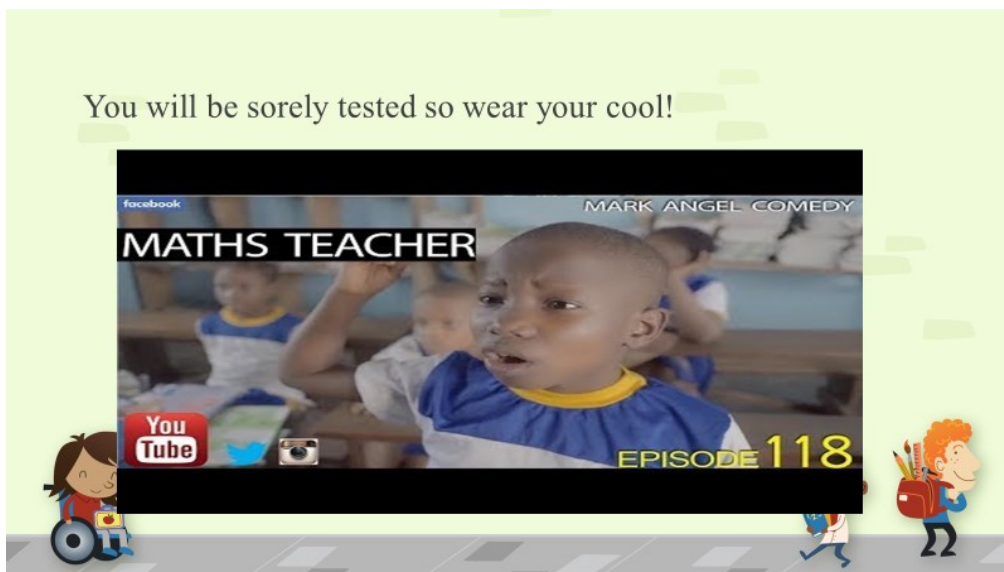
5.3 Reflect and recommend

We need to pay more attention to the power of the five senses. It is a vital part of our daily life and an essential aspect of verbal and non-verbal communication. Non-verbal communication is a tool for discipline. The pre-service teacher does not have to raise the voice or scold any child nor use discriminatory remarks or means. All it takes is silence or a long withering look directly at the child to silence an errant child. It is the art of non-verbal communication which must be learned.

TWT 6: The Punny and the Furious:

<https://www.youtube.com/watch?v=IsaCk4SARPk>

[https://www. Math Teacher 118.com](https://www.MathTeacher118.com)



TWT 6.1 Planning

What was the video about? The video clip on Math Teacher Episode 118 is hilarious. It reveals the lighter side of teaching and learning, but the underlying meaning of the challenges and stark reality of methodology are very painful. It reminds the pre-service teacher of their teaching and learning styles and methods. Most importantly, do we have excellent listening skills, style in delivery of the lessons, the lesson plan, and the

objective and outcomes which are most valuable? Are we speaking the same level of English as the learners? Checking if the objective has been attained after every lesson is vital in moving on to the next lesson. If objectives have yet to be attained, different interventions must be used to achieve the objective.

How was it designed? The video also reveals mindfulness and emotional intelligence humorously. Learners can bring out the best or the worst in any teacher. How prepared are pre-service teachers to handle these challenges? I raised the issue of tolerance and respect in the classroom. Vicarious experiences, as explained by Banduras (1996) are not only about positive experiences but also about learning to deflect from bad experiences whether one views them or experiences them. Therefore, the WBCTP and model were created to improve the versatility and adaptability within the classroom through pedagogy and methodology for pre-service teachers. It is most notable when the learners try to point out the teachers' folly but even more painful when the teacher realises that the lesson was not at the level of reception with the learners. Referring to Bloom's taxonomy: Was the task created at the right level? Did the teacher evaluate the lesson content according to the grade of the learners? Did he analyse or link it to other lessons? How did he apply it, and why did he use it that way? Did he understand, the children did not understand. Did he remember to define the terminology and then remember that the children required VAK?

Why was it designed this way? Technology is an essential tool. However, the teacher could use other modalities to enhance the lesson when we view the rural setting, the lack of remediation, the socio-environmental impact, and the psycho-social impact. Did the teacher understand his learners and his classroom, or was he only doing his job and not his profession? The video was presented to raise many questions that tickle the pre-service teachers' minds. How smart are our children, or do we underestimate their intelligence? And how foolish are our teachers who can be questioned about their training? Is training skills based or is it only academic? Bandura (1996), in his social learning theory, discusses the four sources of self-efficacy as vicarious, mastering experiences, verbal persuasion, and physiological and affective states. He explains that attention, retention, reproduction, and motivation influence observational learning.

6.2 Implementation

What was the strategy? Every pre-service teacher laughed and engaged in an animated discussion with the other pre-service teachers. It is very much laughing at themselves. Experience is the best teacher, even if it is a digital reality. They identified with the scenario because they had indulged in it at some point in their schooling career, i.e., fooling or undermining the teacher. Now imagine the learners doing the very same to them. How would they feel? What would they feel, and why would they feel that way? I raised emotional intelligence and mindfulness in the classroom.

How was it implemented? They talked about fooling teachers, driving them to frustration, and one student even discussed how he had stolen his teacher's English textbook to learn and master the language. The observation from the preservice teachers was understanding the position of the teacher as they understood the learners. They realised that if they were not self-aware and had no positive self-image, with the recent challenges in schools, it would be very difficult for them to be professionals. Professional development includes intrinsic growth and self-awareness. Professional development significantly contributed to their staying power in the field and learning. We discussed their feelings if they were the teacher. They analysed their feelings and explained their inadequacy, especially as pre-service teachers, because of pressure from the curriculum and the different phases of teaching and learning. Sometimes a previous grade has not imparted the tools to the learner, making the next grade difficult to cope with.

Why was it implemented this way? An intelligent teacher has thoughtful planning and knows how to be versatile and adaptable. Remediation is also a tool to be used regularly in lesson planning. Technology is a lucrative intervention from the Dept. of Education and schools are provided with the resources. They must learn how and when to use it. If pre-service teachers felt empathy for the teacher, what were their responses to the learners? It was even more hilarious because the pre-service teachers felt that the learners were street-smart even though they did not understand the lesson. For pre-service teachers, it was about making the teachers a fool. Whether the children had basic needs escaped them was also raised as some of the school challenges. Most significantly, grade-appropriate content when teaching is of the utmost importance. It is about layering, as they had learned in Imagineering.

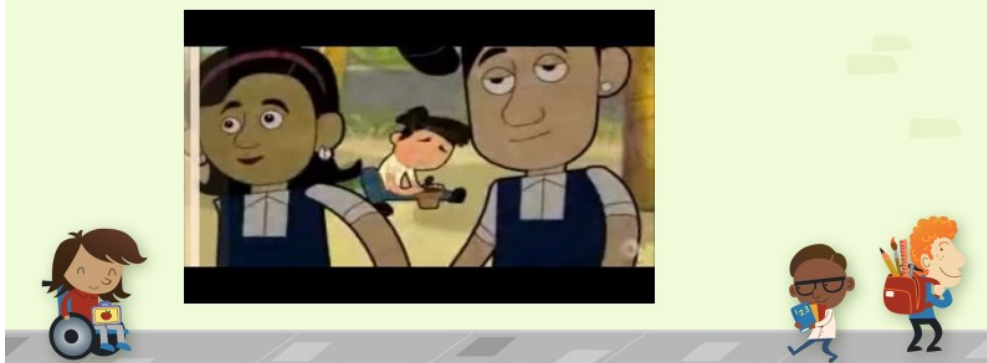
6.3 Reflect and recommend

This video raised many pertinent questions on human behaviour and psycho-socio-environmental awareness. Support structures and remediation are knowledge enablers. Ownership of one's profession, and knowing the syllabus and content brings passion and love for the children being taught and the subject. Dissociation and believing that teaching is just a 'job', leaves one frustrated and devoid of compassion. Roots are discarded, and teaching becomes lonely and a struggle. This is the matter in all professions. Pre-service teachers must be taught skills as undergraduates. Transformation in pedagogy and methodology is a valued precursor for visioners and teacherpreneurs.

TWT 7: Corporal Punishment

<https://www.youtube.com/watch?v=aEbhSsbWL3Q>

Corporal Punishment disempowers you. It takes away your dignity and leaves the child as the victor because that child could manipulate your weak points. That child will remember your stressor and always repeat the offending behaviour.



TWT 7.1 Planning

What is the slide about? The topic of corporal punishment is the most evocative issue. It is a highly debated topic. However, the pre-service teachers' experiences dictate whether they are pro-corporal punishment or against it. The Bill of Rights within the Constitution of the Republic of South Africa, the South African Schools Act, and the recent Basic Education Laws Amendment Bill explicitly prohibit corporal punishment. In the Abolition of Corporal Punishment Act 1997, no person may use corporal punishment, and if such a person is found guilty of the offence, they will be prosecuted. The topic of Corporal Punishment, as presented in the video, raised many issues of WBCT. Firstly, it affected and effected emotions, and secondly, the choice of punishment.

How was it designed? I knew this topic was a sore point, but it must be addressed. Human behaviour sometimes is unpredictable, as we have seen in the previous video. Therefore, punishment is both emotional and divergently based on past experiences, present circumstances, and the outcome of dispensing punishment for such behaviour. In the social learning theory, when a bad deed is punished or chided, the observer will not repeat that behaviour. Even if they do, they do it knowing there is accountability. It was designed to remind teachers of controlled and uncontrolled behaviour and that schools must be safe spaces for children. Pre-service teachers were reminded of their EQ and mindfulness in professional development. I wanted to see and hear their responses as pre-service teachers. In a previous workshop, they learned about socio-emotional learning. How did watching the video and messages impact them?

Why was it designed this way? Pre-service teachers spoke about their experiences and how they found corporal punishment. It was abhorrent. They had experienced it, and we discussed our experiences together in a very holistic but emotional manner. We all did not have good experiences, and as the facilitator, I empathized with them, talking briefly about my experiences. The experience could have been more pleasant. I wanted them to express their displeasure, understand why it is banned, and why we must never allow ourselves to be weak in submitting to anger or feelings of unmet needs. We all have triggers. Ineffective teachers allow those triggers to be released.

7.2 Implementation

What was the strategy? From previous workshops in the WBCTP, I wanted the pre-service teachers to reflect on what they learned in their responses. It was clear they agreed ‘NO, to Corporal Punishment’. I pushed the topic even further and asked if they tested how far their patience can last, whether they are in control of their triggers, and whether they had examined their stressors. Pre-service teachers have emotions, and they have a tolerance meter too. If their tolerance had not been tested, how would they know their choices and response when triggered? The impact of corporal punishment is emotional, social, and mental.

How was it implemented? We discussed from their previous experience and the video that corporal punishment may not have facilitated their behaviour change. It suppressed a particular pattern of behaviour for a while, but inherently the misbehavior was repeated. Some were emotionally and mentally scarred. Sometimes, it was not very pleasant for the teacher. There were various suggestions. However, our point was, ‘No to Corporal Punishment’! It raised the issue of professional misdemeanor, and one’s professional status is at stake. Once again, pre-service teachers were reminded of mindfulness and emotional intelligence inherent in classroom management.

Why was it implemented this way? Teachers were bound by the South African Council of Educators Code of Conduct (SACE). The video is vivid and impactful. It has the right message, and the collage creates emotional, mental, and social impacts. The statements were provocative and thoroughly explained. It also warns teachers to abide by the code of conduct and not to jeopardize their careers.

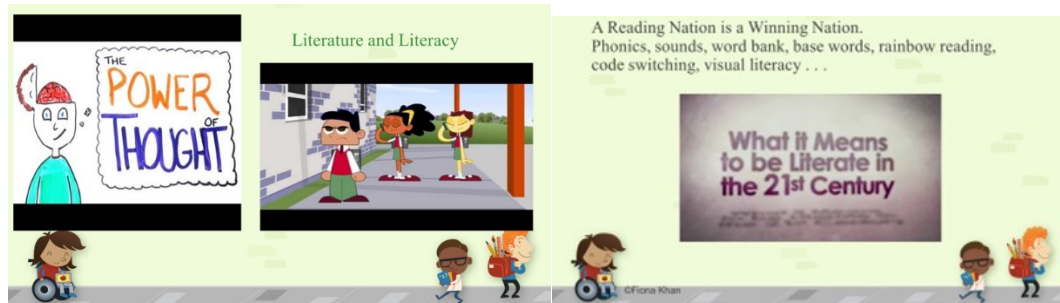
7.3 Reflect and recommend

Speaking of punishment is emotionally challenging. Discipline in schools is very stressful. So how do pre-service teachers cope? Therefore, as stated earlier, one must be emotionally, mentally, and socially strong and a figure of authority. Non-verbal and non-physical discipline is far easier and safer than losing control.

TWT 8: The Power of Thought: Literacy and Language Development

<https://www.youtube.com/watch?v=QVgH8WkW6Bs>

<https://youtu.be/8ET4R0jApKY>



TWT 8.1 Planning

What were the slides about? The Power of Thought and What it Means to be Literate in the 21st Century are videos on literacy. They make compelling content on the importance and the relevancy of literacy and the use of the imagination. ‘What it Means to be Literate’ is a MOOC, an online course. Pre-service teachers requiring furthering their knowledge can, through a mixed reality, for pre-service teachers to excel. However, the message for pre-service teachers was unambiguous, literacy and literacy skills are invaluable and require intervention at the earliest opportunity.

How was it designed? The Arts illustrate STEAM principles in creative, innovative, and imaginative ways within the STEAM framework. A combination of the four cycles and the tasks given to pre-service teachers come together in synchronicity for a whole-brain experience within the WBCTP and model. It becomes an opportunity to use art as an expression through music, art, dance, literature, and poetry. There are communication and language skills, expression of ideas, and the use of colour. Language, literacy, and literature are essential skills for reading, but learners can use pictures for literacy or storytelling instructions. A Reading Nation is a Winning Nation is a reading campaign issued during the presidency of Nelson Mandela. It was a resounding success in establishing the foundation for literacy and language skills and raising the importance of reading and literacy in South Africa.

Why was it designed this way? Phonics, sounds, word banks, base words, rainbow reading, code-switching, and visual literacy are terms for pre-service teachers to be familiar with. Early literacy skills are essential for reading and writing, and communication. The videos are an introduction to the importance of reading. Pre-service teachers watched the videos to familiarize themselves with literacy skills in making reading a positive experience. Literacy skills included storytelling and the importance of VAK. These slides combine all they have learned for a whole brain experience teaching reading. The different theories from Rodgers, Piaget, and Herrmann indicate a holistic, whole-brain understanding of literacy.

8.2 Implementation

What was the strategy? The videos had extensive details on literacy, its importance, and the repercussions of not starting early intervention literacy skills. Every pre-service teacher must empower themselves with literacy skills, for there will be a grave injustice to the learners if they are not empowered with language, literacy, and literature. By introducing technology, vicarious experiences, and videos into the workshop, pre-service teachers could see how effortless this tool is for teaching and learning.

How was it implemented? Videos and robust discussion. Included in this session was the task of storytelling. They had to prepare a story or a poem. Many pre-service teachers chose a story and wrote their own stories. It was presented after the last session in the workshop.

Why was it implemented this way? Including technology as an instrument of change was a vital contribution to the intervention in this session. Pre-service teachers can use various intervention means to enhance lessons irrespective of grades. The main idea is to break learning barriers and ensure learners enjoy a holistic learning experience. Experiencing the workshops is a vicarious experience in self-efficacy. They can assess and judge their own experiences by enhancing their experiences or changing them into new experiences. Bandura (1994) discusses observing other people's performances and experiences to improve self-efficacy. Including learners with SEND and VAK for a holistic experience is going the extra mile to prepare lessons that support and inspire learners to be in classrooms and not abscond, to make learning an enjoyable experience.

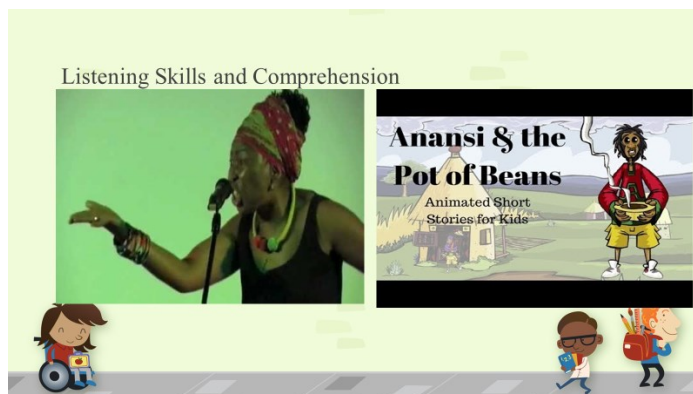
The joy of being with peers and working in groups must expand the learners' experience, curiosity and knowledge beyond what they presently possess.

8.3 Reflect and recommend

As I conducted the topic with the pre-service teachers, it showed how they can extend the lesson into the classroom by self-efficacy. They can model my successful experience or through imagery. These lessons in skill, knowledge, values, and attributes through example are the only tool for a virtual classroom experience. They must feel, understand and comprehend the efforts, experience, and passion of being a teacher to grapple with their experiences with teaching practice and as professional teachers. The virtual reality world can be simulated through secondary backgrounds and vicarious experiences. What impressed them most was my command of the English language, and they wanted to experience and learn the same level of proficiency and understanding. Only through reading and more reading can one command such language.

TWT 9: Storytelling

<https://www.youtube.com/watch?v=2td7unrOX1Y>



TWT 9.1 Planning

What was the slide about? The art and skill of storytelling were best introduced in a video by South African storyteller and writer Gcina Mhlophe. She mastered the art of storytelling in many languages. Pre-service teachers were trained to Gcina Mhlophe's expertise as a precursor to presenting their stories after our final workshop. They were enthralled by her confidence and natural ability to entertain. The song and rhythm in storytelling add vibrancy and mental imagery to the spoken word, where the imagination is set free to explore images captured by the spoken word. The main point was language, literacy, and literature in inclusive classes. Pre-service teachers have many barriers to learning and achievement: low confidence, poor access to quality education and educational resources, language barriers and lack of skill. The WBCTP was created to minimize those barriers.

How was it designed? Pre-service teachers were keen when introduced to themes and word banks to build vocabulary and use VAK. As Gcina Mhlophe did in storytelling, they were encouraged to use code-switching between indigenous languages and English. The videos gave them a greater understanding of using the skills and framework of language, literacy, and literature. Audiobooks are also vital as they build imagination and strengthen aural skills. Storytelling is one of many options for the classroom. To reflect on Charlie and the Chocolate Factory, a Disney movie, discusses machinations and introduces us to artificial intelligence. The respect is for the development of time development literature based on the layering of Imagineering. There were times in literature when Gcina Mhlope worked tirelessly to conserve the rural identity. Her storytelling prowess came from practice and being a proud African as she vividly captures Africa in setting, music and folk tales. Our pre-service teachers and learners must write and continue writing their narratives in diaries. They must conserve the Africa they dreamed into Africa re-imagined with the vines still touching the roots. Storytelling can help bridge this gap by exposing pre-service teachers and future learners to rich and varied language in engaging and meaningful contexts. Children can learn unfamiliar words, grammar rules, pronunciation, and intonation by listening to stories. In the workshop, pre-service teachers practiced language skills, expressed their thoughts and feelings, and enhanced their creativity and imagination by telling stories.

Why was it designed this way? To re-affirm the necessity of literacy skills. Research has shown that literacy levels are at their lowest. The most significant cause, experts say, is a need for more access to resources, including reading material and books. Professor Mary Metcalfe, CEO of Programme to Improve Learning Outcomes (PILO) in 2019 mentioned that 78% of South African children in grade 3 still cannot read for meaning. In 2021, the Progress in International Reading Literacy Study, eight out of ten South African school children struggle to read by age 10. Considering the low literacy rate, what is the level of our pre-service teachers? And when they go to different schools on the completion of their studies, what will the literacy rate be then? Intervention and tools of intervention must start immediately to alleviate the problem systematically. Literacy speaks of reading, writing and understanding in all learning areas. Storytelling is a means of communication. We have used it to preserve culture, transmit knowledge, and inspire action. Storytelling in Language Development introduces unfamiliar words and concepts and helps them practice language use and understanding. It helps to improve literacy skills by teaching pre-service teachers and learners story structure and sequence and how to read with expression. An enormous gap in language ability limits academic success.

9.2 Implementation

What were the strategies? Literacy Development is the primary objective which is the ability to read and write effectively. Literacy skills are crucial for academic success, personal growth, and social participation. There must be passion and motivation. Storytelling inspires reading and writing in children by making it enjoyable. Stories can capture the pre-service teachers' attention, spark their curiosity, and stimulate their emotions, as with children. Characters, setting, plot, conflict, resolution, and theme are the basics of storytelling. By understanding sequencing and structure, children can become better readers and writers. And there is hope and motivation for the pre-service teachers in developing and building on literacy skills. Socio-cultural Theory by Vygotsky (1933) encourages social interaction and language engagement for learning or learning without assistance, with guidance or mentoring or learning in collaboration with others, e.g., peers or group work, i. e., **Zone of Proximal Development**. Vygotsky (1933) expostulated that children learn from culture and mentors and then adapt to current situations. This theory was applied to pre-service teachers in the context of

language and literacy as essential skills to master, not only for their own academic and professional development but also for the benefit of their future learners. Language and literacy are essential for pre-service teachers, and how they can enhance their language and literacy skills through various strategies and resources.

How were they implemented? Multiliteracies Theory is a whole brain process that encourages pre-service teachers to examine their life experiences. Pre-service engages critically, cognitively, emotionally and creatively. The modalities include visual literacy, spatial and digital media and VAK. Pre-service teachers can contribute and construct knowledge with different modes and sources. Multiliteracies include three characteristics:

- 1) Principles and practices of education.
- 2) Psychological approaches.
- 3) Higher order thinking.

The theory acknowledges the rapid changes in technology and globalisation that have transformed the modes and mediums of communication and education in the 21st century. It proposes a more inclusive definition of literacy encompassing print-based, digital, visual, audio, spatial, and multimodal texts. Selber (2004, p. 22) “The key is for teachers to develop a disciplinary approach ... that is generative and directive.” Pre-service teachers must develop their multiliteracies skills and foster them in their students through, e.g., storytelling. Pre-service teachers and children cultivate critical thinking skills like inference, analysis, evaluation, and synthesis. By asking questions about the stories, they hear or tell; they learn to think about the meaning and message of the stories. Social-emotional learning is enhanced, and mindfulness is significantly increased through morals and ethics. By comparing and contrasting different stories or genres, pre-service teachers can learn to appreciate the diversity and complexity of literature. Vygotsky (1933) speaks of culture contributing to higher forms of mental activity; thus, storytelling is also a way of preserving our history and heritage, where we come from, where we are, and where we are going. Stories record our past events,

achievements, struggles, and lessons and transmit our traditions, beliefs, customs, and values.

Why was it implemented this way? The multiliteracies approach shifts the focus from the teacher as a mentor to active learning through prior knowledge and experience in avenues that allow for their expression. The multimodal tools for communication allude to pre-service teachers being multiliterate. However, there must be no distractions. As I have demonstrated, taking one slide at a time and one theme or topic must be practiced in the classroom with patience and tolerance. Each theme or topic must be focused and specific for each lesson to reach the required outcome in the inclusive class. This reminds us that we do not have to stream in schools but empower with whole-brained teaching in classes. This has been proven through the code-switching in languages, the blending and the cultural influences on language, literacies and literature and the attempt to adapt to the understanding and use of technology. Storytelling is the foundation of literature, a skill learned, practiced, and shared. The five senses are active and significant in imagination and creativity. It's a celebration of joy and remembrance of changing societal demands and needs. Pre-service teachers need a high level of language and literacy skills. Pre-service teachers must comprehend, analyze, synthesize, evaluate, and communicate information from various sources and disciplines. They must design, implement, and assess effective instruction that meets their students' diverse language and literacy needs.

9.3 Reflect and recommend

Language and literacy are the foundation of learning and teaching in all subject areas. and the tools for professional growth and collaboration. Pre-service teachers must engage in critical reflection, inquiry, research, and dialogue with their peers, mentors, supervisors, and other stakeholders. Vygotsky (1933) encourages the culture and heterogeneity of different social environments, experiences and skills gained thereof. They can articulate their beliefs, values, goals, and practices as educators in various settings and formats. Language and literacy are the means for social justice and empowerment, and their professional development is enhanced. Pre-service teachers must know language and literacy's social, cultural, historical, and political dimensions. Engaging in SDG 11 of inclusive societies and embodying the spirit of ubuntu and Man

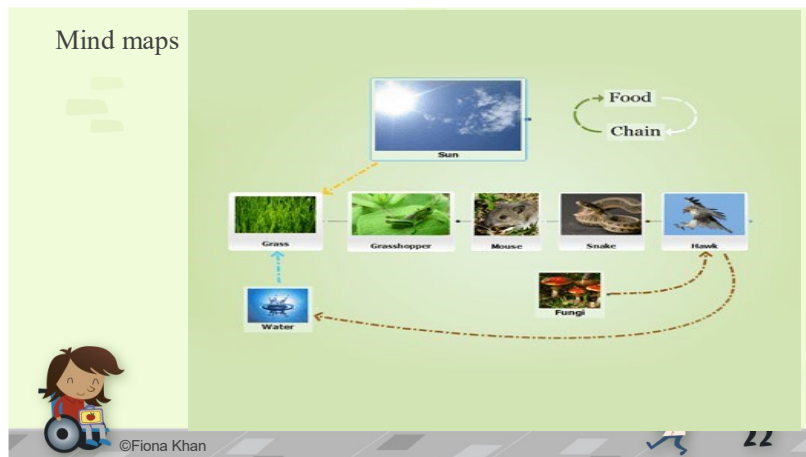
cannot exist in isolation. Pre-service teachers must advocate for themselves and their students regarding language and literacy rights, access, equity, diversity, and inclusion. Pre-service teachers can enhance their language and literacy skills through various strategies and resources e.g., Reading widely, writing regularly and purposefully, speaking confidently, listening actively and attentively, and using technology effectively. They must participate in professional learning communities that foster language and literacy development and explore various theories, frameworks, models, approaches, methods, strategies, techniques, resources, and language and literacy education standards. Most importantly, when pre-service teachers present a lesson, they present themselves, and their passion for their profession shows in their creativity and innovation.

Anansi and the Pot of Beans

<https://youtu.be/Sau3E2LEfcl>

Whereas Gcina Mhlophe tells oral stories, there are different styles of storytelling. The story of Anansi and the Pot of Beans is an example of animated storytelling. There are many resources for storytelling and reading stories. There are libraries, human libraries, digital and mobile literacies, and many organizations and publishers offer books in different languages. Pre-service teachers were encouraged to compile a portfolio of stories and pictures, videos, and audiobooks for future reference. The same can be done for the Senior and FET phases in schools where learners can access resources based on their prescribed texts.

TWT 10: Mind maps



TWT 10.1 Planning

What is the slide about? Mind maps are visual representations of ideas and thoughts stemming from one main idea. It is a skill and a whole brain activity of logical thinking with artistic flair—an essential skill for explanations, helping in comprehension and storytelling. Mind maps clear the clutter in reading, writing, and comprehension. However, mind maps are primarily used to teach writing skills to learners, to keep their ideas coherent and their thoughts logical. All information is presented graphically as a visual representation of ideas around a central idea or theme. It is also a tool for summarizing, creating stories, and creating links between ideas.

How was it designed? Pre-service teachers were asked to doodle an illustration. The keyword or theme is in the middle and the threads of unwinding from the theme connect ideas to the middle. It resembles a spider's web or a branch or sunshine. Mind maps are an excellent memory tool for understanding and retaining knowledge and information. It unclutters the confusion from reading copious texts and is most effective with learners with SEND. It is also designed with the 5Ws and H concepts, making it much easier to comprehend and answer questions in English Language. I mind maps helped organize information in the human brain you have mind maps to track information, present information and to organize it as a timeline.

Why was it designed this way? Most learners and adults have cluttered minds. Drawing mind maps is a whole-brained activity. There is divergent thinking, including the artistic flair of colours and pictures. Pre-service teachers, like learners, are

bombarded by the information highway. Unpacking or sieving through information is mainly for clarity, visualization, decision making, and note-taking. It is used for revising, clarifying, brainstorming, and strategizing topics. With mind maps, thoughts and ideas are coherent.

10.2 Implementation

What were the strategies? Pre-service teachers had to come up with a central idea. They drew an image of the mind map. They were allowed to use coloured pens to colour in or draw pictures. They created branches and connections from the main drawing working from the main drawing using extensions regarding six sub-ideas. They could use pictures instead of thoughts from the central idea. The six ideas were for six paragraphs. This was a fun way of learning, creating and remembering. The mind map is also called a spider diagram, popularized by Tony Buzan (1974). Mind mapping techniques are brainstorming, task management, analysis and structuring.

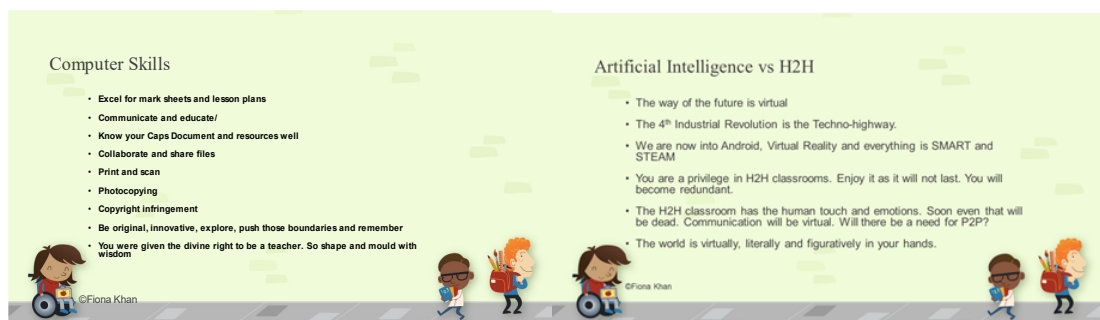
How was it implemented? A central idea was given. E.g., Bullying. They chose six ideas they wanted to write about Bullying. The ideas were varied, and there was commonality. The purpose was to get them to practice and to be sharp-witted. They were also given a time limit of five minutes. The time limit was intentional as a whole-brain exercise for quick thinking and recharging their creative side. It was equated to a lesson in class. If learners are struggling with comprehension, an excellent way to focus and concentrate is to create a mind map on the interactive board or on their iPads. This technique helps learners with special educational needs and those who struggle with literacy.

Why was it implemented this way? Mind maps are an excellent intervention in schools. It is also highly effective in the Senior and FET phases because learners struggle with comprehension and the literature they are compelled to read. However, it is very effective for pre-service teachers as well. In my research, mind maps were the best technique to capture ideas quickly. In design thinking, the initial ideation can best be captured with mind maps. Write as many ideas as possible and then edit with the process of elimination to that idea which is mostly irrelevant. Mind maps are similar.

10.3 Reflect and recommend

I love mind maps for my ideas in design thinking and planning. I found it most effective when planning the WBCTP. It is the most effective tool of focus and concentration and in unpacking information. My recommendation to the pre-service teachers was to practice note-taking at lectures using a mind map. At school, especially with higher grades and as we encountered the 5Ws and H, mentor the learners into using these tools to make learning more accessible and efficient. Efficient because it avoids confusion, and mind maps allude to coherent, logical thinking and unravelling information

TWT 11: Computer skills



TWT 11.1 Planning

What is the slide about? Pre-service teachers must have computer skills. We have traversed the digital divide. We are now into blended education. The future is about technology in education and changing paradigms and modalities in different forms of teaching and learning. Computer skills narrow the digital divide and the metaverse. Artificial intelligence is machine learning. It is used extensively in Imagineering. Pre-service teachers must practice the skill of planning and professional development at undergraduate studies. The slide raises a few basic tasks expected by every teacher daily. Computer technology is the cornerstone of connectivity in education, business, sustainability, STEAM, and social-emotional learning. A human-centered design focuses on real people, like pre-service teachers who create and innovate expressly for learners and schools. Human 2 Human contact is becoming superfluous as machine learning is blended learning.

How was it designed? The Metaverse is a human-centered fictional universe on the internet. It is digital, 3D, and virtual. Examples of the Metaverse are Social Media sites, artificial reality and virtual realities, and video games. Humans can experience a virtual immersive life estranged from the real physical world. It is artificial. But the computer has become our handy carry case for design, storage, communication, etc. *TechTarget magazine* (November 2022) describes the metaverse in the computer industry as the “next iteration of the internet”. If pre-service teachers want to stay ahead of their teaching and learning, they must know the latest computer technology language and at least the basics of software and its application. The more one loves, owns and romances the computer, the more components will become familiar for various uses. With biometrics, the computer can now adapt to the style and the smart connection between machine and man.

Why was it designed this way? Every professional must be prepared for the job of the day. A professional by definition of the Oxford Dictionary (2020) is “engaged in a specific activity as one’s main paid occupation”. Pre-service teachers are to uphold the ethos of professionalism and the profession of teaching by ensuring they are always performing at their best. Every learner who passes through the hands of teachers must be impacted and must have gained the most from that experience. Therefore, pre-service teachers were motivated to start planning early by collecting resources and setting routines because planning is essential to success. They were encouraged to use AI in their daily preparation and planning.

11.2 Implementation

What were the strategies? In our discussion, I plunged the pre-service teachers into a cauldron of technology. They sat in wonder at the terms and a new outlet for information. Some were not overwhelmed because they played video and computer games, while others needed help in translation. However, I explained virtual reality in the simple reality of playing house as a child. That is the alternate virtual reality of life. They understood that alternate realities exist just as when children play with their toys there are alternate realities. We also discovered what many implied was ‘a privilege’. Engaging in this financially high-end frivolity was not for everybody and was not affordable. I encouraged planning a mind map for the day and setting it in the class

then, create a checklist for the day. All this can be placed in the class, and learners are asked to assist.

How was it implemented? Computers now use Big Data. Various programs capture class lists, achievement or assessment scores on a computer. A well-organized leader will ensure that the class and professional tasks are accomplished daily. Big Data also captures patterns and can predict learner achievements. This breakthrough is enormous for the progression of children. Thus, the pre-service teacher must be computer and digital and mobile savvy. Windows or Microsoft connects all the devices; any device can perform the required task. It is shared among the different devices. AI is programmed with specific goals. Technology is used to perceive a specific job, assimilate it, and achieve a particular purpose. Much of Big Data is based on AI and the trends fed through data onto and stored on a computer.

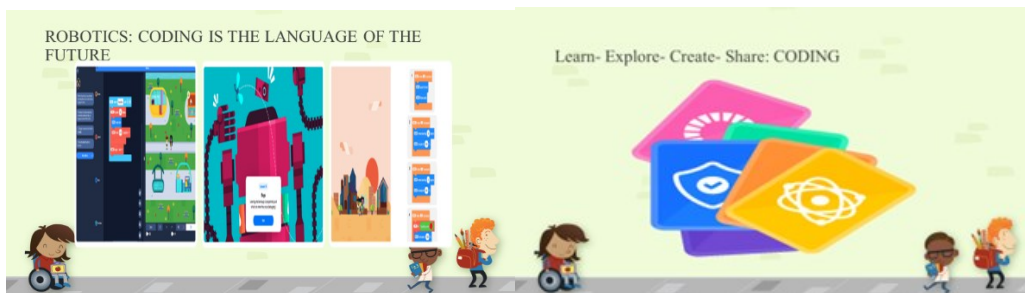
Why was it implemented this way? Administration tasks can be made more accessible at schools and tertiary institutions. It was implemented to raise awareness of being in the knowledge economy. To know everything there is, learn and learn with knowledge and intent. The future of teaching and learning has now become device driven. How far are pre-service teachers prepared to gain understanding and be a source of knowledge?

Further to the AI and Human 2 Human experiences discussion, I redirected the conversation and presentation to Smartphones. Our entire world revolves around our handheld devices. It's the world in our hands. The handheld device is a gateway to the digital information highway and a Whole-Brain Creativity and Thinking system. Women and men can do online shopping, call a taxi, communicate with the children's creche or school, stay informed through search engines, access various applications to stay on par with everything in everyday life, and stay ahead and well informed. Instant communication is one of the greatest inventions through handheld devices. Satellite communication is the most significant contribution to science and technology. Pre-service teachers have access to the same privileges as well. I call it a privilege because information is at their fingertips on the information highway. This information assists with their knowledge and informs their thirst to stay ahead in a digital world. Even education is at their fingertips for research and online courses. Therefore, pre-service teachers must stay informed to inform others.

11: Reflect and recommend

Basic computer skills are essential for pre-service teachers. We are now into Smart technology. Pushing the boundaries for pre-service teachers in Technology and Digital Literacy is an exponentially limitless world. As mentors, we take for granted that the owner of a computer is techno-savvy. That is only sometimes the case. The WBCTP raised the bar on creative, reflective divergent, and critical thinking. For pre-service teachers, the future of working with the Dept. of Education belies the fact that transformation could be faster. There must be passion, leadership and skill cohesion to break barriers and challenge outdated frameworks. Computer Literacy Skills must be included in the curriculum at higher education institutions, primarily because of the discrepancy in socioeconomic structures and status, the literacy skills and levels in schools that are differentiated based on urban and rural privileges.

TWT 12: Robotics and Coding



TWT 12.1 Planning

What was the slide about? Robotics are the use of machines in design and construction to perform tasks done by humans. Robotics are used extensively in the industry, especially in motor vehicles and industries where there is chain management, tasks that are a health hazard or repetitive. In Durban, Kwa-Zulu Natal, we have a massive Toyota plant for motor vehicles. A considerable number of youths are actively involved in robotics in internship programmes. We have previously discussed Kanban, a visual monitoring system that is the Japanese inventory system used just in time to track the production and shipment of materials using robotics. The language for robotics is coding. We encounter Machine learning every day with our mobiles and computers.

How was it designed? The subject raised was necessary for the new coding language with computers for the future and will contribute to coding in the new CAPS curriculum. Robotics and Coding are the languages of the end user. As we touched on before, it was imperative to indicate to the pre-service teachers the change in the requirements for more technology in schools and learning a new language called coding. Coding is the instruction for Robots. Robots read the code and execute it. The most severe factor and concern was whether there could be job losses in the future and the present status of teachers. We now move away from digital to machine or AI learning. They were tasked to ensure the toy they created moved forward, backwards, and sideways.

Why was it designed this way? Pre-service teachers prepared themselves to understand that teaching is multifaceted, multilayered and efficient and has become competitive with robotics in Technology in the classroom. We are transitioning from chalkboard to digital and from digital to artificial intelligence. Participants could use voice prompts and speech-to-text and text-to-speech. They could search the internet using spoken assistance for easy reference. The strategy in the design was to enable ease with technology. Robotics incorporates Design Thinking and Imagineering. Pre-service teachers can dabble in teaching robotics and coding in the future. They must be prepared for it.

Paul Gilster (1997, p. 2), in his seminal book *Digital Literacy*, “As we teach the next generation of Web users about the networks available to them, we are also allowing them to learn a mindset that can allow them to stretch and explore the potential of this interactive medium”. Gilster (1997) discusses merging media and communication to inform and entertain. Belshaw (2012) extended the pragmatic approach by including eight essential elements of digital literacies for positive action. The most fantastic observation was the cohesion of the elements envisioned and created in the WBCTP.

12.2 Implementation

What were the strategies? Referring to Belshaw (2012), the eight essential elements were cultural, cognitive, constructive, communicative, confident, creative, critical and civic. The details have been discussed in the Literature Review and Methodology;

however, pre-service teachers understood texting and Moodles, which they used for studies, Google Scholar, hyperlinks and Web searches. It is not whether teachers can be replaced but whether teachers can upscale their soft skills to include technology. Robots now replace manual labour in the industry and have done so globally. The WBCTP encourages the use of a whole-brained curriculum, and an integral aspect of Robotics is creativity and innovation.

Communication is the foremost of those soft skills with critical thinking skills. Robots and artificial intelligence can perform tasks humans cannot achieve. Alternatively, companies use robots to cut costs on human labour. We should have gone into more detail about the concepts and principles of coding and robotics. However, it raised many questions about the future of education with Robotics and Coding as subjects. The development of systems of robots in some countries has now placed human-to-human contact in jeopardy.

How was it implemented? Social-emotional learning and EQ are critical indicators for Coding and robotics as the language of computers. Have we mastered communication with our learners? How do we include technology and AI now and in the future by increasing self-awareness and being proactive? Belshaw (2012) eight key elements were covered in Workshop 2 under Imagineering and the WBCTP. However, Imagineering and Design Thinking have exploded further as we use the Metaverse, Artificial Intelligence, Augmented Reality, and Digital technology. We are using components of the computer that requires unique coding, a language only computers understand for those specific programs to make it accessible and understandable to humans. Time management among teachers is a criterion in pedagogy and skill. Network building is a vital component of WBCTP and technology use, as discussed in Workshop 2.

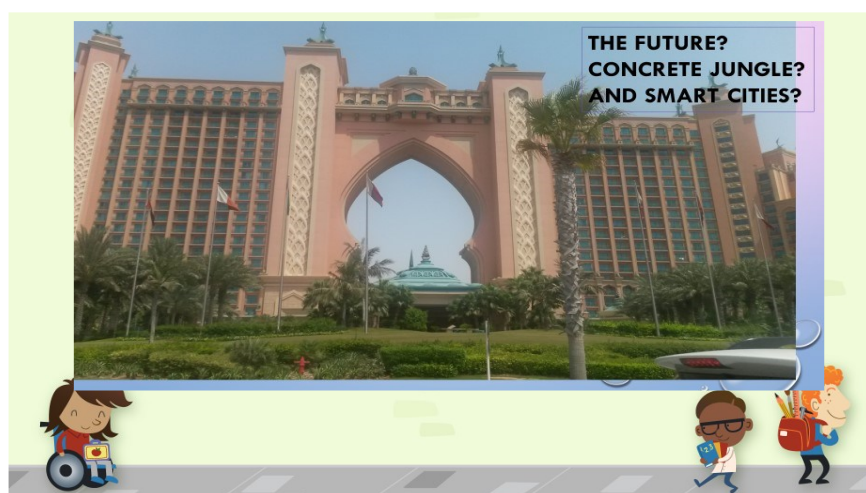
Why was it implemented this way? With the above implementation in mind, we envisaged coding being a significant part of the curriculum in schools. Are tertiary institutions prepared for the transition? What steps have been taken to fill the coding, computer, and robotics niche? These are rhetorical questions answered with time. We envisage a 5G or Fifth Generation of increased performance and a multisensory user experience, but as discussed with pre-service teachers' it is a slow transition. The rapid

rate of tech transformation is different from the efficiency of human empowerment and knowledge acquisition and the change in the mindset of a skeptical population. It starts with structured education in teaching and learning and must begin early.

12.3 Reflect and recommend

The depth of robotics and coding eluded pre-service teachers. This knowledge was not within their capacity or within this time and space. The general expertise was quintessential in feeding pre-service teachers with the ability of the future. They needed to savour it and understand that as much as we need the human touch and emotions, robotics is a huge part of the citizens' daily lives in countries like China and Japan, especially in the workforce, chain management, and home and office. Widening the horizon through divergent thinking, pre-service teachers had to think critically about the future of teaching and learning. It means they have more significant opportunities to explore their choices in education by being pragmatic and rational. An introduction to coding and robotics encouraged an alternate way of processing information because the process is whole-brained. Coding is a logical and analytical process and requires method and analysis, whereas robotics includes the creativity aspect of design and ideation.

TWT 13: SMART CITIES



TWT 13.1 Planning

What is the slide about? Leading the presentation on Technology and Imagineering, we meander on the creation of SMART CITIES. What are they, and why are they built? An example of a Smart City is Dubai. I used my experience from my travels as I was in awe of the technology. From the airports and the facilities to the flights, the city's facilities and transport, the SMART recognition, the intelligent digital applications were very techno-based. People whom the authorities find suspicious are tracked, and all of these movements are in technology using 5G, smartphones and Cyber tracking facilities. Most importantly, they serve the constant movement of people, both tourists and migrant workers or foreign nationals who seek employment within the city.

How was it designed? The other side of the Smart cities as techno-hubs is commerce, industry and tourism. As an international trading centre of intelligent technology, Smart cities must be on par with service delivery anywhere in the world. Their chain management, politically, economically and socially, has to be prioritised to serve the many nationalities who work in the cities. Because of the global reach of citizens, their digital and technological outreach has to be comprehensive. Other countries are Qatar, Saudi Arabia, and many Middle Eastern countries where labour is imported. However, with a mega-economy and global outreach, these countries and their economies of scale must stay ahead of the rest of the world with their digital and knowledge economies.

Why was it designed that way? Acknowledge that our teachers are looking for better opportunities in countries that can provide a better income. Teaching internationally has now become a trend for teachers. Pre-service teachers are assisting with teaching English online and as a second language and becoming teaching assistants. They should be trained as global citizens in pre-service teaching with a worldwide footprint. The strategy we adopted is working SMART. S.M.A.R.T is a mnemonic acronym for Specific, Measurable, Achievable, Realistic, and Timely. However, here we discuss how life changes to suit the change in the environment and a country's socio-political and socio-economic climate using the S.M.A.R.T principles.

13.2 Implementation

What were the strategies? Investments in SMART Cities are huge. The turnover on that investment is exponential because the country is willing to serve its people, so

everyone benefits from the lifestyle. Government benefits from the chain management in parastatals and within the hierarchies are manageable goals and objectives achieved. Thus, project management, employee maintenance and performance management, and government and personal dreams and goals are performed. If South Africa were to develop SMART cities, there would be strategic interventions through technology to uplift the status quo of most South Africans. And South Africa will not be considered a third-world country in its infrastructure. Pre-service teachers were most pleased with this idea, especially for job opportunities and job creation among the youth in the very Afrocentric commercialization of the country.

How was it implemented? As in Design Thinking, the participants were asked to create an abstract Smart City and consider what teaching and learning would be like in Smart Cities. They based their discussion on knowledge gained from previous WBCTP workshops. They created what they wanted in a school and classroom, i.e., futuristic thinking. They created imagery from their right brain of the perfect school and then used the left brain to plan and execute logically. With this image in mind, they understood what planning, dedication, and projection meant. It became the blueprint that if they wanted to see changes, they must work towards it and constantly upgrade their knowledge and skill through Lifelong learning.

Why was it implemented this way? An important reminder was how quickly our world is evolving and revolving. Everything is 'INSTANT'! Expectations, aspirations and exasperations, food, shopping, communication anywhere in the world, and messaging. Time zones have become redundant because of 'Instant'. It is the mindset, the demand of the youth, children, and adults for instant gratification. We discussed the future as a world 'beyond our imagination' because we have cars with water, renewable energy, and electric vehicles. We have flying cars and drones. The scenario of future wars, communication, gamification, industries, and medicine is beyond what the mind can perceive. Space travel and space exploration has emerged as the future of travel for humanity through the ingenuity of Richard Branson and Elon Musk. Pre-service teachers were in awe but were mindful of education changing with the same human capacity.

13.3 Reflect and recommend

We are still entrenched in draconian curriculums and models that have yet to embrace the future. Pre-service teachers highly recommended the Whole Brain Creativity and Thinking Programme for bringing the latest information and for informing pre-service teachers of the potential and possibilities in the mantle of the future. We completed the session with the etiquette in Professional Development.

TWT 14: The Etiquettes in Professional Development



TWT 14.1 Planning

What was the slide about? Professional Development (PD) is an intrinsic and extrinsic process. It is the development of skills to enhance the needs of learners or students and to improve the outcomes of learners and students. Everybody has challenges; however, they should never be limited, nor should they be debilitating. We revert to our previous discussion on self-image, self-development and the improvement of SKAVS. Dedication to the profession is gaining new skills, constant learning and lifelong learning, support and encouragement, and even incentives from the Dept. of Education.

How was it designed? Career management is the most lucrative opportunity to climb the professional ladder. The possibilities are endless. Perspective is invaluable. Perseverance and the art of presence are strategies for Professional Development.

Collaboration and sharing creativity and innovation are the business acumen. Pre-service teachers must know their learning style and design for the full impact of their profession. The WBCTP is an enhancement for their career and PD.

Why was it designed this way? Professional development requires support and encouragement. There must be opportunities and processes to use the mastery of their skill. They must problem-solve, set goals and reflect. This workshop on WBCT culminates in reminding pre-service teachers of the importance of their profession and their upscaling of knowledge and skill impact on learner outcomes.

14.2 Implementation

What was the strategy? The South African Council of Educators (SACE) outlines pre-service teachers' rights and responsibilities. Teachers or educators must translate and adapt change in practice and innovating strategies for a positive and holistic school culture. Continuous professional development is formal and informal. As mentioned, blended and distance learning, MOOCs, workshops, retreats, and peer-to-peer communication exist. It is the student or learner's achievement and needs in education that are the goal. Success for the student or learner is success for the teacher and reflects excellent skill in enhancing the learner's talent or potential. As new teachers, pre-service teachers must have a growth mindset and be willing to mentor future leaders.

What was implemented? Teachers drive change in the education system. Their empowerment is a priority because they know the needs of learners, and they know their classroom. They must participate in interdisciplinary teaching, game changers and agitators in active learning. They are facilitators in the school, and feedback at the end of the lesson is essential for strategizing. And there must always be a PD plan. The topic of PD was covered in previous slides and the previous workshop. However, this is a reminder that after all the technical knowledge and impact, there is time for reassessing and personalising their personal and professional development.

Why was it implemented this way? Improvement in skill, teaching styles, selection of subjects, and broadening the knowledge base by reading and attending workshops are essential in PD. The goals were once again a reminder of the importance of teaching

and learning. They must focus on objectives and personal development. Collaborative learning and strategizing change the positivity of the environment. Skills-based training was encouraged to reimagine, redesign, and realign education in the classroom and with colleagues. Mental health resonates with pre-service teachers and learners. There must be student and learner advocacy and counselling. PD includes seeking professional and medical help when required and being socially and emotionally intelligent to encourage open, practical, and effective communication with parents and learners.

14.3 Reflect and recommend

Taking a profession seriously is the priority every pre-service teacher must actualise. It is the sacrifice of years of study, the dedication to the parents in honouring dreams and the opportunity to serve in the best way possible by educating the future of this country. Mentoring and coaching by teachers are the bedrock and cradle of all knowledge and the contribution to the knowledge economy. If a teacher decides to invest in learners, that teacher has subliminally taken a vested interest in the learner's future. After 14 years of grooming in an institution, learners will be shaped by the energy and knowledge imparted to them by the various teachers or educators. So their mentors holistically nurture future leaders, visioners, game changers, and world leaders. This is a crucial aspect which pre-service teachers must actualise.

7.2 Conclusion

Professional development is the development of a wholistic professional who uses potential, achievement and excellence intrinsically to shape and actualise identities and leaders extrinsically. The Human 2 Human touch will always be needed, and technology can never replace the warmth and emotions of humans. Pre-service teachers' fears were allayed by understanding the Affluence of Knowledge and the Exposition of Integration, including multiliteracies. A professional, when confident, will perform at the very best because of the power of knowledge and the power of the ego. Therefore, intrinsically and extrinsically, pre-service teachers must be whole. A professional who lacks executive skills will always underperform, not only because of a lack of confidence but also because of a lack of self-value and self-esteem - there is no self-

belief. Technology empowers and forces boundaries to be broken. Are we raising the bar to our potential or setting new limitations?

Section 12: CHAPTER 8
 Cycle 4

Workshop 4: The Whole Brain Creativity and Thinking Programme

8. STEAM The Long and Winding Road for a Whole Brain Educator

8.1 Introduction

LWR: 1 Structured Learning



LWR 1.1: Planning

What is the slide about? The long and winding road is a reminder that the life of an educator or mentor takes work. I prefer the word ‘mentor’ because a mentor supervises and advises, showing empathy and mindfulness. An educator instructs learners and tells them what to do. It was important to draw this construct for pre-service teachers to know the difference in the classroom. Taking on the responsibility of being a teacher/ educator is far more significant due to the term *loco parentis*. This means a teacher is acting and standing in the place of a parent as a vicarious responsibility. It is a considerable responsibility in safety, education edification and guardianship. It also adheres to the commitment to emotional, psychological and physical well-being through circumstantial rights. Workshop 4 holistically concludes the four workshops as a structured programme of the Whole Brain Creativity and Thinking.

How was it designed? In South African law, the Bill of Rights allows every child the right to education; however, teachers do not have any rights, legally or otherwise, over the child. However, every teacher must follow the school rules and the rules as prescribed by the Department of Basic Education and the South African Council of Educators (SACE). To counter responsibility, every parent signs an indemnity, thus indemnifying the teachers, the school, and the Department of Basic Education from liability. Pre-service teachers were advised to read their supporting documents carefully when joining unions, SACE and when assigned to a school. Socio-Emotional Learning and executive functioning skills are also crucial for emotional and mental balance in

professional development. A structured approach by pre-service teachers to teaching and learning reduces the margin for error in planning, presenting or imparting knowledge. The programme was structured and designed to formalise it to be adopted by pre-service teachers.

Why was it designed this way? Pre-service teachers require flexibility to acquire skills. They need support and a precedent or exemplar for instruction in a less restrictive environment. The studies are interrelated in the four workshops. The WBCTP offered practical knowledge and guidance with a particular purpose and content. The design precedents the importance of short modules and specific content to engage pre-service teachers with experiential learning. The SKAVS acquired is from the experience of collaborating and creating by pre-service teachers. Active engagement for the pre-service teachers to change is both external and internal. Pre-service teachers are reminded of the Code of Conduct and the principles of a leader and role model.

1.2 Implementation

What was the strategy? Pre-service teachers were asked to familiarize themselves with the various documents required for teaching. This must be an essential requirement as a code of conduct among teachers and for professional development. We need emotionally resilient teachers with skills and competencies to survive in the classroom and among their colleagues. Professional jealousy and competition are real in the workplace. Pre-service teachers require emotional, mental and physical support in the current schooling contexts, such as school violence and aggression. Therefore, intervention and skills must be necessary to stand the test of being within the classroom and build healthy, strong relationships with the learners.

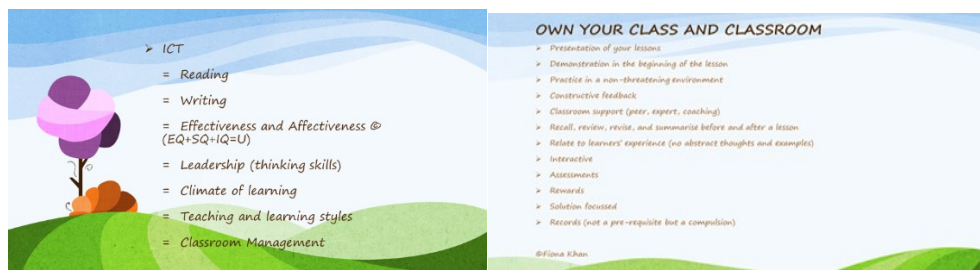
How was it implemented? Pre-service teachers were led into a discussion complemented with information. The Whole Brain Creativity and Thinking Programme and Model were used to guide pre-service teachers' experiences and their teaching and learning concepts. It is a programme precursor to transition in tertiary institutions' methodology and pedagogy for a holistic experience throughout pre-service teachers' careers. Pre-service teachers selected LTSM to guide their daily planning and instructions, create new avenues in delivering the content and achieve specific goals. To achieve success, there must be active engagement and commitment. Success in any classroom is based on blended learning and teaching strategies adopted to achieve only the best. Classrooms are inclusive; learners learn at different paces that suit them. Every learner and teacher must play an active role to achieve success and be positive.

The environment was conducive to teaching and learning. Different strategies must be used to find the best experience for all learners.

Why was it implemented this way? Discussing classroom strategies encouraged a bold inspection of personal choices. The discussion revolved around how they were taught, how they would change, how they were taught, and what they enjoyed about their experiences, which could work in present times. I informed them that future leaders need mentoring, not teaching. Also, instilling learning skills and coping mechanisms in the classroom creates a class of change-makers for the future. The essential tool for successful classroom management is planning. An inclusive classroom is a microcosm of the social environment. As much as we would like all learners to be at their best in achievement, the world is not perfect, and neither is the little world in the classroom. There is diversity and inclusivity, and all children are different. Each child is different and developing at their own pace. I compared it to the hand. A Persian quote says, “All five fingers are not the same”- Nobody is similar, and nobody can be compared to each other.

1.3 Reflect and Recommend: Diversity and inclusivity are two challenges that face pre-service teachers. Inter-racial, different language barriers and learners with special educational needs and disabilities. Believing in the learner, stimulating the potential through encouragement and raising the self-esteem will always make that learner believe that they can accomplish anything and will never stop trying. With believing in themselves and knowing that they are accepted by others boosts their morale in achieving. Pre-service teachers also discussed the importance of being professional at all times. There is the issue of trust in the quadrangle of education among the teacher, the Department of Education, the parent and the learner. That trust should never be broken!

LWR 2: The Whole Holistic Teacher



The graphic is divided into two main sections. The left section features a stylized illustration of a purple and pink flower on a green hill. To its right is a list of teacher qualities and skills. The right section is titled 'OWN YOUR CLASS AND CLASSROOM' and contains a list of classroom management strategies. At the bottom right, there is a small copyright notice: ©Olivia Khan.

Teacher Qualities and Skills:

- > ICT
- = Reading
- = Writing
- = Effectiveness and Affectiveness @ (EQ+SQ+IQ=U)
- = Leadership (thinking skills)
- = Climate of learning
- = Teaching and learning styles
- = Classroom Management

OWN YOUR CLASS AND CLASSROOM

- > Presentation of your lessons
- > Demonstration in the beginning of the lesson
- > Practice in a non-threatening environment
- > Constructive feedback
- > Classroom support (peer, expert, coaching)
- > Recall, review, revise, and summarize before and after a lesson
- > Relate to learners' experience (no abstract thoughts and examples)
- > Interactive
- > Assessments
- > Rewards
- > Solution focused
- > Records (not a pre-requisite but a compulsion)

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LWR 2.1 Planning

What were the slides about? Every pre-service teacher must learn the art of effective affectiveness and executive functioning skills. Words carry meaning and energy when we utter them with intent or indifference. I used my facilitation skills as a skill they are modelling or will model at some point in their career. Our egos are fragile as students and learners, because a lack of knowledge makes us vulnerable. Emotional intelligence is the art of using words to uplift and empower. It is the intrinsic mode of perception for the outward visibility of expression. Literacy skills are the building blocks of any learning area, and basic computer technology skills are most relevant for pre-service teachers. It is essential to consider that technology is now an informed choice, and the teaching and learning climate must be conducive to empowering. The atmosphere of learning alludes to the classroom environment too. Executive functioning skills are accomplished through whole brain processing, which includes classroom management, time management, coping skills both mentally, emotionally and physically and completing each lesson, each task and each day with ease. As there are learning styles, so are their teaching styles. Blended, collaborative and hybrid are some of the teaching styles pre-service teachers can adopt. Skills are learned and accompanying coping skills too. Whether for the teacher or learner, the achievement is reflected in classroom management and pre-service teachers' impact on their learners. As discussed previously, the classroom is a microcosm of society. Therefore, empowering learners to be future leaders through literacy, language, and literature are vital components of leadership and professional development.

The different Teaching Styles:

a) **Learner-centred:** the teacher is a lifelong learner and a teacher.

b) **Cooperative:** collaborative teaching and learning skills.

Group work and working in pairs.

c) **Blended:** online and face-2-face teaching

d) **Hybrid:** Holistic teacher who brings knowledge and expertise into the classroom but still follows the rules and structures of the school and the Dept. of Education.

How was it designed? $EQ + IQ + SQ = U$ is an equation I created in the explanation of defining a holistic human mathematically. The Emotional Quotient (EQ) (heart), or the emotional ability of a person and the cognitive consonance (IQ) (Head), together with the social and spiritual quotient and upliftment (SQ), encapsulates a person as a holistic, whole person. We are beings measured by our emotions and intelligence, social and spiritual experiences to have hope and a purpose. If we measure ourselves against others, we have expectations. Therefore, pre-service teachers must remind themselves that they collaborate best with shared experiences while they are confident in their self-image and self-worth. Working in isolation leads to doubt and demoralizing, especially when low emotional intelligence. Pre-service teachers ought to know Microsoft and Chrome and the different software applications for the future embrace the tech revolution, and learners are quick-witted and technologically enhanced through handheld devices and iPhones. It was imperative to reiterate the importance of romancing the computer and romancing in terms of familiarizing oneself with the device, learning from the programmes, and programming the computer to serve one's professional and personal needs and requirements.

Why was it designed this way? The more we encourage blended and hybrid learning and teaching, the quicker our pre-service teachers and learners will embrace their footprint in a digital world. The reality of unavailable resources, pre-service teachers only receiving their first computer on entering a tertiary institute, or still learning to use the computer through trial and error is a stark reminder of our tragic past. However, the enthusiasm shown by pre-service teachers overshadows any challenges as they are robust and passionate about new knowledge. As mentioned in previous workshops on layering in Design Thinking and Imagineering, workshop 4 is also about layering and a step-by-step process in teaching and learning. In STEAM education, we learn through play and trial and error. Then we must ask why these devices cannot be given to every teacher and learner by the Department of Education in the first step to being in the know and a step into the tech revolution. As visioners, STEAM education is the pathway into the Humanities. We must establish if pre-service teachers can use computers and handheld devices and how advanced their knowledge is, but their lack of knowledge becomes evident when assigned a task. They were

reminded to complete lesson plans, prepare content for class lessons, and research the information that can expand the focus of different topics. Using and exploring technology will widen their creativity, exploration and innovation. While watching my PowerPoint presentations, they thoroughly experimented with their presentations and topics, enjoying a new experience of new knowledge. It was exciting as they used the design thinking principles and always returned to ideation in developing the presentation tasks.

TWR 2.2 Implementation

How were the strategies implemented? Once again, pre-service teachers were reminded that they are instruments of change. Communication skills are most essential and are invaluable in accessing and dispersing information. Reverting to VAK, aural and kinesthetic skills are essential for inclusivity. If we strive to be global citizens, there must be a balance in our personality and spirit and values. Value-based education is based on values that inform social and relationship skills, enhancing academic achievement. This is so because we value, appreciate and offer gratitude for who we are and where we come from. The pre-service teachers should develop the right attitude and values for a character in Emotional Intelligence (EQ), Social Emotional Learning and Ubuntu, Cognitive development (IQ) for global citizenship and Spiritual Intelligence (SQ) for the Self. All of the intelligence embodies a holistic person who is driven by upbringing and the values and ethics shaping their personality, e.g., if parents are respectful and raise the status of women, then pre-service teachers raised in that environment will shape their character based on treating women with respect and dignity and their environment shapes them. Vygotsky's (1996) social-cultural theory reiterates that our cultural background shapes us and will influence how we learn based on cultural differences. This is an essential aspect of a learning environment, and it was a theory I considered when implementing the workshop. He affirms his theory by stating that immersing in professional subculture influences what and how pre-service teachers will think.

How was it implemented? Indulging in Vygotsky's theory, I provided the platform for social integration and learning. Pre-service teachers indulged in collaborative learning. There was a ripple of 'I want to do better' and 'I can do this' or 'Why didn't I think of that before?'. This was an abridged version of **reciprocal teaching and learning**. Therein was the entire concept of whole-brain creativity and thinking. Pre-service teachers explored new possibilities of questioning, predicting, seeking clarity

and summarizing. Their minds were ablaze with information. After three workshops, they were buzzing with new knowledge combined with their previous knowledge. What new knowledge can they create, and how will it be implemented? Their new knowledge was to ride the techno-revolution and business strategies they had learned in the WBCTP and practice them in teaching, learning, and their professional lives. Workshop 4 provided the space and opportunity for pre-service teachers to express their SKAVS and think independently.

Why was it implemented this way? Examining the theory of Kolb's (2014) open-mindedness together with Bloom's (1964) higher-order thinking and Vygotsky's (1996) sociocultural theory have one thing in common: Pre-service teachers will learn from their environment and the facilitator or mentor who made a significant impact on them. They will be guided by the knowledge imparted by their mentors and will be successful in their transcendence of values and beliefs. As Vygotsky (1996) claimed in modelling, they have been transformed by attention, perception, sensation and memory. Executive functioning skills affect pre-service teachers, and it affects learners too. Modelling is an active process in every classroom; therefore, pre-service teachers must learn the art of preparedness through the workshop. SEL assists and supports pre-service teachers in their studies and development; it is the basis for teaching and learning.

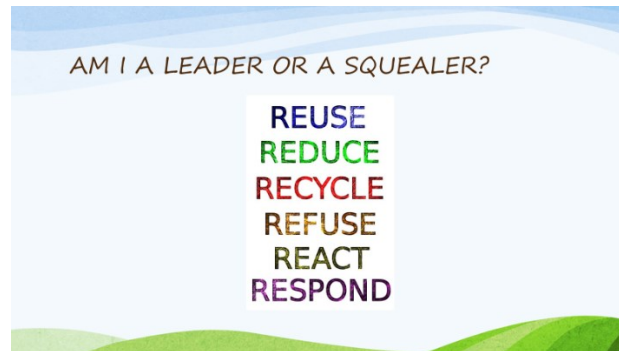
Metacognition is another aspect of pre-service teachers' development by questioning and drawing conclusions through their thinking. Their criticism is turned inwards, a critical awareness of their learning and then thinking. Critical analysis is internalised and questioned by a thinker, learner, or student. How well do pre-service teachers know themselves and the SMART principles that apply to metacognition? It is time pre-service teachers started thinking about their thinking. The WBCTP has provided the spark for a conflagration of knowledge.

TWR 2.3 Reflect and Recommend

Professional Development starts with personal development for pre-service teachers. Practical and affective coping skills and executive functioning skills are critical aspects for the future of teaching and learning. A holistic teacher uses all four brain domains for planning, organization, and dedication with perseverance. It is not being endowed with superior knowledge but how one can develop the skills, knowledge and attributes to empower and instill leadership qualities. Schools require more mentors and coaches to develop and expound multiple intelligences and skills. It starts with

personal transformation and how high the goals are set. What are the parameters for seeking knowledge and skill for pre-service teachers and learners? Freedom of knowledge acquisition must have no boundaries. Children exposed to technology at an early age are more comfortable exploring new content and forging ahead with information than those who struggle and do not have techno-devices. Pre-service teachers must boldly forge ahead and stay ahead by taking risks.

TWR 3: The Circular Economy



TWR 3.1 Planning

What is the slide about? “A winner never quits, and a quitter never wins” is a quote from the old Archie comics. A leader must always be grateful for every opportunity and accolade. The circular economy is not only for the sustainability of the Planet. It is also for the knowledge economy and lifelong learning. In all we do and say, there must be a minimum waste. Knowledge and constant updates on formation are essential for lifelong learning. Pre-service teachers must re-affirm their Self and enhance their self-image all the time.

How was it designed? Teaching is challenging, and it takes grit to withstand the pressures. Failure is part of growth and development. Therefore, they looked at challenges as opportunities because there were a variety of personalities, and team building and social cohesion are people management skills. Reuse, reduce, recycle, refuse, react and respond in every aspect of our lives and homes, reducing waste. The circular economy is relevant in the humanities and environmentally sustainable development.

Why was it designed this way? Strategic thinking and planning in the circular economy require critical thinking and decision-making skills. Pre-service teachers must be grateful for all opportunities rather than complaining and trivialising challenges. The circular economy is a daily occurrence. A good leader engages learners and colleagues to drive a delicate balance between school and home in taking cognisance of practising

at home what is practiced at school or the workplace. I reminded pre-service teachers about congruency and the cliché “practice what you preach”. Learners are very discerning observers who mention everything they observe, regurgitate, *ad verbatim* words uttered, model behaviour, and indulge in heuristic processing.

3.2 Implementation

What was the strategy? We discussed pre-service teachers as individuals as each person shapes their future. Hence, in the business model and programme, the business aspect of the knowledge economy is crucial. Knowledge cannot be destroyed, but it can be re-used and re-imagined. Therefore, the ability of every person to a creative can be reused. Resources can be shared. Finding yourself as a teacher can be daunting; therefore, always ask for ‘help’.

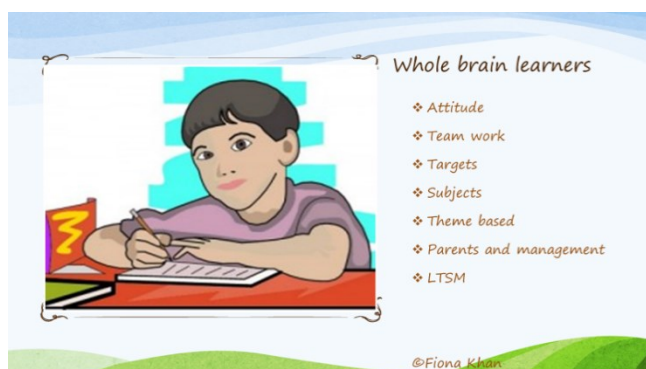
How was it implemented? It was brilliant to see how easy it was to connect with the knowledge and different concepts. From the time we started the programme and model, there was total attendance, and that was the strategy of engaging the pre-service that they would never stop asking for more information. I discussed simple examples, e.g., Using a milk container for watering the garden or using them as scoops for litter.

Why was it implemented this way? I believe in stretching the imagination with creativity and divergent thinking. Every container or packaging is reusable. Recycling starts at home and school. If we examine the energy source, most things are created from the earth—the rest from recyclables. It’s a conundrum of destroying what nature has to offer for our betterment, so it is only natural to give back to the Earth by recycling

3.3 Reflect and Recommend

Recycling is a lifestyle. The effort must be inherent and be a part of the daily routine. One cannot dissociate and switch roles concerning the Earth’s consciousness. The habit of recycling must be taught to our children through example.

TWR 4: Whole Brain Teachers for Whole Brain Learners



4.1 Planning

What were the slides about? The programme and model can be translated into a career of choice. Learners will be helped in changing their attitude and focusing on their altitude. The Education Hub (2021) Piaget's theory for teaching is more constructivist. Pre-service teachers and learners "construct knowledge rather than passively taking in information". New knowledge is added to previously acquired knowledge (schemas) to create new constructs. Therefore, pre-service teachers can continue to develop an understanding of the learner's thinking. This further means that the classroom environment and the teacher's guidance must be to learn for themselves and bring in new knowledge through their experiences.

How was it designed? Mindfulness is about intention and the awakening of the senses. For the development of holistic whole-brained pre-service teachers and learners, we need whole pre-service teachers and learners. Teaching and learning must not be encased in mental and emotional trauma and issues, as this hinders growth and development. Piaget (2011) encourages the use of props and visual aid; all instruction must be in action and words, and pre-service teachers and learners must have a global vision by not being myopic. I considered the following when designing this slide.

The weakness in Piaget's theory, and why I have discarded the aspect of observation, schemas and conclusion where children are concerned, is the disregard in theory for the growth and development among children from different racial backgrounds and the impact of the environment on their growth and development. E.g., the growth and development of an African child cannot be compared or equated to that of a white European child because of the different socio-political and environmental influences. Piaget experimented on Caucasian children, not children of colour. Immediately, there is a bias and contradiction, yet we still use Piaget to discuss cognitive development in children. Children classified as Black or Asian or any other race, their mental and intellectual development cannot be compared and equated to those experiments and conclusions reached by Piaget, which were exclusively White children who were observed. Children of colour, their schemas, socio-genetics and history of racism and subjugation cannot be compared to a privileged white child, as Piaget used his children for experimentation. White children were from a privileged background and were exposed to more opportunities than any child of colour would ever experience at that period in time. They were theories developed when racism was rife, and children of colour were considered inferior across Europe and America. Hence, the question is,

why do we still refer to Piaget on cognitive development in children with the discrepancy of racial bias? Why do we still colonize ourselves with old literature and theories when decolonizing our minds and lifestyles because of African Consciousness? It must be understood that children of colour, especially in South Africa, are skills-based due to socio-economic conditions. Poverty and discrimination are debilitating to material success; however, through the **Affluence of Knowledge**, children of colour's success are their wisdom, understanding, perception and creativity. My theory on the **Cadence of Imperfection** is the framework for dispelling Piaget's racial bias and incongruence in his findings.

The other matter of contention is children with SEND, Autism or ADHD. Evidence does not exist that cognitive development is equated to every child's developmental milestone based on environmental influences and racial background. However, Piaget's learning theory concerning the interplay of new experiences with past experiences, then creating and accommodating new experiences in children, is the same as Kolb's experiential learning, which, as I reviewed, would apply to any age group.

Why was it designed this way? Vygotsky's (1996) Social-Cultural Theory reminds pre-service teachers that learners can learn more quickly through a social environment. There must be interaction with peers, teachers and others to create a learning environment for maximum benefit and the ability to expand the learning environment through discussion, collaboration and feedback. Since most learners' study English as an additional language, using a theme-based word bank is integral to code-switching. I recommended intervention strategies for pre-service teachers to lighten their load in teaching practice and in-service teaching. As much as resources (LTSM) are limited, recycled material must be used in creating innovation and using creativity to create new resources. They were advised to remember their goals for the day and the month, the objectives for the lesson and the outcome of the assessments. Pre-planning is crucial to the smooth operation of a day's work.

4.2 Implementation

What was the strategy? One of the goals of the WCTP was that we needed a change in tertiary and primary education in institutions to increase the pass rate, encourage whole-brain thinking, and mentor whole-brained pre-service teachers for whole-brained learners. The strategy was once to mentor whole-brained learners vicariously through pre-service teachers. If pre-service teachers were whole-brained and imbibed their experiences to translate into future skills and values for the benefit of learners,

knowledge acquisition would be more accessible, and the tools for learning would be used for benefit, not just personal gain. Attributes were from SKAVS. The attributes of pre-service teachers determine their attitude and their knowledge acquisition. They must believe that they can achieve success irrespective of any challenges. Using whole-brain creativity and thinking, they discover new learning domains and are now conscious of them. This is emphasized in teamwork and being a team player, as collaboration is one of the characteristics of a global citizen. One achieves more because of sustainable collaboration and design thinking.

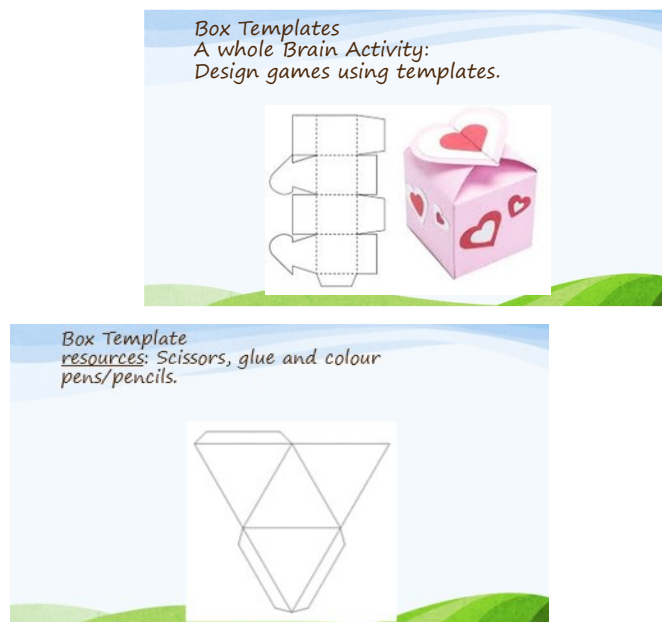
Why was it implemented this way? The WBCTP assists best in assimilation. Pre-service teachers must be empowered as drivers of change so that their leadership can only be emulated. STEAM education is the fundamental experience of being whole-brained and multifaceted. Pre-service teachers must be versatile, adaptable and mobile and teach any subject with flair and aplomb. Leadership skills are tested when dealing with management and parents. Always resort to policy and source documents; therefore, they must be studied. Learner and teacher support material (LTSM) as resources are always accessible through the different websites. The impetus in knowing technology is incomparable because it is the entrance to a world being innovation and creativity. It is the entrance into an unequivocal abundance of free-spiritedness in Design Thinking, Business Model, and Imagineering and STEAM, the **Exposition of Integration**.

4.3 Reflect and recommend

Science-related subjects must be integrated with fun and enthusiasm in the Arts. If we examine cognitive development in early childhood, children learn through play. Early Childhood Development has different learning areas: Mathematics, emotional development, understanding the world through active participation, physical exercise, arts and culture and design, cognitive development, language and literacy skills. The recognition is immediately STEAM subjects, so why do we change the subjects in formalised schooling from Grade R? The reason is structure and focus on children's academic achievement, not creativity. Scientifically success and achievement are still based on the Split-Brain theory of Sperry (1968). Schools assess and recommend recalling memory rather than exploring the whole-brained child. The negative impact is only realized once the learner reaches a tertiary institution. As an undergraduate, that learner discovers that studying is critical thinking, communication, collaboration and creativity. All four components must complement each other. It was most recognizable

when one component, most commonly communication, was missing. There was a growth stagnation; intercommunication was stunted, and the pre-service teacher was speechless. With communication, the art of collaboration and creativity expands exponentially through interaction. Critical thinking and creativity follow collaboration and communication. The four principles in STEAM are critical for the whole brain, highly impactful global citizens who are teacherpreneurs and visioners.

TWR 5: Box Templates



5.1 Planning

What were the slides about? Box Templates are a curious and exciting way of engaging learners. In workshop 4, pre-service teachers were given templates and asked to create boxes. The activity was whole brain activity. Cutting requires hand-eye coordination with scissors, following the line of cutting, motor skills, creativity, and creating the box by sticking it together. I requested they consider a literacy game they can include with the activity. E.g., a story, a poem, or hidden clues for a game. It must be interactive and engaging.

How were they designed? Making the box template was an easy task for pre-service teachers. But some needed help with connecting the sides into a shape. There was a break in the analyzing, interpreting and presenting. Motor skills require hand-eye coordination, fine motor skills, patterning, and retention. The transfer of skill was together with acquisition and retention. Playing with templates is an unstructured manner of engaging the learner, just as it did the pre-service teacher. There is the art of

self-regulation and creativity, problem-solving skills and independence, and time regulation.

Why was it designed this way? Therefore, it was an exercise for brain activity and working with both sides of the brain. An activity like this in a classroom will help a teacher recognize the deficiency in specific motor skills. However, it also allows for creative innovation when creating a game. The activity for a game can be a group activity and collaborative, but the learner needs to work alone to make the box. Logical and different thinking skills come into play. Most importantly, every pre-service teacher, just as every learner, needs quiet time for this activity to bring their thoughts together.

5.2 Implementation

What was the implementation strategy? The box templates test problem-solving skills. They were given three different templates to create with varying levels of difficulty. Some struggled, but they all enjoyed the activity. It was different from the monotony of listening skills. The tactile activity tested their fine motor skills, coordination, focus and concentration.

How was it implemented? Pre-service teachers were tasked with creating a game and a new contraption for literacy. They ensured they followed instructions and knew how to engage with a whole brain activity by cutting, pasting and creating. They could choose to colour the item or leave it uncoloured. They had three templates and were given a time limit of ten minutes. The timing encouraged focus and concentration but also reminded them about the significance of not wasting time. It was an intervention of instilling discipline and simulating a classroom scenario.

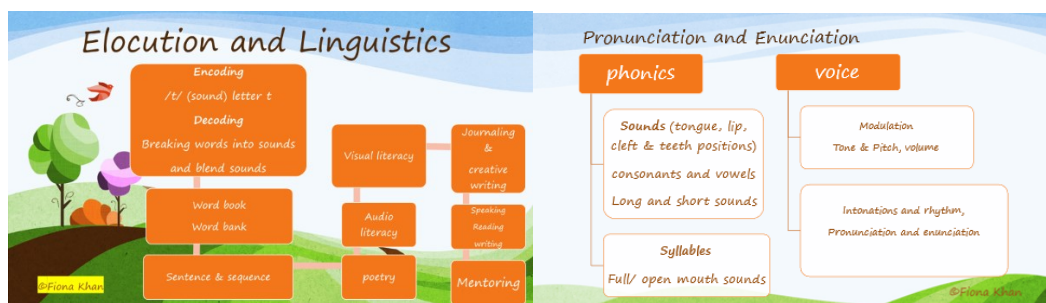
Why was it implemented this way? With discipline and time limits, any task can be completed. The simulation was a reminder of classroom and lesson management when engaging in an activity. However, it was the different skills that were significant in the task. Like the templates, this activity combines different subjects in STEAM and engages the brain's different parts. It is holistic but captures the focus and attention intently towards completing the task. The templates have many facets, including precision, dimension, vertices and angles, colours, 3D imaging and game development.

5.3 Reflect and recommend

Creativity and innovation are the key elements of the Arts in STEAM. Our environment is a reflection of ourselves just as much as we are a reflection of our environment. Therefore, socio-genetics are characteristics and traits of genetic factors

influencing social behaviour and outcomes. It examines the contrast between environment and culture in shaping society. With socio-genetics, we understand the origins and diversity of human social traits, such as altruism, cooperation, aggression, and empathy. The impact is affected on executive functioning skills personally and in the classroom.

TWR 6: Language and Literacy



6.1 Planning

What was the slide about? One of the biggest challenges within the group was language and literacy. English challenged them as a medium for teaching and learning, and the indigenous languages were not encouraged. Much of the language challenges stemmed from English being an additional language. However, it must be noted that there were challenges even in the indigenous home language when expressing English. Pre-service teachers were introduced to a few primary language, literature and literacy concepts. It was stated that reading is the foundation for grasping concepts for all subjects. Language skills and reading is the quintessential difference between success and failure in all areas of learning. Therefore, all pre-service teachers must be acquainted with encouraging literacy from Early Childhood Development and even further integrated from birth. This concept from the breast means the child learns with song and lullabies, prayers and nursery rhymes to develop language skills. Thus, it means that the language skills of pre-service teachers must be on par with the early readers and learners. Pronunciation, enunciation and fluency of words must be par excellence.

How was it designed? Pre-service teachers were led into an exercise on different aspects of speech. Learning the art of linguistics by being aware of phonics and tongue placement during pronunciation assists with speech. Encoding and decoding sounds and words are the basics of early reading strategies. Whereas encoding is the sound for the basic letters and blends in the alphabet, decoding is the breaking down words into sounds and blends. e.g., C-A-T and C-AT. We reiterated the importance of word

building and a word bank, forming sentences in word order and writing paragraphs. Each paragraph starts with a new idea and answers the questions of the 5W's and an H.

Why was it designed this way? Visual literacy and audio literacy are different strategies for comprehension and learning. Creative writing can be started through journaling and penning thoughts and emotions. As requested, pre-service teachers continued journaling, translating into many facets of language, literacy and literature. We worked on simple, complex and compound sentences, e.g.,

I walked. (simple sentence) **what did you do?**

I walked swiftly to the taxi so I would not miss it. (complex sentence) **how did you do it?**

I walked swiftly to the taxi. The driver was waiting for a long time.

I walked swiftly to the taxi because the driver had been waiting for a long time. (compound sentence) **why did you do it?**

Through discussion, it was discovered that writing English was a challenge because the tools for the skill were not taught to pre-service teachers.

6.2 Implementation

What was the strategy for implementation? To encourage the skill of language, literacy, linguistics and literature, they were asked to complete all tasks for the programme and pen their journal entries to improve their writing. They were encouraged to implement the 5Ws and an H to practice perfecting their writing skills. They were also enthused as they practiced phonics orally. They were reminded of word and sound formation through the placement of the tongue, the position of the lips, the shape of the mouth, the tongue on the palette, and the tongue placed behind the teeth. I encouraged using a mirror to perfect their enunciation and pronunciation in articulation.

How was it implemented? Furthermore, they were asked to identify parts of speech in English to indicate the placement of words, their meaning and the word function to construct a grammatically correct sentence. The parts of speech in language were nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions and interjections. It may have been a simple task practiced at school, but the intention was for pre-service teachers to identify the technique that was used to demonstrate. They could identify the difference in teaching skills, teaching style and attitude for them to learn and understand the lesson better.

The big brown fox jumped over the lazy dog because he was very hungry.

experience in the classroom that STEM subjects are gender sensitive. Science, Technology, Engineering and Mathematics were reserved as subjects for males based on Sperry's Split-Brain Theory and the social theory that males are better at those subjects than females. However, with the change from STEM to STEAM and the inclusion of the Arts, Science and Technology was all-inclusive with males and females because it was a whole brain concept and theory. From my experience, insufficient time is given to explain mathematic concepts, and the foundation for Math is not firmly established in schools. Teachers are not adequately trained and specialized in the subject, insufficient time is spent on the foundations of mathematical theory, and the creative tools for explaining math and science are not applied. Games and learning tools must be used for long-term memory storage and short-term usage.

How was it designed? Examining the theory, visual literacy is the most critical aspect of understanding a concept. Learners, as with pre-service teachers, require concrete examples to understand concepts. The WBCTP theory expressed that design, colour, and pictures can explain what logic and theory cannot explain in context. Therefore, the whole brain theory works in explaining mathematical concepts. Learners also assimilate and store memory using prompts and props to explain concepts. The use of innovation was one of the reasons for gamification in the classroom. Pre-service teachers were tasked to design a game for literacy and math literacy which can also be studied using a game. They were referred to using magazines and Google Play to download applications that offer math games to spark creativity.

Why was it designed this way? Visualizing or visual literacy is a memory tool that assists long-term and short-term memory. Self-efficacy is one's responsibility to complete or deliver tasks to learners to achieve outcomes. If the learner can visualize and use the five senses, their short-term memory is for fast recall, and they remember what they have learned as the senses affect the brain's Limbic system. Applying the methodology of visual literacy to pre-service teachers worked very effectively and effortlessly.

7.2 Implementation



What was the strategy for implementation? Building Blocks are resources that can be obtained at any store. Inexpensive and in different colours, recyclable, they visually indicate the practicality of demonstrating addition, subtraction, fractions and multiplications, which are basic math concepts. Some learners are autistic, some are slow developers, and others have learning difficulties. Learners find it challenging to apply Math concepts to context. The understanding of the abstract confuses pre-service teachers and learners until it is practically demonstrated. If they need help understanding the principles, the building blocks are used. Building blocks are also the first step to Engineering and designing for children.

How was it implemented? I indicated to the pre-service to have a useable kit for demonstration as I had used. A kit should have coloured paper, scissors, a sharpener, different colours and markers, a few toys for demonstration and a few blocks. It is advisable for each desk to have a kit as well. Not all concepts can be understood on the board, and not all learners have the same learning capacity. Since we have moved from chalkboard to interactive board, it may work. I further indicated the use of the Rubik's cube that can be used for fractions and multiplication, division, as well as addition and subtraction. Once again, the visual impact was effective because of the colours and the mechanism.

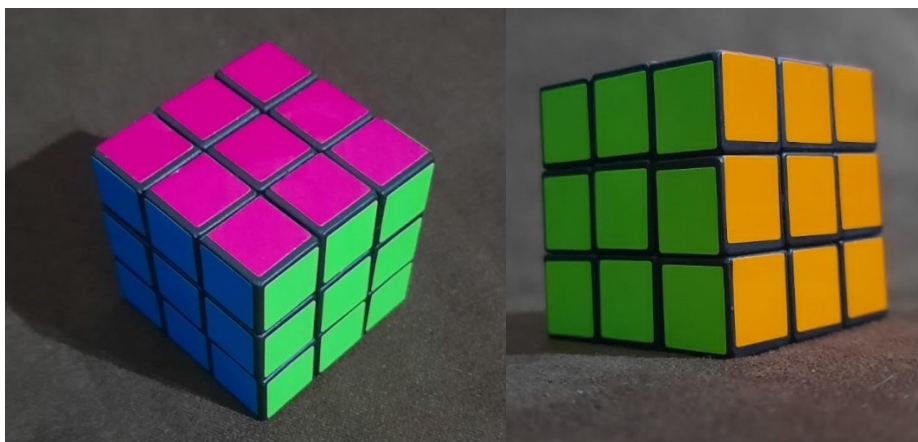


Why was it implemented this way? It is Math made easy and for everyone to enjoy. Mathematics among females is a hesitant choice. Over the years, females have been led to believe that they are not mentally and cognitively equipped to cope with mathematics, and this agenda has been pushed consistently with curriculum developers and senior management teams. However, we cannot blame a failing system on inadequate skill to teach the subject to learners who have no clue from their foundational knowledge of math. If teachers do not know how to teach, then learners will not know how to learn. That is precisely the motivation why we have the Whole Brain Creativity and Thinking Programme and Model.

7.3 Reflect and recommend

The WBCTP and model was an innovation created and designed with design thinking and Imagineering. All the workshops were layered and tailored to offer the ultimate experience of a skills-based short programme to uplift, upskill and upgrade the knowledge economy of pre-service teachers. It is uncomplicated. The WBCTP bridges gaps and empowers pre-service teachers who will soon be in-service teachers. However, the discussion revolved around the poor reception of pre-service teachers from the permanent teachers at schools and the need for more experience when pre-service teachers are practising teaching. It is, therefore, necessary to supplement undergraduate studies with short skills-based programmes. It must be noted that this model has yet to be created before. The responses from the pre-service teachers were overwhelming.

TWR 8: Rubik's Cube for Mathematics



8.1 Planning

What was the slide about? A Rubik's cube can teach dimensions, perimeter, area, exponents, and square roots. And they can be used at any phase or level of teaching. The reaction was fascinating. Toys are made with design thinking. Design thinking and designing have a purpose. That does not mean we cannot innovate further by reimagining and redesigning a previous design and using it for different purposes. It is innovating and Imagineering, reinventing with a different purpose.

How was it designed? Pre-service teachers were fascinated to learn these concepts to make teaching and learning easier. Some pre-service teachers did not know what a Rubik's Cube was. This reverts to the influence of past inequalities and disadvantaged social integration due to underprivileged schools and resources. The Cube comes in various sizes and with various numbers of squares painted in different colours. Each side has nine blocks with six sides. Each side with nine blocks can be used for functions of math.

Why was it designed this way? I used the cheapest and most available resource for pre-service teachers. It is doable, available and reasonable. The cube has length, breadth and height designed with an algorithm to be used in a particular formula: $a \times a \times a = a^3$. Therefore, the colours and the blocks can be used for basic Math concepts. Counting colours, counting squares, subtracting, and multiplying, it requires motor skills and sharp concentration.

8.2 Implementation

What was the strategy for implementation? To show pre-service teachers diverse and creative thinking styles. Resources can be recycled material and the objects we see and use daily. Visual input and stimulation trigger better responses than they had experienced in the workshop. What cannot be understood clearly through cognition can be comprehended through visual clues. Play is an integral part of subliminal learning.

How was it implemented? The cube has six sides, three divisions on each side, nine squares on each side, and each side has a different colour. The colours can be used for foundational math concepts without changing the colours by turning the division. However, if the divisions are turned, they can be used for fractions and division. The impetus and techniques are from the creative mind of the teacher. It works as I had demonstrated to the pre-service teachers.

Why was it implemented this way? Using the Cube is a very effective technique in teaching Foundation Phase. More so because children are fascinated with new colourful objects and extraordinarily curious; however, the Cube can be used in other

phases for fractions and complicated math concepts. As I had indicated, the Mind, Imagination, Creativity and innovation are limitless, and it is for the pre-service teachers to create their unique style and brand.

8.3 Reflect and recommend

As a teaching practitioner and a tutor, I found that even undergraduates needed help with mathematics literacy. When I speak of Mathematics literacy, I speak of the language of math. Most pre-service teachers are undergraduates with English as an additional language. The language of math always needs to be understood in translation. But, with perseverance and good foundational Math, there is success. I use blocks and allow the learners to learn through play. Once they are shown the basics, the rest is easy to accomplish. Learners are asked to buy their own, just as I asked pre-service teachers to carry their kit to school.

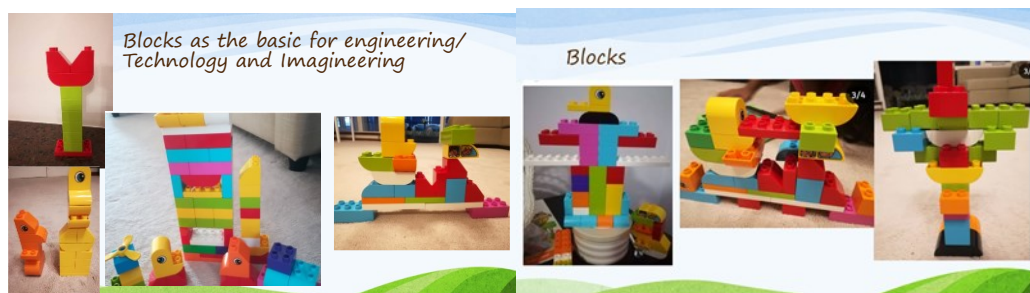
8.4 Multiplication table

<https://www.SplashLearn.com>

x	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

I included the above multiplication table for pre-service teachers to visualize how multiplication can be taught and used as a cue card for Foundation and Intermediate phases using colour coordination. Rote learning is not encouraged. However, with continued use and practice, the learner grasps the concept. As an intervention in class, where each learner has a copy and uses it as a reference.

TWR 9: Blocks in Engineering, Robotics and Technology:





Courtesy of Niall McNulty

9.1 Planning

What are the slides about? In the slides above, we see the basic blocks used for building. But we also see the child's image in the mind of an eye and an object. The child, therefore, tries to create an abstract example of the real object. We also see symmetry, balance, colours, and the ability to have spatial awareness. Let's examine a close-up of the objects. Therein also lies the beginning of Robotics and Engineering. All it needs is the machinations to make it mobile. I reminded pre-service teachers of the power of technology and children. Whole brain function begins as early as 12 months when a child can swipe the face of a mobile phone by visually observing learned behaviour. It may not be the correct thing they are searching for from the association but they will attempt the actions because they learn from role modelling.

How were they designed? Pre-service teachers were in awe of the building blocks children use as toys that can be integrated into Mathematics, Engineering, Technology and Technical Drawing. When a child first plays with building blocks, it is the first lesson in Engineering and Technology. The children are cognitively developed through imagination and creativity. They have higher-order thinking skills. A four-year-old child made the objects. By, observing the pattern and design, there is WBCT. The picture has already been created in the imagination. The child will then seek colours and the size of the blocks to match the schema already created in the mind's eye. But there is a very significant detail, the level of processing. Higher-order thinking is not restricted to age. And there are also executive functioning skills. The child will initiate the task, plan by choosing colours and sizes of the blocks they require and persevere to get the right image; planning, there is working memory, self-control, metacognition,

intense concentration and time management (they can take time to get the image as they want it through trial and error), and the flexibility (break and reconstruct). Furthermore, transcendence comes from validation. The child will ask for validation to move on to a higher level of thinking and creating. They are holistic and whole.

Why was it designed this way? Children are visioners and Imagineers. Design thinking and imagineering are inherent in all of us. When encouraged from birth, whole-brain thinking and creativity raise highly functional and high achievers. Thus, pre-service teachers are already predisposed to higher-order thinking and skills. They have forgotten. The WBCTP is a refresher on thinking, creativity and innovation. The workshop is a reminder that all pre-service teachers have the potential to be outstanding in their person and have brilliant careers. I reminded them of the little wooden or steel go-carts they made as children. Immediately they were alive and buzzing with ideas and associated their creations with WBCT, and a spark was lit for them to tap into that latent potential.

9.2 Implementation

What was the strategy? Childhood is not a place to dwell but a place of reference. As adults, we forget what quality has brought us joy as children. That spirit of adventure and freedom (free will and choice), the joy of exploring (taking risks), falling, and rising (never giving up), waiting to grow up with a head full of dreams (expectations), feeling the thrill of exhilaration when a task is accomplished (achievement), and then reinforcement (accolade and validation). I call this cycle of life the Synchronicity of Life. We follow the cycle four times in life: in childhood, Youth, Adulthood and Old Age or the Golden Years. Pre-service teachers were asked to ponder on this theory I presented as they acknowledged that the past is forgotten as they enter a new phase.

How was it implemented? Pre-service teachers were reminded of their task to create a moveable object and to create their poems. In both instances, it is their original creativity and innovation. They must be proud. Thus, we must appreciate and enjoy creativity and innovation. Every innovation is a labour of love and dedication. They were also given blocks to peruse to see how they can be used in the inclusive classroom.

Why was it implemented this way? In the WBCTP, pre-service teachers' experiences were similar to listening or participating with a storyteller. Stories tell us about relationships with people. There are always settings, backdrops, history, and a timeframe. Finally, what is the lesson behind the story? What can we learn as a moral

or value that we can use in our lives? Similarly, children are storytellers. They cannot articulate the words, but they tell stories through what they create.

9.3 Reflect and recommend

LHS pic: Shows us symmetry. The child understands there must be balance in the body structure. Wings on both sides are equal in length. The legs need extra support because the child already perceived that the blocks were not strong enough, so there is an additional green line of blocks down the middle. The child adds a base to raise the position of the inanimate object representing a bird/ duck.

Middle pic: This construction is extraordinary. The child has never been on a boat or a ship. She has never travelled on one nor seen one. However, the child's construct from previous knowledge or pictures allows the child to create an object using Design Thinking. All children use Design Thinking. They make, break and remake until it suits their idea of perfection. Similarly, the child has created a ship with a lifeboat, a base and a launch pad; the people seated on the ship are for walking, linking one side of the vessel to the other; the anchor...is an indication of Whole Brain Creativity and Thinking because all four quadrants of the brain are used in thinking, logic, innovation, design, animated and reflection of one's intellect in cognition. It is also the motions of time, patience, inspiration and risks that the child takes to create. If the child had the essential skill to create an animation, they would.

RHS pic: A man lifting weights. This is the beginning of Robotics. The design is Robotic. The structure is Engineering, the design process is Design Thinking, and once again, the child shows the faces of a holistic child in innovation and creation. There is symmetry and balance, and the child places a red block so the structure does not collapse. Very similar to how one builds a home. Sheer brilliance.

TWR 10: Space Exploration and Astronomy in STEAM

through storytelling, pictures, and storyboards. We cannot wait until the Senior and FET phases to decide that space and aeronautics is a career choice. Since we now offer coding and robotics as 21st-century skills for the workforce, the possibilities of the metaverse and technology are inexplicable.

How was it implemented? Pre-service teachers are the first to be exposed to computer knowledge. Their guidance and mentoring of learners are the vision that parents entrust teachers with to enhance any potential their children possess. Most learners have their dreams crushed because insufficient support and resources exist to fulfil them. But, if we have teachers who are empowered with knowledge and skills to tap into visioners and their potential, we have in schools raw talent that can be enhanced into a skill. Therefore, Higher Education entities must invest in holistic education and edification of pre-service teachers.

Why was it implemented this way? The workforce at schools is ageing. There needs to be more teacher support, and the socio-economic challenges are glaring. Therefore, we must start with pre-service teachers because the infrastructure at tertiary institutions is already established. With pre-service teachers, we have the reservoir of wholistic education and meaningful engagement. Space exploration and aeronautics are to launch the pre-service teachers onto a platform of leading young minds who are deficient in skills but must be raised to be learned to the best of their abilities.

TWR 11: The end of the Winding Road



11.1 Planning

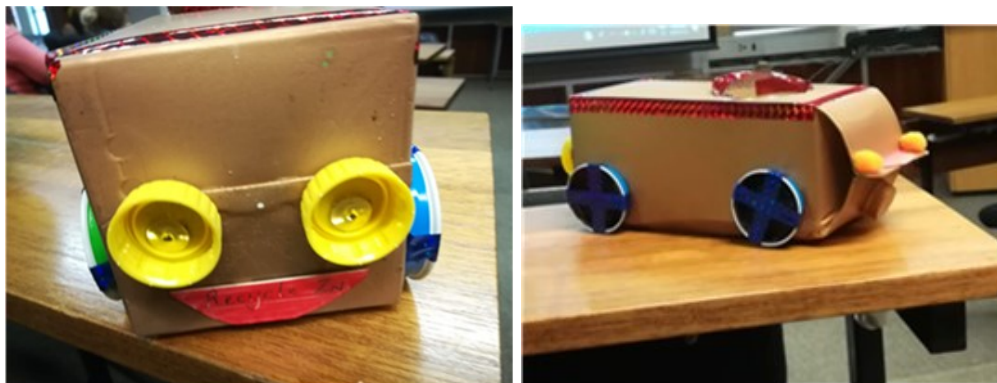
What were the slides about? We closed the programme by looking at what was required for simple tasks in a classroom and for pre-service teachers to encourage creativity with a purpose. Pre-service teachers understood the circular economy and the use of as many recycled materials as possible. The circular economy is in every aspect of our lives; there should be no wastage, even in knowledge. Pre-service teachers presented their projects with recyclables, and it was terrific.

How was it designed? It was designed with the theory of Affluence of Knowledge in mind. All children required validation through their skills. I discussed the importance of crafts in the classroom and how it has become a lost art. The idea of baking, stitching, drawing, and music were essential skills. We must acknowledge that not all learners and students are academically inclined, but they must feel that their talent and skill are essential to humanity. The presentation of all the tasks and pictures is in the appendix.

Why were they designed this way? I collated the different aspects of the visual methodology for a whole brain experience. Each aspect of the senses, the environment, the shapes and the colour of the objects were significant.

11.2 Implementation: Included in the tasks of the pre-service teachers were the use of recyclable material, innovation, Design Thinking, Imagineering and STEAM. **Below is an example.**

What was the implementation strategy? In this figure of a vehicle, the participant applied the basic concepts of movement. The pulley is a simple pull-and-push system of movement. Recycled materials were used.



How was it implemented? The task was to create a toy or any moveable object. The simple concept was to remind pre-service teachers that they are design thinkers and Imagineers. I also included the concept of simple robotics as a precursor of what they can achieve if they want to study technology and robotics, and coding further.

Why was it implemented this way? Stretching their imagination and the WBCTP and allowing them to experiment with their creativity and diverse thinking reminds them that they have the skill. It may not be perfect, but it's a start.

11.3 Reflect and recommend

One of the observations was the pre-service teachers who choose the path of limiting belief. If there is passion, it will fuel outstanding creativity and innovation. I must add that some pre-service teachers had never created an object before. For some of them, it

was the first time. That is an achievement. Rising to a challenge to stretch the boundaries of the mind.

8.2 Conclusion:

Concluding the programme was a sad occasion. I wished that lecturers could see the potential I envisioned. Motivation inspires SKAVS. Positive reinforcement establishes it in long term memory. Higher Education and Basic Education should speed up the transformation into the 4th Industrial Revolution. STEAM education must be introduced to pre-service teachers, and Technology in 4IR must be the focal point. The world, in its revolution, is changing too rapidly for us to hang on. Change is imminent, but how fast it happens is beyond our control. Teachers spend seven or eight hours a day with our children, and our children's socio-emotional health, cognition and thinking styles and patterns are influenced by teachers. Thus, investment in pre-service teachers is compulsory for the creative and knowledge economy. Higher Education Institutions are responsible for the pre-service teachers being the drivers of change and the visioners we envisage and support the investment in the Affluence of Knowledge. We know that the present pre-service teachers are digitally fluent and can flourish in any environment. The tools we empower them with now, will be the game changer for the future.

Chapter 9

9.1 Conclusion

The previous chapters presented the findings based on the four concepts and workshops in the Whole Brain Creativity and Thinking Programme. The analysis was based on the discussion and findings during the four workshops with the focus groups. The four concepts are Sustainability, Imagineering, Business Model and STEAM. In this Chapter, I motivate for the programme and the significance of the Whole Brain Creativity and Thinking Model.

This Chapter concludes the significant findings relevant to designing a programme and model and discussing pre-service teachers' experiences within the programme. Interpretivism, an epistemological exposition for the study, was undertaken to understand and discuss the presentation and findings. Diverse perspectives and experiences were reviewed. Pre-service teachers in the context of the theoretical framework underpinning this study, the seminal work of Ned Herrmann, and various literature. The objective and purpose of the study were to create and design a programme and future model by exploring pre-service teachers' experiences of the programme and a model to be the framework for future beneficial and successful implementation at any tertiary institution.

9.1 Sustainability

Understanding sustainability in life, education, and the planet underpins the four concepts of this study. There are variable interpretations and definitions of the concepts; however, our discussion was localised to understand that sustainability and technology start with the self and home (the nucleus), which adds to the collective around the globe. Understanding this study's position on the four concepts is also critical. The findings regarding the critical questions generated to address this study's objective are then discussed.

The introduction of the WBCTP was a fascinating new concept for pre-service teachers. It reiterated the theories of Kolb, Nilsook et al. and, most importantly, Ned

Herrmann. Pre-service teachers from different levels of study entered into the WBCT programme “through enquiry, discussion and revision” (McNiff and Whitehead (2011). Interpretivism included “Accepting and seeking many perspectives, being open to change, practising iterative and emergent creative techniques, promoting participatory and holistic research and going beyond deductive and inductive approach” (Wills. 2007, p. 583). We discussed STEAM literacy as a new and introductory concept for pre-service teachers at tertiary institutions based on the STEM principles, which consisted of:

- “1) the ability to identify STEM problems,
- 2) the ability to seek new knowledge,
- 3) the application of the STEM concept,
- 4) the ability to solve problems using STEM,
- 5) the ability to communicate information relating to STEM, and
- 6) the ability to make decisions based on STEM” (Nilsook *et al.*, 2018). Therefore, STEAM was a new concept which included ARTS. Literacy and language were critical aspects of understanding assimilation in all four concepts.

In the four cycles, we discussed new content and concepts unfamiliar to pre-service teachers. The content was designed for a whole-brain experience and a holistic overview of new knowledge in theory and practice. During the discussion, new content and, the purpose for the new content, the context of a sustainable future for pre-service teachers and tertiary institutions were critical to understanding the programme. Pre-service teachers were guided into viewing new content with fresh eyes and an open mind to imbibe four creative approaches personally and in the classroom. Most of the pre-service teachers understood the four concepts, especially sustainability.

9.2 Imagineering

The Herrmann Model of Whole Brain Theory focused on design and delivery. Herrmann (1996, p. 150) refers to the world as a “composite whole brain”. He elaborates, “Teachers must change their assumptions about who is in the classroom”. Pre-service teachers were encouraged to ensure that each child enjoys a whole-brain experience in the classroom rather than streaming them into right-brained (creatives) and left-brain (analytical) groups. There must be homogeneity. Therefore, they were encouraged to allow learners to work in groups with mixed abilities for everyone to

have a fair share in contributing content. Imagineering approaches are technical, critical, analytical and creative.

Pre-service teachers were given box templates to create their boxes. Examining their deftness in the skill is a whole-brain experience. However, some were a little weary because of a lack of training in problem-solving skills, knowledge of following instructions, knowledge of design, visual clues, and ideation. Many gaps were created by needing more skills, values and knowledge exposure. There was also a sense of complacency and entitlement that they did not have to do the task, and education was compulsory only to earn a better wage and the benefits of teaching. “Would it not be positive if we could merge Imagineering and education as a transformation of education? We could enrich curriculum studies, creativity, and citizenship education by increasing students' creativity in developing and implementing new and existing ideas and advancing innovative practices in schools and society.” (Nilsook *et al*, 2014, p. 19). The transformation in education includes the Internet of Things and leading the pre-service teachers into the Fourth Industrial Revolution. We have not yet become immersive in the metaverse for an overall learning experience. Pre-service teachers understood that they must envision a future of gamification, immersive, engaging learning and teaching experiences and machine learning without the chalk and board. They understood that the future of teaching could be compromised through virtual reality. How do we change the teaching and learning experience into a more engaging and real-world experience so that learners do not escape to home and virtual reality learning?

Considering the WBCTP is based on the living theory, (Stoll & Fink, 2000) mentions teachers rethinking strategies for improving performance, taking risks and encouraging spontaneity in communication in the education process. The gaps in knowledge for pre-service teachers are an opportunity for a multi-disciplinary, multicultural, constant restructuring of the education curriculum, and the gaps in literacy, literature and language. A paradigm shift is a change in mindset, and in this research, it is the voices and experiences of the pre-service teachers to empower themselves. The realisation for restructuring rural education, creating sustainable futuristic green cities, embracing the world of a 5G or the Fifth Generation Technology of iPhones, handheld devices, and mobile networks connecting everyone virtually, for the inclusivity of Smart Cities, the WBCTP and Model sparked the curiosity and inspiration of pre-service teachers. Disney created fantasy as a stretch of the Imagination through layers of whole-brain

creativity in Imagineering; however, based on constructivism, the use of the imagination stretches beyond the confinement of a classroom by examining previous knowledge and repackaging it into new knowledge by making dreams a reality and exploring the unexplored. Imagineering is created by Imagineers, who take imagination and make it into detailed reality through artistic creativity. In a 5G future, Imagineering is business in virtual reality. Every child in every classroom deserves a holistically knowledgeable teacher to translate and empower them with that knowledge.

9.3 Business Model

Pre-service teachers understood the responsibility of taking ownership of their profession and accepting it as a profitable and multi-disciplinary. The profession has inroads into all other professions because of its versatility. It transcends both Basic and Higher Education platforms and can rise in the ranks with the appropriate remunerations. Professor de Boer (2001), in her research, did not include the Herrmann Business Model nor the effective use of Whole Brain Creativity, as did Potgieter (1999). With mixed methodologies research, de Boer (2001) enhanced thinking skills through her research in divergent and multidisciplinary methods to enhance learning at tertiary institutions using Hermann's (1996) Whole Brain Thinking Model. The WBCTP and Model combine Thinking and Creativity with business principles to mentor future leaders. Using tools for professional development, lifelong learning and extra and co-curricular activities, the Dept. of Education instituted Integrated Quality Management System (IQMS). On closer examination, IQMS is a performance management system based on performance and personal growth within the year, whole school evaluation and the developmental appraisal for all in-service teachers. Schedule 1 of the Employment of Educators Act, No. 76 of 1998, was developed to enhance and monitor performance. With this understanding and document, the WBCTP and model was developed. Through the programme and model, the knowledge and skill gathered within the programme enhanced the pre-service teachers' personal development and professional development. Therefore, to be constantly evolved and involved with knowledge and SDG 4, to be accountable and professional within the ambit of professional development, to be a lifelong learner and willing to seek knowledge enhances pre-service teachers' competence, effectiveness and affectiveness. Within the WBCTP and model, the pre-service teachers were confident and motivated to extend their informed, new interpretation of knowledge to profitability. In professional development, they would rather have excess information for informed choices and

decisions than be in deficit. Within Imagineering and Design Thinking, pre-service teachers were inspired to aspire at their pace and inspiration but enjoy the benefits of the facilitator believing in them through their motivation to attend the WBCTP. They could aspire because of Heuristic processing, i.e., how they received and processed persuasive messaging for immediate decisions and conclusions based on available information. It aligns perfectly with Kolb's experiential learning cycle and Kolb's learning styles of diverging, assimilating, converging and accommodating for a whole-brain thinking and creative experience.

As an Imagineer and Visioner with a business mindset, the confidence and skills within the programme were to self-regulate as a creative. The future tech teacher must be confident with excellent communication and leadership skills to empower and mentor. With Emotional Intelligence and Mindfulness, the Imagineers and visioners can manage emotions because design thinking requires patience and tolerance. It requires clarity of mind and a purpose. Visioners and Imagineers are also vicarious learners by learning from the behaviours of others. They must understand learning or processing in the classroom to adjust their social learning and emotional response. Within the WBCTP, pre-service teachers learned from the experiences and narratives of others. The intragroup discussions and expressions created a feeling of collectivism that their experiences were not insular. Everyone in the group had similar experiences in different contexts. Just as in design thinking, they must understand the problem or need to design a product to suit that need. In the WBCTP, pre-service teachers added, subtracted or enhanced their perception, organisation and integration of information to form impressions of themselves and others. Impression formation was foremost in the discussion because many could not articulate their struggles, challenges, feelings, and emotions.

Within the programme, they had learned they were familiar with the latest information technology and computer systems. Their learning was from outdated textbooks and lecture notes that was in dire need of updating and reformation. Many had to discard subliminal conditioning of attitudes. They had become aware of the antecedents of those attitudes that held them back from stepping boldly into a new frontier of the knowledge economy and the economies of scale. The Economies of Scale by Investopedia (Will, 2022) are the advantages reaped when productivity becomes efficient. "In business, companies increase production and lower costs because costs are spread over a larger number of goods". In the teaching and learning environment,

the more information and knowledge the teacher or pre-service teacher has, the better prepared they are to impart that knowledge over many grades and many learners over many years, thus, the knowledge to create more leaders and trendsetters of the future. Including Big Data and the Internet of Things means that the latest trends and knowledge were within the reach of the pre-service teachers. They needed to access it to make their lives easier in professional development to enjoy the profitability of teaching and learning. They showed what they had learned within the WBCTP in their presentations.

9.4 STEAM

STEAM education was the first pre-service teachers had heard of the concept in a tertiary institution. It was the first time within the WBCTP that STEAM education was introduced to pre-service teachers. The core principle of STEAM education is the happiness and joy education bring to teaching and learning in a fun way. STEAM education is a Whole Brain concept and was introduced to the pre-service teachers as a Whole Brain Creativity and Thinking programme. The components of Science, Technology, Engineering (including Environmental Education), the ARTS and Mathematics were primarily conceived by Rodgers (2005) as inquiry-based, not whole-brained. On closer examination of the four quadrants of the brain, as discussed by Herrmann (1996), I discovered that STEAM education was a Whole Brain concept as it uses all four quadrants. The brain can be manipulated over time to dominate the part of the brain that is most trained to be most prominent. E.g., In STEAM, a person can be more dominant in Mathematics due to social and environmental influences. However, the person can use the other three quadrants to power the quadrant where math is dominant. That informs my theory that we usually use the Whole Brain in everyday tasks. As humans, we cannot use only the left side of our brain without thinking or, separate the right from the left side of the brain for everyday tasks. That is machine learning and virtual and artificial reality.

Metacognition is essential in Imagineering and STEAM. One needs imagination and curiosity. Murray (2011), in his research, quotes Wenger's (1998, p. 176) original research on Metacognition and imagination, quotes "Imagination is a process of expanding our self by transcending our time and space and creating new images of the world and ourselves". Especially in Mathematics, one has to visualise concepts and create mental models and illustrations to understand the theory. Metacognition is the cognitive knowledge pre-service teachers know and have and the strategies they will

use to enhance the knowledge through their experiences of the WBCTP. The influences were also the environment and their concrete and tacit knowledge. It was an opportunity to bring in doodling and mind maps to disseminate the understanding and constructs into smaller pieces of information, easier to understand. The ARTS aspect, as in music, dance, drama, and storytelling, as an expression of creativity and imagination enhanced the understanding of concepts. Astronomy, Biology (Botany and Zoology), Chemistry and Physical Science, Geography and History are subjects embracing a holistic global citizen as a pre-service teacher and holistic learner in the classroom. STEAM is questioning with curiosity and encouraging further questioning and exploration through divergent critical thinking.

9.5 The Presentation of a Programme and Model

The development of the model and programme was a renewal of the knowledge economy with pre-service teachers. Ned Herrmann (1996), in his *Whole Brain Business Book*, revolutionised professional development into descriptors for the future by using the whole-brain theory. The basic theory equates to the knowledge economy in tertiary institutions for leaders and visioners. The elicitation of the programme and model, the four concepts changed the educational strategies, the role of pre-service teachers, the educational objectives and instructional materials. The living theory proposed by Whitehead (1989) was conducive to proposing and creating the WBCT programme and model. Whitehead (1989) expounds on the “uniqueness of each individual’s living educational theory in improving practice and generating knowledge”. He explains further, “emphasising the importance of creativity on improving knowledge and practice from within historical and cultural opportunities and constraints in the social contexts”. We know that our pre-service teachers were disadvantaged, as they brazenly discussed. Socio-economic and politico-environmental injustices from a previously disadvantaged background did not promote an Afrocentric curriculum within tertiary institutions. The WBCTP proposes teaching methodologies and pedagogy; policymakers for higher education and academia must include digital transformation within the infrastructure. The transformation must be immersive and not subversive. The future agitators are skilful; their attributes are mentoring and coaching rather than teaching. The pre-service teachers experienced a transforming programme and modelled themselves as they were immersed in a realistic and relevant critical evaluation of the specific competencies in their experiences. The WBCTP and model

changed the Knowledge, Skills, Attitudes, Attributes, and Values (SKAVS) of pre-service teachers in their commitment to themselves, the outcomes of the programme and their professional development, which I theorised as the Affluence of Knowledge.

Examining the interpretive paradigm as “socially constructed realities” (Willis, 2007, p.4), the four workshops reveal the acceptance by the pre-service teachers of multiple perspectives and being open to change. They also challenged new realities in the African education system in schools and tertiary institutions. Both Thanh (2015, p.24) and Creswell (2014, p. 9-10) discuss the change in the participants’ lives, which is what the Whole Brain Creativity and Thinking Programme and Model achieved. Creswell (2014) further expresses change within “the institutions in which individuals work or live, and the researcher’s life”. The idea is to mobilise African youth of all races towards educational sustainability. For youth to be empowered, they must be holistically educated, enriched by policy development, implementation and promotion and supported by knowledge.

Feedback from pre-service teachers, global citizenship is of primary importance. The knowledge, skills, attitude, attributes and values are critical in social-emotional learning, gamification or game-based learning and transforming themselves by riding the digital highway. Rather than lectures, pre-service teachers need hands-on workshops like the WBCTP. Through this intervention, pre-service teachers gain new skills. Is-based knowledge and insights. They learn and can reflect, innovate and create for the future and themselves. Sustainable education ecosystems allow undergraduates to be the instruments of change. We must understand presently that children as young as a one-year-old can operate a handheld device, even if it is scrolling or skipping advertisements. Within our discussion, we were mindful of learners with SEND. Therefore, it was imperative to understand that technology, Artificial Intelligence and all creative tools support learners and pre-service teachers with SEND.

I have dispelled theories and frameworks that were not conducive and practical for the 4th Industrial Revolution, nor was it aligned to decolonisation and Exposition of Integration. We must expound new knowledge from an African perspective. Social theories were contested in the WBCTP, and conceptual frameworks were included. In my narrative, everything experienced was explicit and firsthand. All responses from pre-service teachers were recorded. Facts and realities were sometimes brutal to accept, but the concepts of mindfulness, emotional intelligence and spiritual intelligence.

guided our healing and acceptance, allowing us to grow in the spirit of ubuntu and social-emotional healing.

9.5.1 New Knowledge Presented for a Model

- a) Introducing, designing and implementing the Whole Brain Creativity and Thinking Programme as a teaching paradigm in methodology and pedagogy.
- b) Raising new concepts and structures in the theoretical and conceptual framework.
- c) Introducing theories in a new African perspective with inclusivity and decoloniality.
- d) **Affluence of Knowledge:** Increasing SKAVS for visioners and Imagineers who stay ahead of others. They are drivers of social change and who believe in carving leadership ownership. They understand the benefits of vicarious learning or observational learning.
- e) **Cadence of Imperfection:** Children or learners do not seek perfection initially but appraise their attempts and creativity through fresh eyes, senses, and visual literacy. They are inherent Design Thinkers and astutely emotionally intelligent.
- f) **Exposition of Integration:** Integrating Sustainability, Imagineering, Business Model and STEAM as a Whole Brain Creativity and Thinking Programme and Model. Thus, I created a theoretical framework for a theory that can be used for research and support and hold the structure of a theoretical framework. The programme's conceptual frameworks as analytical tools can be applied to the different cycles and concepts, making conceptual distinctions and different ideas for a cohesive Model.
- g) **Design Thinking:** Design thinking has never been used at tertiary institutions in South Africa as the basis of all literacies and knowledge acquisition. I established design thinking as the future in changing literacy levels through attributes, play and Skills based knowledge.
- h) **STEAM: STEAM** must be included in the curriculum for tertiary institutions, especially in education. As a wholistic concept and multiliteracy system, STEAM education is a must as introduced to pre-service teachers for whole-brain thinking, creativity and learning for the first time at the University of Kwa-Zulu Natal.
- i) **Multiliteracies:** It is a social theory, approach, and science for new knowledge. Multiliteracies include Indigenous Knowledge Systems, Sustainable Development Goals, and heuristics in the WBCTP. It is the first time VAK is included as a segment of literacy and a concept for inclusive education

- j) **Indigenous Knowledge Systems:** An essential aspect of Inclusive Education and SEND that must be embraced for self-concept and efficacy. The encouragement of re-establishing African Consciousness and Identities.
- k) **The Zone of Proximal Development:** Participants complete tasks through guidance. Once they develop the SKAVS, they are independent and do not need guided assistance.
- l) **Self-Concept:** Developing the self-concept was an integral aspect of self-realisation in reaching the full potential of holistic pre-service teachers.
- m) **Wholistic Teachers:** A portmanteau for holistic teachers being whole. A revolutionary concept regarding mental health and stability as teachers in a techno-savvy world. It includes the attitudes and attributes of a holistic teacher empowered by knowledge and creative economies.
- n) Introducing the concepts of **Imagineering, visioners, drivers of change, agitators and global citizenship.**

With the above taken into consideration, for the successful completion of the programme and the empowerment of educationally disempowered and disenfranchised pre-service teachers, the call for a revision and upgrade to present infrastructures in tertiary institutions is quintessential for the future of teaching and learning.

The WBCTP was developed five years ago and was the first programme to call for urgent revision of Basic Education and Higher Education curricula. Designing and implementing the programme and Model was a leap of faith for the future of the knowledge and creative economy. Therefore, I motivate to include the programme as a Model for pre-service teachers and as an integral part of their curriculum. As a social entrepreneur, I take risks. Taking risks is one of the skills of business leadership. The WBCTP was the risk I took in believing in my design. I am now audacious enough to recommend that the WBCT programme and model is the education we reimagine in institutions.

On the point of note, The WBCTP was presented at:

- a) Maritzburg College in Pietermaritzburg, Durban, South Africa
- b) School of Education- Haskoli Islands, Iceland (Digital literacies)
- c) Writing for the Future: Edgewood Campus, School of Education
- d) Reading Champions for the Dept. of Education, KZN-DoE.

The presentations to the above institutions indicate the urgent need for change in our knowledge economy. Transformation is a companion in the circle of life because if we do not transform and transcend, we stagnate. Furthermore, transformation is transcendental and liberating in the bare necessity of life.

-
5. Any further information you wish to bring to the attention of the selection committee with respect to enrolling in this programme:

6. Attach your CV, academic record and Essay (see topic below) to this application.
Essay topic: *My vision as a teacher and how I will actualize that vision.*

*** All applications must be complete and emailed to _Dr James – jamesa1@ukzn.ac.za_ or handed in to __Reception by the 18 July 2019. Please note the email has a number 1.**

** Applicants will be subject to selection. A maximum of 100 students will be selected. All selected students will need to make a commitment to meet all the requirements of the programme: full attendance, project work and assignments. Students who do not demonstrate this commitment may be asked to withdraw from the programme. Those who meet the requirements will receive a Certificate of Achievement.*

2. SUSTAINABLE DEVELOPMENT

ACTIVITY ONE: MESSAGE TREE

1. **Create a note on one side with the paper provided**
2. **Draw an emotion on the flip side of what you would like to express of the Earth using the Earth as shown in a previous slide. (Happy, sad, distressed, crying, angry . . .)**
3. **Write a message of love to the Earth**

Attach to a branch using the string provided

ACTIVITY TWO: WRITE A POEM/STORY

1. **PREPARED: TO BE RECITED OR TOLD IN THE WORKSHOP**
 2. **KISS (KEEP IS SHORT AND SIMPLE BUT IF YOU HAVE THE STAMINA GO FOR IT)**
 3. **IT MUST BE LOCAL AND REMEMBER THE 5 SENSES.**
 4. **DO NOT BE PEDANTIC, LET IT FLOW**
 5. **BE YOURSELF WHEN WRITING**
 6. **ALLOW YOUR IMAGINATION TO SOAR LIKE

AN EAGLE OR BE LIKE A BULLET TRAIN**
1. **BE ORIGINAL. DO NOT FAKE IT NOR PLAGIARIZE**
 2. **BE THE BEST YOU CAN BE BECAUSE THAT IS ALL YOU WILL EVER BE!**

ACTIVITY THREE: MUSICAL INSTRUMENT

1. **USE ONLY RECYCLED MATERIAL**
2. **USE NATURAL ELEMENTS E.G. STONE, LEAVES, SAND AND MORE . . .**
3. **MAKE A MUSICAL INSTRUMENT THAT CAN PRODUCE A UNIQUE**

SOUND TO PRESENT YOUR POEM OR STORY. LET IT COME ALIVE.

1. **WE WILL PRESENT AN ORCHESTRA AFTER THE WORKSHOPS WITH ALL THE SOUNDS TOGETHER.**

.....

3. 17 Sustainable Development Goals

SUSTAINABLE DEVELOPMENT GOALS



4. Journaling Samples:

Participant: World Champion Journaling.

Reflection 1:

Feelings

As I was attending this first session of the programme, I had more understanding of what this programme was about. Basically, referring to the important of conserving our planet. I also enjoyed Fiona Khan's presentation based on environmentally sustainable development knowledge.

Evaluation

In this session I learned how environment conservation can be brought about in teaching and learning in a school environment. For instance, having different dust bins for different recyclable materials (paper, glass, metal and etc.) in a classroom. Learners can also design musical instruments using these recyclable materials, thus promoting sustainability (Reuse, Reduce and Recycle).

Conclusion

I am committed in attending all of this programme sessions from what I've learned today.

Whole Brain Creativity and Thinking Programme

Topic: Imagineering Techno Skills (Tools for Digital Media), E-learning, Mathematics and Biometrics.

Reflection 2:

Description:

This was the second session of the programme which took place in Edgewood Campus (Auditorium) from 10h00 to 12h00. Miss Fiona Khan's presentation today was based on Imagineering Techno Skills (Tools for Digital Media), E-learning, Mathematics and Biometrics in teaching and learning.

Feelings

The presentation was very helpful and I felt enthusiastic about how I can use different types of Media as resources for teaching and learning. In addition, I felt proud after presenting the poem I wrote based on sustainable living, titled "My Companion". I also submitted the musical instruments (drums) made from recyclable materials, which will be used during the last session (Recycling poetry, storytelling and music).

Evaluation

The presentation brought some questions to discuss, for example;

How do you plan your lesson?

What steps do you follow/consider when planning a lesson?

How can media tools (e.g., newspapers) enhance a lesson?

We responded differently on these questions based on our different teaching practice experiences.

Conclusion

I would like to learn more about tools of digital media and how these tools can be used to enhance teaching and learning.

Whole Brain Creativity and Thinking ACTIVITY

Topic: Recycling Poetry and storytelling, musical instruments

Reflection 3

Description:

This was the last session of the programme which took place in Edgewood Campus (Auditorium) from 10h00 to 12h00. Miss Fiona Khan's presentation today was based on teaching strategies & methods and pronunciation & enunciation. This workshop was also about recycling poetry and storytelling, musical instruments.

Feelings

I felt positive and happy during the work. Simply because, I learned a lot with regards to teaching strategies & methods, for instance; structural learning, teaching models, reading and writing, classroom management, group work (sharing & pairing), presentation of lessons, assessments, attitude and teamwork, elocution, pronunciation and enunciation. The aforementioned will be really resourceful and helpful during my Teaching Practice experience. In addition, I felt proud during our performance of the poems and musical instruments. Although I think we should have put more effort in inviting fellow students. And also receiving a certificate of participation in this workshop was another happy and joyful moment.

Evaluation

Best quote of the presentation "**I Lead to Succeed**".

The presentation covered various topics, with more emphasis on pronunciation and enunciation, including phonics & voice (tone and pitch).

Towards the end of the workshop poems and musical instruments were presented. And I think the presentations showed creativity and some talents.

Conclusion

I would be happy if this workshop can also be conducted again. And I would be looking forward to participate and engage in "**Whole Brain Creativity and Thinking Programme**". **Oh my can this pic be removed?**



Poem for Presentation: World Champion

My Companion

Look all the Litter

Those leaves

The land loaded

With the jungle of

Junk

With the scattering

Scramble

Look at all the buildings

That are built

Block by

Block on

Wetlands...

What about the Biodiversity

Habitat?

**Why destroy nature?
The birds sing for you
The trees that wave and dance for you
The sunrise that brings light on the neighborhood
The flowers that bring, bees to buzz.**

**Why destroy the home of love and beauty?
The blue skies that bring color in your eyes
The green grass that brings happiness in your heart
The red flowers that bring love to your soul
Why destroy such a wonderful home?
Why destroy my companion**

Reflection 4

Golden thread...

I believe the programme is very much useful, educational and uplifting, will be of great benefit to most students as it will give about direction to the lost souls [first years] in this new environment, that's very confusing, challenging, intimidating.

Different students come from different backgrounds and different upbringings, with different values and morals, and perceptions about the higher institution, some come here [university] with the aim of studying, graduation in record time, getting into the world of work, yet some come here with intentions of just being away from home, with the status of just being in university. I personally feel, it will give such students an idea as to why they are here, what is it that's expected of them and so forth.

Furthermore, as much as confused one is when they reach an environment of novelty, this programme, might gear them into the right path. Give them an idea how to handle themselves, and what not.

It will teach of what effectiveness and competency is. Additionally, it will help uplift them change their mentality and nature or boost their self-esteem.

This should be a welcome to university module.

Participant: Treasure

Poem:

Mother Nature

She provides, she sustains!!!

She provides, she sustains, lives of many different kinds,

Human species, fauna and flora.

Her value, incalculable.

People have different views of her.

She means a lot of things that are different to different people.

To others she is of intrinsic value, yet to others she is of instrumental.

Environmentalists, ecologists, conservationists, "the green doctors" know her equivalence, her worth.

Economists only see the profitability in her

She is effective, sufficient, has enough for need not greed.
Protect me! Conserve me, she screeches. She is so loud with words she does not utter.
In a confused world she's only understood and appreciated by few.

Slowly but surely, she hints on phenomenon,
speaking in riddles [she portrays unstable weather condition]
Sending a memorandum to her consumers, successors.
"Sooner or later, if you DO NOT listen to me, "you will sustain a common tragedy" she yells.

She was there since genesis, even now during revelation times.
She self-regulates as the Gaia hypothesis exists.
She MOTHER NATURE is for love, peace and tranquillity.
All things all day everyday occur around her.
She MOTHER NATURE is for love, peace and tranquillity
So says the waters flowing in the rivers,
Refreshing our minds and souls.
She MOTHER NATURE is for love, peace and tranquillity
So says the chanting birds in the early morning as the sun rises, restoring hope in the hearts of the
broken and hopeless.
The clear blue skies at dawn, the billion stars in the later evening,
Lighting our hearts and path.
The wind blowing trees, improving the quality of the air we breathe.

These interactions, biotic and abiotic, on the habitat [environment]
Occur around her all day, every day.
She feeds us, she shelters us and she clothe us. She is for love, peace and tranquillity.

She MOTHER NATURE, the environment very strong and natural,
cannot be cloned, gradually she gets weak, as she is consumed by her consumers,
She breaks down, she decomposes...

It is up to you to help me regain myself worth, help me combat this depression that's tormenting me.

Remedy me, give me anaesthetic, antitoxin help me regain my Dignity.

She MOTHER NATURE cries,

She cries for the DEATH of egocentrism and the REBIRTH of ecocentrism.

Care for me, in order for me to care for you, Bring back my aesthetic beauty.

The world is in your hands.

Participant: Treasure

Whole Brain Creativity and Thinking Programme.

I am a 23 years young lady, who has successfully completed my degree in Geography and Environmental Management at the University of KwaZulu-Natal, Howard College. I am currently studying Postgraduate Certificate in Education at the University of KwaZulu-Natal, Edgewood campus.

I grew up in a township called Lekazi, Mbombela city, Mpumalanga province. Raised by a single parent, who played both roles of a mother and father that is why she is QUEEN MOTHER who will harvest my success. I pray to God to keep and sustain her for me so she witnesses my triumph.

I am a very kind yet reserved person, not very good at conversing, which is why I hardly associate myself with people. At most times I am all by myself. I love music, I love singing, soccer of which am not that good at, I also would love to learn how to swim, I have been in Durban for four years now, but only been to the beach like 4/5 times, am afraid of water [aquaphobic] and some heights depends. However, I am an individual who loves a challenge and always game for one. I love taking short walks in the evening for that is when it 'is chilled and refreshing.

At the age of 10 in grade 4 I joined the South African scout's association, as a cub of 1st Tenteleni primary school. We would attend meetings, on every Tuesday of the week during schooldays just after school, to engage in activities, and we would also go to camps, where we would enjoy the fascinating aesthetic beauty of nature, we not sleep in hotels or guesthouses but we would pitch tents and sleep in them for the duration of the camp.

Camps would usually be two nights three days, or four to five nights five to six days. That is when and where my love for nature realised for while in meetings and or camps, we would take part in adventurous and exciting activities which among others included hiking, wall climbing, bed feeding, conservation, planting of trees, making of gardens and more. We would also be taught on how to be

independent and survive on the streets/forests just in case one day one ran out of road at night and be prepared for anything, of which the scout motto is "BE PREPARED". Alongside of the motto there is a promise, law and other things that we adhered to.

I am one person who would go out and connect with nature at any given time of the day, rather than be indoors watch TV or go out partying.

I love the inextricable relationships of nature it [nature] is very distinct, diverse and remarkable I am one person who very much values nature for nature is a miracle itself, nobody can reproduce it, only it can.

I wrote the poem and titled it Mother Nature for mothers take good care of their children and so does nature, so in this sense I refer to nature as our mother, in paragraph 7 of the poem I contend that " She feeds us, she shelters us and she clothe us."

That's what our parents do, especially our mothers, no matter the circumstances I also state that "She is for love, peace and tranquillity"...

Mothers always try maintain the love and peace at home whatever feud and tension is there, she will try restore the peace.

It's easy I am just one person who believes in the phrase " healthy nature, healthy people" which was our scout summer camp 2007 theme. In order for us as people to be healthy, our environment has to be clean and healthy too.

I always say to my relatives, you cannot be in a dirty place and expect to be clean. One has to be in a clean environment/ place in order to be clean too. Just like the air we breathe has to be clean pure in order for us to stay healthy too, otherwise, impure air, would result in a lot of sick individuals. My poem also states in paragraph 6.

" The wind blowing trees, improving the quality of the air we breathe. I also believe in the saying, "cleanliness is next to Godliness". I also believe in scout law number 10: **A Scout is clean in thought, word and deed.**

Participant: Reflection: African Queen:

The four workshops were very informative. I learnt a lot and the knowledge gained enhanced my personal and professional development. I found the left and right brain activity very interesting because it was new content and useful to use in the classroom. Also, the aspects to using music to activate the whole brain activity in the classroom bring positive change in mood and focus.

Furthermore, I learnt different teaching strategies that can be used in the classroom to activate effective learning. For example, interactive learning methods and using relevant materials and resources to enhance content taught. One can use blocks for multiple functions in a mathematics lesson such as fractions, in an English lesson for different colours.

Participant Treasure: Journaling

The Whole Brain Creativity and Thinking Programme.

Reflection

Topic: The [W]holistic Teacher: Back to basics (human-to-human interactions).

Today was my second day attending workshop [second session]. We learned about being a holistic teacher. A **holistic view means** that we are interested in engaging and developing the whole person, incorporating the concept of holism in theory or practice. Integration of different aspects of teaching. So basically, content was focused on making a classroom an inclusive medium of debate, an interaction centre. To create a classroom that's interactive and lively. Instead of teaching in the same old tradition manner, change the status quo of pedagogy. For it is good to be constantly changing and adapting rather than to be passive and tradition. Most importantly the importance of inclusive education, for the creation of equal opportunities and possibilities for students, in order to achieve substantial results. Furthermore, I learnt that it is of vital importance for us as teachers to include all learners in the learning process irrespective of their differences or similarities, and to treat them all equally, and to avoid streaming for that creates a gap and /or a divide among students.

Inclusive education as defined in the WP6 accepts and respects the fact that all learners are different in some ways and have different learning needs which are equally valued, enabling education structures, systems and learning methodologies to meet the needs of all learners. Acknowledging and respecting differences in learners whether due to age, gender, ethnicity, language, class, disability, HIV or other diseases. Broader than formal schooling, acknowledging that learning also occurs in the home and community, and within formal and informal settings and structures, changing attitudes, behaviour, teaching methods, curricula, and the environment to meet the needs of learners. Maximising the participation of all learners in the culture and the curriculum of educational institutions is being inclusive. Inclusive education is also empowering learners by developing their individual strengths and enabling them to participate critically in the process of learning. Most

importantly, identifying and minimising the possible barriers to learning. For once one student feels side-lined, discriminated against or isolated, they automatically change their view of school and or learning, therefore affecting their learning process, participation /performance and their overall behaviour. This was a very productive session, very helpful and educational, for it has taught me how to be a good and effective teacher.

Participant: Treasure

The Whole Brain Creativity and Thinking Programme.

Reflection

Topic: Imagineering Techno skills [Tools for Digital media] E-Learning, Mathematics and Biometrics.

So today was my very first day, must say I was kind of confused as to what was happening, I mean the topic itself somewhat seemed very sophisticated for someone like me, I mean am just nothing but an average student, who likes things, wish I were involved in a lot of programmes but then zilch opportunities coming my way. But this programme was different. I was learning and I knew myself. Fiona spoke to my soul.

Learnt of Imagining and engineering as in 'Imagineering' which is to devise and implement (a creative idea). Imagining and engineering technological skills.

How to think on the feet [using your brains] as to gain learners trust [The pyramid of trust] how to treat, respond and talk to learners, also to make teaching a techno business. Making or creating a happy and vibrant, lively classroom. Conducting lessons in a way that stimulate learner's attention from beginning of lesson all way throughout the end.

To make use of immediate and available resources. Also learnt of the effective use of E-Learning, as it also grants and advance learners computer skills. For E-learning is the current and effective method of learning, so if schools have the resources, learners should be exposed to such. Allowed to use their mobile phones for research and communication purposes, and even much more.

Technology is what students live and breathe every day. If you want to make your class the most interesting class that everyone loves to go to, then you must incorporate some kind of technology. Instead of lecturing and having students take notes, use a smartboard and have students come up to

the board and interact. Instead of giving students a quiz on paper, use a computer or a tablet. Instead of having students work on a project together, have them video conference with another class from another country and work with them on the project. Utilize technology in your classroom and your students will be interested and engaged in what they are learning. Overall, talk less and involve students more. The more you make your class interactive and the more that you utilize technology, the more your students will enjoy what they are learning.

Participant: Gold Digger

Reflection on Session 1 of the Enhancement Program for students and teachers with Fiona Khan

Whole Brain Creativity and Thinking

As a teacher in training the theoretical work we are taught in lectures is just the slab of building a comprehensive teacher. Fiona Khan's session of the enhancement program was expressly advantageous to myself and other colleagues present. It allowed us as teachers to holistically view the art of teaching completely differently.

Learning about left and right brain activity for whole brain creativity really unlocked much of the questions many of us had about going out into the field and what activities one can use to promote inclusion in the classroom. To me this section felt like an extension of Teaching Practice which is already a part of the Bachelor of Education curriculum. Fiona also introduced simple resources such as building blocks which can be used from grade R through to grade 12 in teaching with counting, fractions, sensory motor skills, colour differentiation and so much more. There were also some worksheets with cut outs which could be used in class for learners to cut and construct objects which can be used to see how well a learner uses scissors from ECD or can put together such an object/device in teaching and learning for gaming and math.

Encouragement in the use of digital data was also important because many learners and teachers are still too afraid to include this in their lessons not realising that due to the 4th industrial revolution most learners have become more acquainted with apps, the internet and visual literacy as a whole. These teaching strategies, if managed and planned for thoroughly can make a success of any subject and content.

Awareness of our living environment and how to reduce the human carbon footprint was also emphasised as a subject to be taught and practiced in schools by all stakeholders. Leading by example is the key to the success of such projects where one as a teacher can start a program, with principal and SGB approval, and encourage learners to join and become self-sufficient in maintaining a project independently. Such programs can be extended to the community surrounding the school and be grown exponentially.

My personal favourite was the discussion on indigenous knowledge, because this is where I am most passionate. It was highlighted that indigenous knowledge will alert learners to the importance of being in harmony with the ecosystem. Learners may then take this back to their parents as well as their

communities where they will then act as innovators of change within the community. It also taught us that one must be flexible in the class and allowing such knowledge to be used to relate content effectively.

Overall, I thoroughly enjoyed this session and was re-invigorated to be the teacher I imagined myself to be and also to have proof that it can and has been achieved beforehand.

Thank you, Ms. Fiona Khan.

Participant: Earth Angel: Story for Presentation



Fire and Water – The pleading spirits

This is the story of two pleading spirits;

The spirit of water

And

The spirit of fire.



2

The Pleading Spirits

"Why is it that you burn so strongly these days *fire?*", asked the water spirit.

"It is because of what I see everyday *water!* Through the eyes of the sun I witness humans burn rubbish bags, throw plastics onto roads, mix rubbish easily and leave taps running unnecessarily, wasting your life my friend."

"I hurt when I see Father Earth and Mother Nature toss in pain from the harm these humans leave behind. A species which cares for only itself!

No matter how loudly Father Earth shouts 'SENZENI NA, SENZENI NA?' ('WHAT HAVE WE DONE, WHAT HAVE WE DONE?'), as if it were back in 1976. Does Earth have to go on a strike before they recognize that the problem is real?

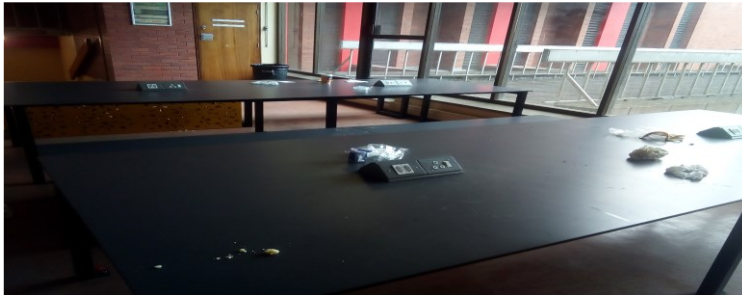
Does Mother Nature have to sadly sing 'SABELA, SABELA, UYABIZWA!' ('RESPOND, RESPOND, YOU ARE BEING CALLED!'), before they heed the call to plant more trees and look after what nature has given them!

3

The Pleading Spirits

"One would think", continued *water*, "that they are educated enough to recognize that all the big and small containers are placed for them to throw away rubbish."

"But even the simple thought of taking a mere five steps from their way would ruin the entire day.", exclaimed *fire*.



4

I've also heard them excitedly quote 'they are creating jobs' when they "lovingly" throw a plastic bottle, which housed me, out of a moving vehicle. Not realizing that that container may go down a drain and straight to the ocean, on its way killing a fish or three.", sighs *water*.

5

Educated they claim to be, yet the simple gesture of putting plastics, cardboard boxes and paper in an orange refuse bag, all garden refuse in a green bag and normal household refuse in black refuse bags, where a whole in the back yard can be made for organic materials such as potato and carrot peels is frustrating." - *fire*

6

"How do they plan to teach the younger generation when it is such a CHORE to be responsible?" - *water*.

7



The Spirits Plead

This is how green our land must remain.

8



The Spirits Plead

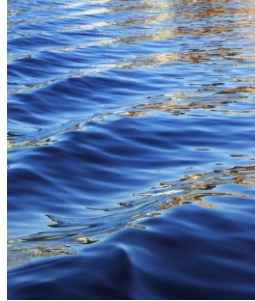
Let us plant our own nutritious food.

9



AS SPIRITS WE PLEAD, TAKE THE FIRST
STEP.
THROW AWAY THE RUBBISH WHICH
BELONGS TO YOU IN THE PROPER PLACE,
THEN BY EXAMPLE TEACH OTHERS!

The spirits plea.



Second year Bachelor of Education Student at UKZN, Edgewood Campus. Studying towards specialization in the Intermediate and Senior phases with Natural Science and Mathematics as major subjects for teaching. Loves to read and is passionate about education; be it for the young or the older generation. This short story was written as a 'task' for a Teacher Enhancement Programme run by Dr. James of UKZN, Edgewood and facilitated by Fiona Khan, in attempting to prompt the greater University as well as the outside community of the damage we as humans are doing to the Earth and Nature.

Participants: Rockstars Poem:

My Companion

Look all the Litter

Those leaves

The land loaded

With the jungle of

Junk

With the scattering

Scramble

Look at all the buildings

That are built

Block by

Block on

Wetlands...

What about the Biodiversity

Habitat?

Why destroys nature?

The birds sing for you

The trees that wave and dance for you

The sunrise that brings light on the neighbourhood

The flowers that bring, bees to buzz.

Why destroy the home of love and beauty?

The blue skies that bring colour in your eyes

The green grass that brings happiness in your heart

The red flowers that bring love to your soul

Why destroy such a wonderful home?

Why destroy my companion?

My Companion

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Why destroy such a wonderful home?

Topic: Imagineering Techno Skills (Tools for Digital Media), E-learning, Mathematics and Biometrics.

Reflection:

Description:

This was the second session of the programme which took place in Edgewood Campus (Auditorium) from 10h00 to 12h00. Miss Fiona Khan's presentation today was based on Imagineering Techno Skills (Tools for Digital Media), E-learning, Mathematics and Biometrics in teaching and learning.

Feelings

The presentation was very helpful and I felt enthusiastic about how I can use different types of Media as resources for teaching and learning. In addition, I felt proud after presenting the poem I wrote based on sustainability living, titled "My Companion". I also submitted the musical instruments (drums) made from recyclable materials, which will be used during the last session (Recycling poetry, storytelling and music).

Evaluation

The presentation brought some questions to discuss, for example;

How do you plan your lesson?

What steps do you follow/consider when planning a lesson?

How can media tools (e.g. newspapers) enhance a lesson?

We responded differently on these questions based on our different teaching practice experiences.

Conclusion

I would like to learn more about tools of digital media and how these tools can be used to enhance teaching and learning.

DR James

MOTIVATIONAL LETTER; Right and Left Brain Activity for Whole Brain Creativity Program.

I write this letter to state why I should be granted a seat in attending the program titled Right and Left Brain Activity for Whole Brain Creativity. The title of the programme have interest me in a way that I cannot wait to hear, learn more about the "whole brain creativity" and hear different perspectives from the academics who will be present. From my perspective I believe brain is the most important part of the body because everything happening in the body is reported unto the brain and the brain do amazing things if it is use efficiently. Brain is like a driver and a body is like a vehicle or any transportation that needs a driver to function. From our actions, behaviour and attitudes it easy to determine if brain is use efficiently. From what I know about the two hemispheres of the brain (right and left hemisphere) I believe I will be more equipped and rich in information after the program. Learning new things from different academics always interest me. Making TedTalks for example are always interesting to watch.

If you grant me an opportunity to attend this programme will not be a regret because I will spread information to others and to my siblings and I will be available to attend all the four sessions dated.

Thank you

RIGHT AND LEFT BRAIN ACTIVITY 4 WHOLE BRAIN ACTIVITY

Reflection

Description:

This programme took place in Edgewood Campus (Auditorium) between 10h00 and 12h00. Miss Fiona Khan and Dr Angela James introduced and explained the purpose including objectives of this programme. Basically, this programme aims to enhance students' experiences and actions with regards to Sustainable living through creativity, language usage and reasoning in Science and Technology Education.

This was the first session of the programme, therefore it was like an orientation.

Feelings

At the beginning I felt very confused about this programme. However, as soon as Miss Fiona Khan explained the importance of conserving and protecting the environment, I was able to make connections and think critically about environmental sustainable development.

In addition, the activities we did (singing & drawings) were fun and enhanced my interest with regards to sustainable living.

Evaluation

In this session I've learned to express my ideas and opinions with regards to issues associated with environmental sustainability. Issues that include; climate change, ecotourism, desalination, rainwater harvesting and carbon footprint.

Conclusion

I think this programme could have been more interesting if more students were involved.

Action

It would be a positive action to call upon fellow students to attend this programme as it is very beneficial in several ways. Students can develop environmental knowledge and skills.

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Ideas must flow. not authors

② focus ⇒ make it clear ⇒

relevance ⇒ of questionnaire
IS it the programme or
SD.

teaching ⇒ not so.
pre-service ⇒ teaching
practice

③ Kobus Kleiting ⇒
de Beer. WBC + SD.

too many

How do they
what are we achieving

what is the programme. ⇒ More
Methodology details
data requirements.

④ leave out ~~conclusions~~ keep
keep action Research, keep
Methodology

⑤ evidence ⇒

Structure ⇒ what is problem
Problem ⇒ problematic

focus. Netan
advocate

✓ Rationale ⇒ but
backed by (structure) a researcher

assumptions are presumptions

Methodology

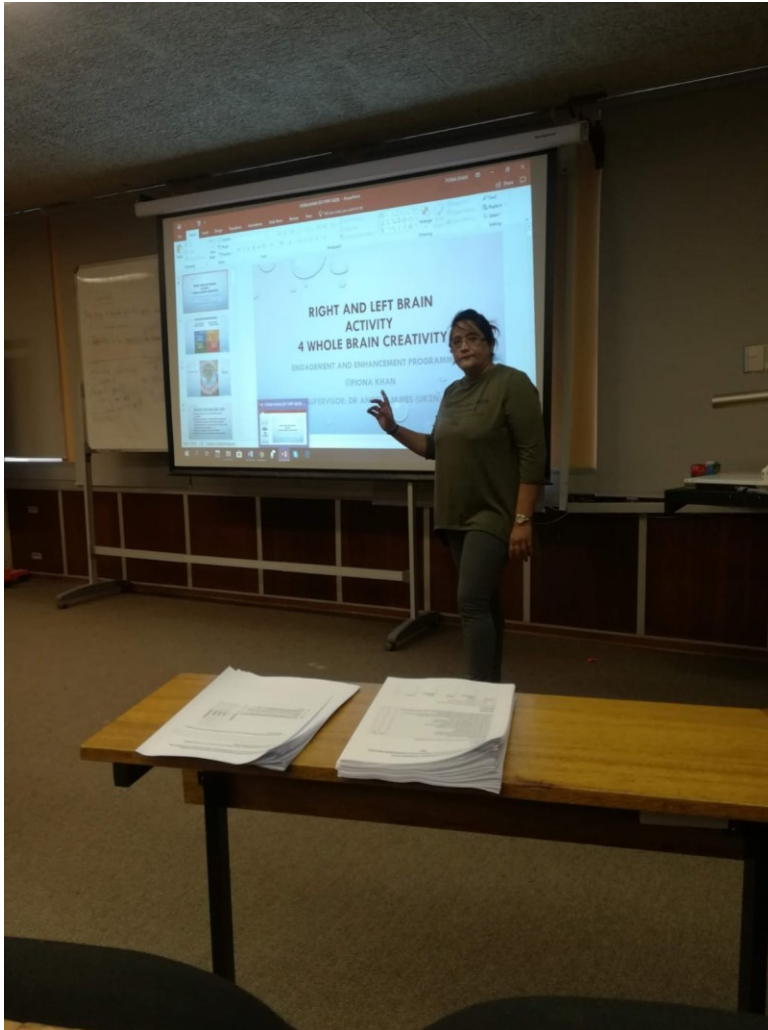
Structure ⇒

Sampling: n of students
These should have
been in the program

Data Analysis

guba ⇒ 1985 - more
recent

Let's get started with the WBCT Programme.



Group Photo of the participants in the Whole Brain Creativity and Thinking Programme.





The planning, ideation and testing. The Whole Brain Experience with Design Thinking and Imagineering.

of SD through the experience: RLA4WB

Research Questions

- 1) What are the students' experience of the ALBA
- 2) Did their experiences enhance their understanding of SD. Y/N
- 3) What are the understandings
- 4) Why did they have the experience

Research Questions

1) What are the students' experience of the ALBA

RQ1	Instrument	Reason
RQ1	Students' experience	Questionnaires

goals

UNESCO. SD + RLA4WB

Implications FYs?

Argument

* This study argues for the use of whole brain creativity and thinking instead of Right or left brain dominance.

Building Blocks

- 2) Students understanding
- 3) experience of RLA4WB
- 4) within an educational concept

Lit Rev. De Boer M.H. Creative Model

SD + Goals

students understanding of Sust. Dev. focus on content and experience

goals

UNESCO. Implications

Argument

* This study argues for the use of whole brain and thinking instead of Right or left brain dominance

standing: RLA4WB Creativity

creativity is about using the brain. I.O.W. be simple or left brain dominance and intelligence and

Contribution to Research

Knowledge / Ideas / Paradigm

Implications FYs?

Argument

* This study argues for the use of whole brain thinking and thinking instead of Right or left brain dominance

2 groups contribution? Research about students understanding of Sust. Dev. (concepts) focus on experiences

What?

To enhance students' understanding of SD through the concept of "RLA4RB" Creativity

NH (1990) creativity is about using the power of both sides of the brain. I.o.W. be dispels the myth of left or right brain dominance in determining a person's intelligence and creativity. Educationist continues to base their thinking on dominance of Left brain cognitive competences over RB creative competencies.

and practice of learner performance

DELIMIT

Theoretical Frameworks

1) Experimental Learning (what highlights say about)

2) 20

2 groups contribution? Research about students understanding of Sust. Dev. (concepts) focus on experiences

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UNESCO

SD

Implications FVS?

Argument

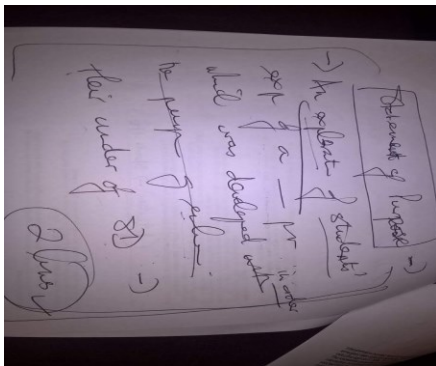
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Building Blocks

1) Student's understanding of RLA4RB within an educational concept

Lit Rev. USDT + Goals

De Boer NH (1990) field



students understanding of Sust. Dev. (concepts) focus on experiences

UNESCO

SD

Implications FVS?

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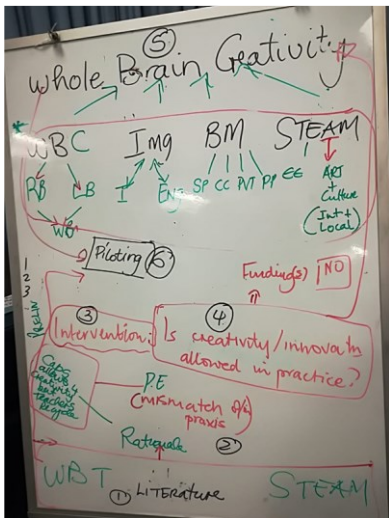
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Contribution Research

What?

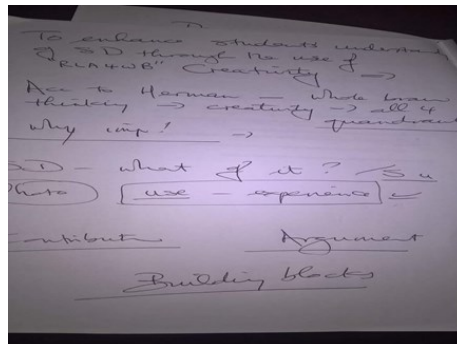
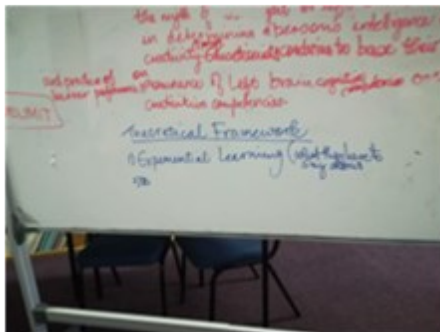
To enhance students' understanding of SD through the use of "RLA4RB" Creativity and experience "Right/Left" in their mind

I.o.W. be dispels the myth of left or right brain dominance in determining a person's intelligence and creativity. Educationist continues to base their thinking on dominance of Left brain cognitive competences over RB creative competencies.

Implications FVS?

Argument

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The Four Workshops

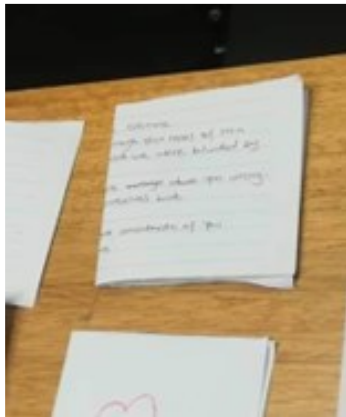




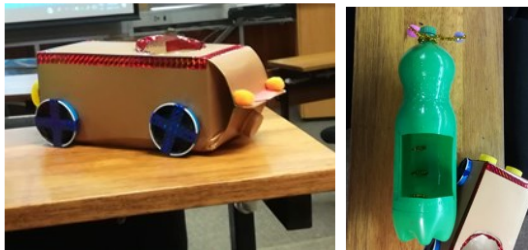


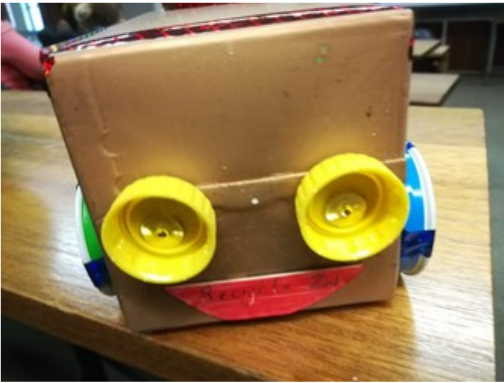
Completed Tasks using Recycled Material

Task 1: Making cards to the Earth

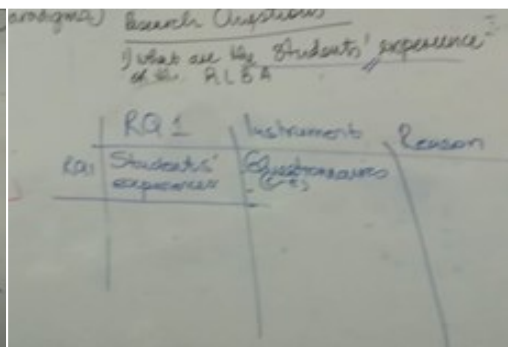
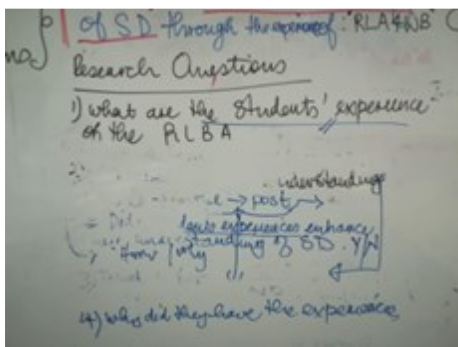
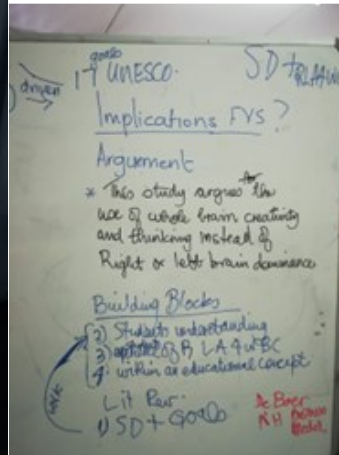
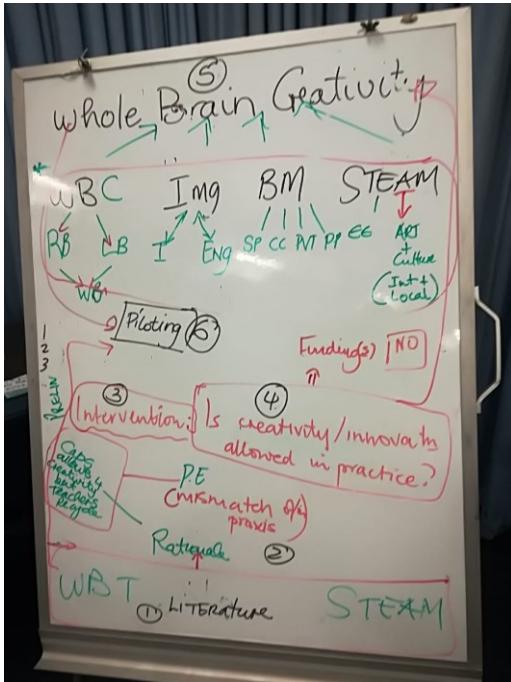
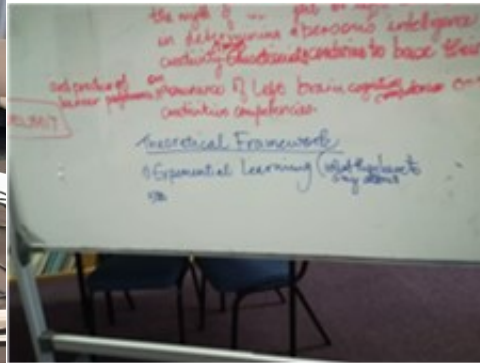
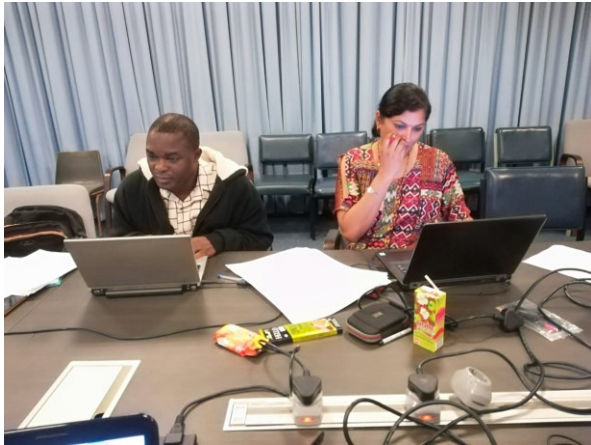


Task 2: Making a robotic toy with recycled material.





The Designing and the Layering in Imagineering:

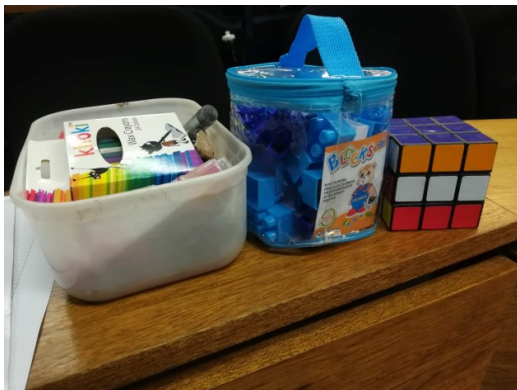
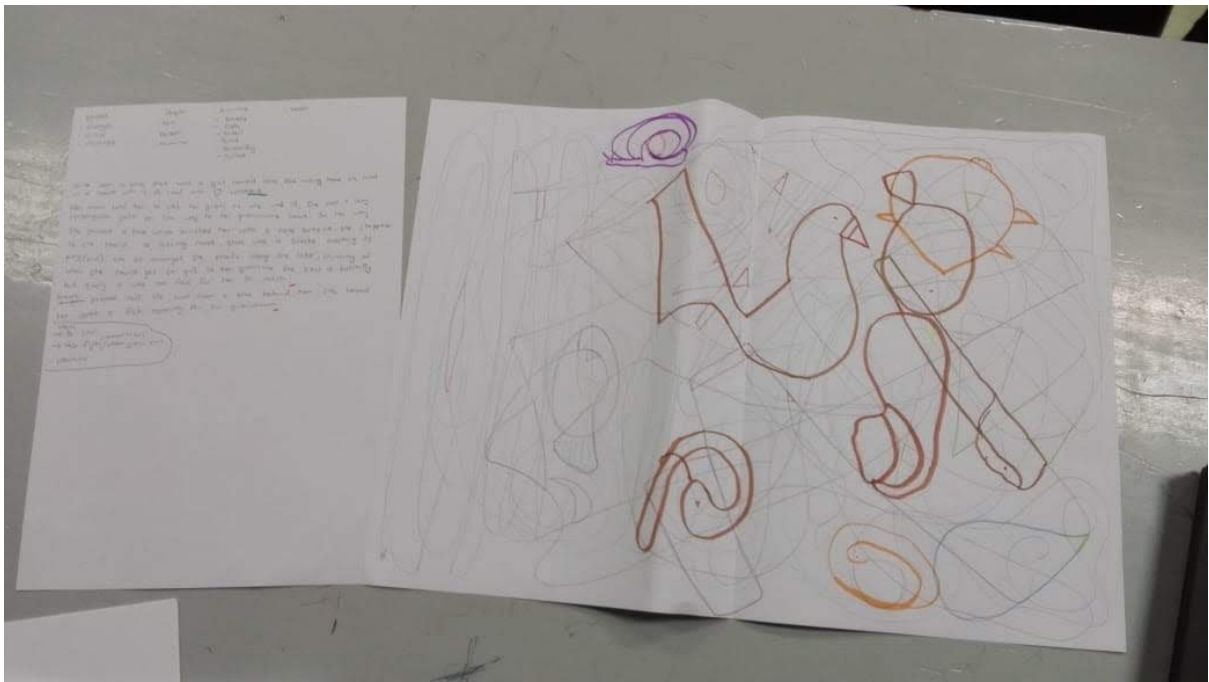


Redefine problems and create innovative solutions with Design Thinking while working among the cohort.

Musical instruments using recycled bottles.



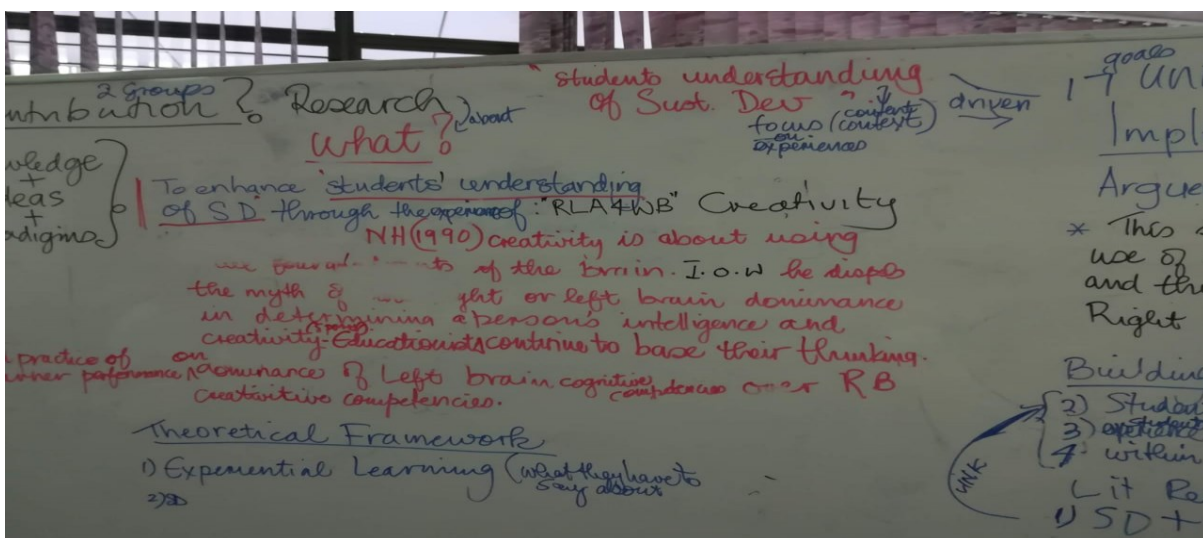
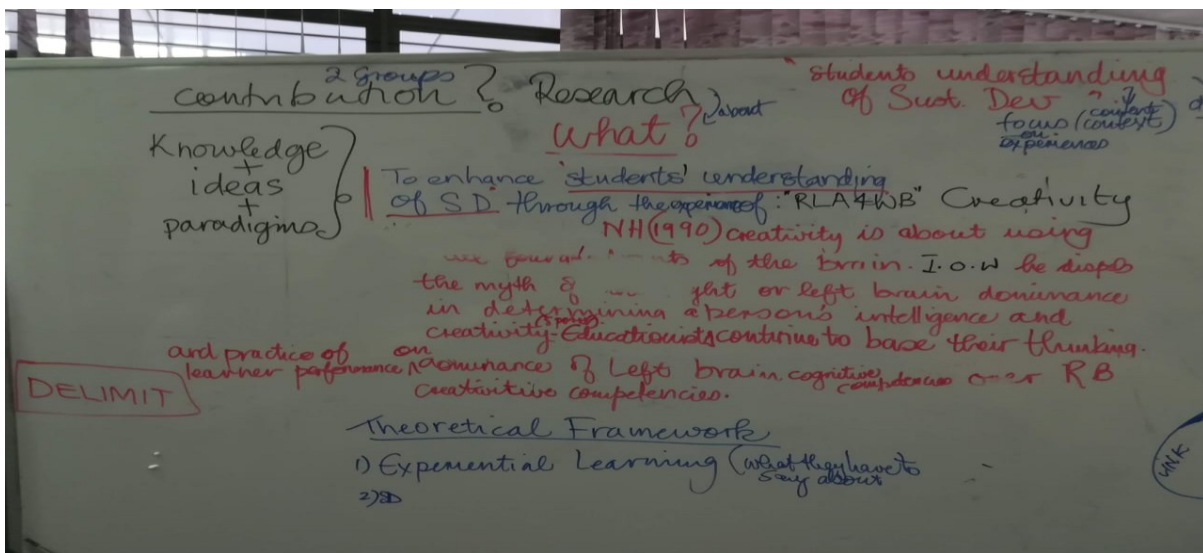
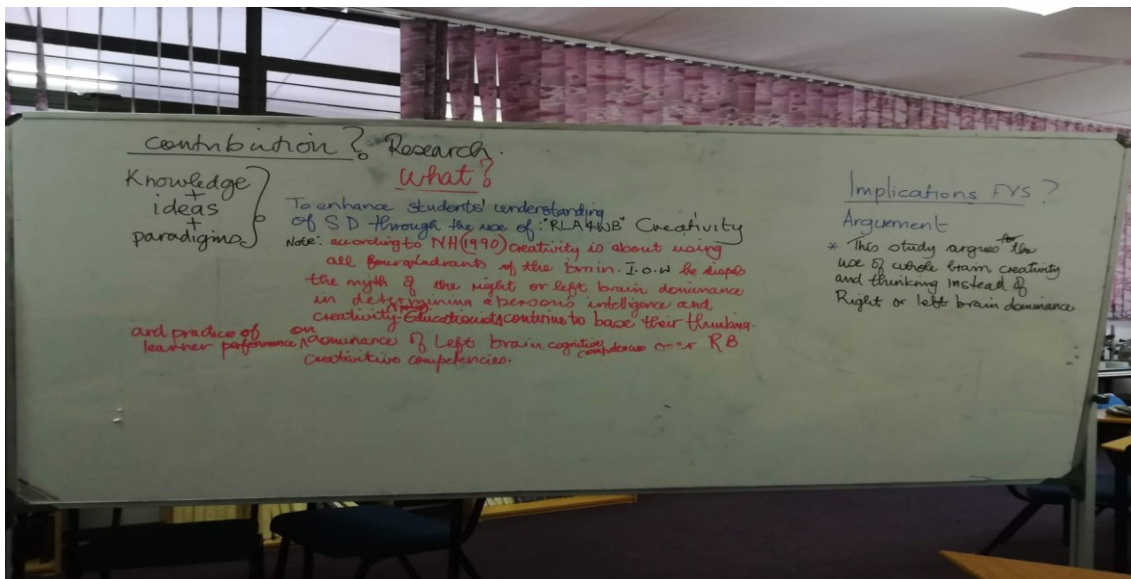
Doodling and drawing: Encouraging Pre-service teachers to explore their creativity.



students understanding
 of Suat. Dew → driven
 → cause (creative)
 → experience

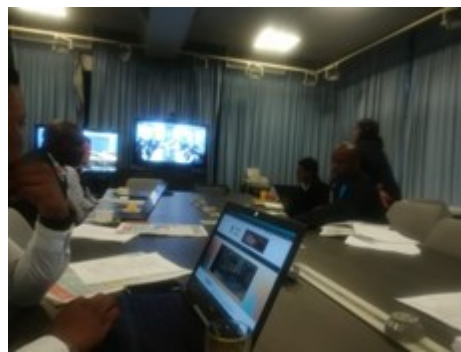
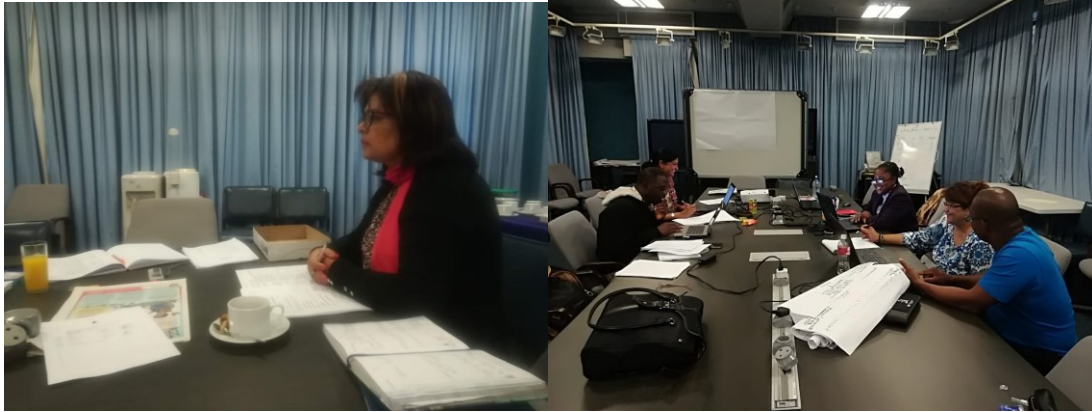
17 UNESCO: Implications
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 and thinking mstr
 Right or left bra

Understanding
 "RELATIB" Creativity
 tivity is about using
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 or left brain dominance
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THE LONG AND WINDING ROAD
© Fiona Khan
Supervisor: Dr Angela James





Planning, presenting and bearing your soul. Back to the drawing board.

Celebrating our future leaders and visioners who completed the Whole Brain Creativity and Thinking Programme. The future of Imagineers in education at Edgewood.





Poetry and the Spoken word accompanied by musical instruments for an aural, Whole-Brain experience.



Chapter 11

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