FOSTERING HOLISTIC EDUCATION IN A SCIENCE CLASSROOM:

A TEACHER'S SELF-STUDY

BY

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ABSTRACT

I am a Science teacher with less than 10 years under my belt. In this research, I aimed to look at how I could integrate holistic education into my mainstream Science class while still aligning my teaching with the prescribed curriculum. I chose self-study as my methodology, thus unravelling and examining myself and my teaching practice became a focal point. My research focus was on Natural Sciences. I was the leading participant, and the other participants were 29 Grade 9 Science students. This study was framed by a socio-cultural perspective, which enabled me to see students through the socio-cultural lenses, i.e., the diverse social and cultural aspects that influenced their development. As the teacher-researcher, this framework emphasised that I, too, did not learn in isolation. The first research question that framed my research was: *How have my past experiences contributed to my interest in holistic education?* I looked at my past experiences with the aid of artefacts, auto-biographical writing, and self-portrait drawing. This yielded insights into why I was a particular way in my classrooms and why I taught my Science lessons in a specific manner. My second research question was: *How can I foster holistic education in my Science classroom?* To answer this question, I worked with my Grade 9 students through adapted lessons that included many arts-based techniques. Data were generated using artefact retrieval, reflective journal writing, drawing, collage, and audio recordings of lessons and conversations. I found that my students enjoyed those specially adapted lessons and were able to gain confidence, and they grew in how they thought about Science. My final research question was: *What is the value of fostering holistic education in a Science classroom?* I looked at the benefits of pursuing a holistic path in Science education, paired with a drawing of my vision of extending this research into practice in my classrooms. Overall, self-study methodology helped me reflect on and make connections between my past lived experiences and the teacher I am now, enabling me to see the growth of the teacher I have become and wish to be.

COLLEGE OF HUMANITIES DECLARATION-PLAGIARISM

I, **TRISHA GOVINDASAMI**, declare that

1. The research reported in this dissertation, except where otherwise indicated, is my original research.
2. This dissertation has not been submitted for any degree or examination at any other university.
3. This dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
4. This dissertation does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

a. Their words have been re-written but the general information attributed to them has been referenced

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Signed  ……

STATEMENT BY SUPERVISOR

This dissertation is submitted with my approval.

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PROFESSOR KATHLEEN PITHOUSE-MORGAN

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LIST OF ACRONYMS

1. CAPS	Curriculum Assessment Policy Statements
2. FET	Further Education and Training
3. GRADE R	Grade of Reception/Prior to Grade 1
4. KZN	KwaZulu-Natal
5. NSC	National Senior Certificate
6. OBE	Outcomes Based Education
7. PGCE	Post Graduate Certificate of Education
7. SGB	School Governing Body
8. STEM	Science, Technology, Engineering, Mathematics
9. STEAM	Science, Technology, Engineering, Art, Mathematics
10. TED	Technology, Entertainment and Design

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CHAPTER ONE: AT THE HEART AND SOUL OF HOLISTIC EDUCATION

1.1 Once upon a time…in a Science classroom not so far away

> "I never teach my pupils. I only attempt to provide the conditions in which they can learn."
>
> - Sir Albert Einstein

Sir Albert Einstein, born to a Jewish electrical engineer in Germany, was a world-renowned scientist, scholar, and teacher. My understanding of his message was that in providing a growing and conducive learning environment, we teachers must create a space where students take responsibility for their learning with us to facilitate and help perpetuate that journey of self-discovery.

1.2 Trying out my superhero cape

I have always had a passion for Science. Since my high school days, I have been intrigued by the field of Science. My zeal for Science education sparked my journey to study towards a Bachelor of Science (BSc) degree in cell biology at the start of 2006 at the age of 17, having just completed my matric year. Studying Science at university was exhilarating for me. Learning new information for me was always a welcomed event. The structure of my lectures and the fact that I had mandatory practicals (where experiments and dissections took place) was different to how I had been taught Science in school. In school, we mostly had the teacher facilitate the practical as a demonstration, as we had no hands-on experience working in a laboratory doing Science work. University life shoved me into the forefront and I was expected to know how to dissect a rat, how to turn on a Bunsen burner, and how to operate a microscope. At school, I had only learned how to do all this in theory. Even my lectures were different. Compared to my lessons in school, lectures at university were driven by a lot of 'self-study' and 'self-learning'. Unlike school, my lecturers would not notice or question if I did not show up to class: my learning was my responsibility.

At school, even though I had a sense of responsibility towards my learning, I constantly had the teachers at my beck and call, reassuring and providing me with the right answers. At university, I struggled in my first year to adapt to the sense of learning on my own and making self-discoveries of the content. Nonetheless, I graduated with a BSc degree in 2009.

At the start of February 2010, I undertook a temporary job teaching Science in a Durban high school (School A) for girls from 2010 to 2011, to girls from Grade 8-10, which re-ignited my passion. I was fresh out of university and was not keen to venture away from my home just yet to enter the working force. A relative who was an English teacher mentioned that her school principal needed a temporary Science teacher to start as soon as possible. I wanted some working experience before I felt confident enough to leave the nest, so I sent in my CV and was called in for the interview. I started the job the next Monday. School A was based in Durban central and was an institution that enrolled only girls from Grades 8-12. A variety of subjects was offered, from Art to Music, to Science and Computers. All forms of sport were also provided, and students had access to many different staff members, from a school nurse to a counsellor, to a multi-media teacher.

I had had an amazing Science teacher in high school, which I elaborate on in my memory writing in Chapter Three of this dissertation. I entered the world of teaching with the hope of resonating with the same persona, attitude, and energy my favourite teacher had in the classroom. But, to begin with, I could not make many changes at my first teaching post, as I was just a temporary teacher and filling in for another teacher who was on leave. I did not want to overstep the boundary as I was new and did not want to offend a seasoned teacher by pushing my taste into his classroom dynamics.

However, when I became a more permanent member of staff and was given my classroom, I put up posters of Science, invested in an interactive skeleton, and even brought some of my knick-knacks in to inspire curiosity in my classroom. I tried to bring some colour into my Science classroom. A bright, colourful, expressive classroom seemed to make my students interested in what I had to offer. I tried to make my classroom look like the very idea of Science evolved there, from covering my windows in artificial leaves instead of curtains to dressing my model skeleton up in the latest scientific fashion. I regularly had pop quizzes in my class, not as a punishment, but to make sure my students would be motivated to learn. Also, I gained a conscientious satisfaction from seeing students that typically achieved average Grades get better marks in an easy ten-minute quiz; this seemed to give them hope and made me feel reassured about what I was trying to achieve.

Since my high school days, I was passionate about Science and tried to make sure my students knew it by always trying to help them, whether it meant explaining the work they did not understand, offering after school tuition, or even offering some personal advice when needed.

This teaching that I tried to facilitate in my early teaching years was incredible because it allowed me to develop my relationships with my students, understanding their educational needs better so I could help them even more. I realised that what I loved more than learning about Science was teaching Science.

At the end of 2011, I resigned from the temporary teaching job and enrolled at university to study towards a teaching qualification, the Post Graduate Certificate of Education. I studied full-time in 2012, with majors in Life Science, Natural Sciences, and Mathematics at the high school level. Since then, I have completed my Honours in Education and taught at two other schools in Durban and Gauteng (School B), before relocating back to Durban where I currently reside. School B was based in Gauteng, where I relocated for 9 months and subsequently placed my study on hold. The school catered for boys and girls from Grades 8-12. The school was ranked as quintile 2 and had severe socio-economic challenges. (The quintile ranking used by our education department places schools in the ranking according to what they may be able to offer and how much funding the department can allocate to them. Generally, rankings of 1, 2 and 3 are non-fee-paying schools, while 4 and 5 are fee-paying schools). Students at this school came from poor communities, often with drug-fueled backgrounds, and families in need of a lot of assistance. I left school B at the end of 2016 and started at school C, where I resumed my study.

Today, I teach at a Durban school (School C) that is co-educational and caters for students from crèche to matric. I teach Physical Science to Grade 10, 11, and 12 students and Natural Sciences to Grade 8 and 9 students. I am slowly building my teaching experience with less than 10 years under my belt. School C is in Durban North and is also co-educational. School C caters to learners from Grades R to 12 and offers many services like school A. Both schools A and C rank fourth on the quintile ranking.

1.3 Holistic approaches in Science education: An untapped power for a Science teacher

As I gained more experience as a teacher, I started to feel that I had been part of a culture that focused on logic and linguistics as being far more gainful and empowering, with minimal regard given to creative aspects. This same sentiment is expressed by Schiller (2006, p.70):

> Over the years, their ability to rely on inner knowing or on intelligences other than logic is weakened or even lost. They lose their ability to be creative and misperceive creativity as a mysterious something or other that only a few gifted people display. Unfortunately, information, logic, and persuasion, the essential modes in research, still receive more value than creativity…

I had this feeling of having been controlled and trapped into perfecting my academics for recognition by my peers, scholars, parents to propel myself into a bright future. I recalled how in high school I was repeatedly told that it was my Grades that were more important than anything else and that my Grades would determine my career and life choices. For example, I recalled a particular incident in Grade 10. I always was an 'A' student and never needed to go for extra lessons. In my Grade 10 year at high school, I started going to show jumping lessons at a local equestrian farm. I thoroughly loved it; I loved the horses, the freedom, getting back to nature. However, as the year progressed, my parents believed that additional tuition for my core academic subjects would be a better use of my time than riding horses. Sadly, I was forced to give up something I really enjoyed and thrived in, to go for extra lessons that I did not need because the message was that excelling at academics was the only goal for me as a high school student. In thinking back to my own past experiences as a high school student, I felt placed in a culture of indoctrination that was rife as I progressed through the Grades. It seemed to me that I was presented with minimal opportunity for general, universal or more holistic development in contrast to constantly being bombarded with directives to prove myself academically.

Looking back, I can see how the desire to investigate the phenomenon of holistic education and how to foster it, stemmed from my own past experiences as a university student, where I found myself struggling to deal with society on a social level, after mainstream education. In my opinion and experience, most students were taught to absorb and assimilate information from their surroundings in a way that best fits with the curriculum standards. I felt that in engaging in such shielded learning, students might have neglected learning basic survival skills for when they are out of the schooling system and no longer units of a government curriculum.

I felt that students became focused on performing only if it meant they would progress in some way, academically. To illustrate, when I started teaching and provided class work or activities for completion, students asked me if work submitted was for marks; there was this trend of

only doing work and learning information that would result in achieving a good Grade. This seemed to be the measure of valuable education to my students. Many of my students had become accustomed to just showing up for the lesson, taking down notes, and leaving. However, I felt that this under-prepared them for the future of their scholastic plans. This again reminded me of my past as a university student: I had felt little confidence in how to suddenly start my adult journey outside of my set and strict schedule of high school life. I had felt like I was under-prepared for life when I graduated. I struggled to adjust to how the working world works. Skills learnt at university to do a particular job were fine. Still, the proficiencies needed to become a confident, well-rounded individual that could cope with stress, cope with failure, cope with the demands of the real world seemed to be lacking. Theoretically, I had learnt the steps to move to the next level after school, after university, but had I really learnt the strategy of life, the game plan, the coping mechanisms of the ups and downs that life tosses your way? In educating students, I automatically felt that I would be perpetuating the training I had received. I was to teach the content this was to ensure they could move on. But, had they really learnt valuable skills from me to cope and adjust to the next, more complex level of life?

I started to become conscious that, as a Science teacher, my teaching was limited by what I had to complete in keeping with the prescribed curriculum, which guided the content taught in my Science classroom. In reading Lawrence and Dirkx (2010), I found myself questioning my innate role as a teacher. I felt that I was expected to roll labourers, lawyers and doctors off the production line we call mainstream education. However, I had this desire to make it more worthwhile and to impart (from my own lived experiences), the tools needed to make my students more creative in how they viewed education, to build them up as innovative thinkers and doers.

1.4 Mapping out my study

In the research presented in this Masters dissertation, I aimed at looking at how I, as a teacher, could integrate aspects of holistic education into my mainstream Science class, while still aligning my teaching with the curriculum as prescribed in the Curriculum and Assessment Policy Statement (CAPS) (Department of Basic Education, 2011). I chose self-study as my methodology, thus unravelling and examining myself and my teaching practice became a focal point. I engaged in self-study in an attempt to not only learn more about myself but to

understand the educational journey I have undertaken thus far, and how it has impacted me personally and professionally.

My research focus was on Natural Sciences as I was directly involved in teaching this subject to Grade 8 and Grade 9 students. I chose to focus on Natural Sciences for this study because I have found it to be a gateway subject. It is a subject that students have to do until Grade 9, at which point they then decide to either continue with it (in Life Sciences, Physical Sciences, or both) or not. Natural Sciences has all the prerequisite knowledge for both Life Sciences and Physical Sciences in terms of content coverage.

I wanted to try to develop a more comprehensive approach in my Science classroom. I wished to integrate embracive avenues in my lessons so that my students could have opportunities to flourish themselves in other realms than numbers and language. I sought to open up their minds to creative learning. Similarly, Glenn (2011) suggests that teacher pedagogy needs to share interconnectedness to the integrated approach of shaping and moulding students, to develop the human mind beyond pure cognition of language and numbers. Numeracy and literacy are two foundational aspects that South African teachers are required to prioritise at an early age. The Department of Basic Education has curriculum policy documents for language, numeracy and life skills as the only curriculum documents for the foundation phase. Language is allocated 10 hours per week, numeracy is assigned seven, and life skills is given only six (four if you exclude physical education). The allotted hours display the hierarchy of what knowledge and skills are deemed the priority. Our fast-paced world demands individuals who are capable of thinking and handling problems with a creative and diversified approach (Hunter-Doniger & Sydow, 2016). Cultivating creative thinking requires risk-taking, especially from our students (Hunter-Doniger & Sydow, 2016). Hence the introduction of a safe environment, where students feel comfortable to engage fully, is of utmost importance (Hunter-Doniger & Sydow, 2016). This, I believe is relevant to for all education subjects, but I approached and applied this guideline specifically to Science education, as this is where I wished to make some advancement.

The CAPS document for Natural Sciences covers general aims for this education system and is intended to ensure children receive the knowledge and skill set needed to propel them to the

next Grade. This document, in my opinion, mostly provides a textbook definition of Science education, detailing the procedures involved in doing Science and how one can formally identify that Science education is taking place. For me, this curriculum document does not provide a multi-faceted definition to include creative, innovative, imaginative, and inclusive approaches to Science that will yield not only understanding, but an interest in Science education.

Natural Sciences has four knowledge strands outlined in the CAPS document. These four strands form the framework for all content covered in a year for each Grade: Life and Living, Matter and Material, Energy and Change, Planet Earth, and Beyond (Department of Basic Education Curriculum and Assessment Policy Statement, 2011). The CAPS document for Natural Sciences also highlights specific aims intended to provide students with opportunities to comprehend, question, and research ideas in Science. They utilise rules, laws, and methods to do Science, understanding the content and theory of Science, and understanding the uses of Natural Sciences and indigenous knowledge in society (Department of Basic Education Curriculum and Assessment Policy Statement, 2011). The issue I have had with this is that the CAPS curriculum policy document provides no avenues for how to implement ideas about the uses of Natural Sciences and Indigenous Knowledge in society in my lessons. These were concerns that prompted my self-study. The aims were admirable but the execution required attention in my Science classroom, especially when I had deadlines to adhere to in finishing the content first.

Through my research, I aimed to learn how I could foster aspects of holistic education in my Science classroom, and in doing so, came to understand the value of this approach in the mainstream curriculum. Although the need for students to achieve was set by a standardised testing program (the National Senior Certificate), I wanted to promote learning in a varied, alternative, user-friendly nature that fostered the growth of well-rounded people (Lawrence & Dirkx, 2010).

The focal point of the study I present in this dissertation is on fostering holistic education in my Science classroom. Before coming to terms with the final focus of this research, I explored a previous piece of work I submitted for a Bachelor of Education Honours module in Teacher Development Studies. This piece of work was essentially a letter I had written to my past self, discussing and exploring my experiences as a student in my school days. During a Masters

supervision group session, I unpacked my letter and identified crucial points by myself, as a reader, researcher, and primary participant. This led to the formulation of first, a found poem (Figure 1.1), and then later evolved into a haiku poem (Figure 1.2). My supervisor, Professor Kathleen Pithouse-Morgan, explained to us that a found poem took an existing text, made little changes to what was important from the text, and created a poem that would relay the central message. A haiku is a short Japanese poem written in three lines (Koller, 2009). From the key points, three lines were formulated. Thereafter, with the aid of my fellow Masters students, I examined the three lines and altered them to compose a haiku poem, with line 1 comprising of 5 syllables, line 2 of 7 syllables, and line 3 of 5 syllables. The haiku poem then illustrated, for me, the focal point of my study, which represented fostering holistic education. Figure 1.1 and Figure 1.2 below show the found poem and haiku poem.

Prepare them for the “big bad world”
It is my responsibility
Teachers feeding it to us
Turning me into a functional member in society

It is my responsibility
Adapt my teaching
Turning me into a functional member in society
A reflection of how we were

Adapt my teaching
Teachers feeding it to us
A reflection of how we were

Prepare them for the “big bad world” 

Figure 1.1: Found poem

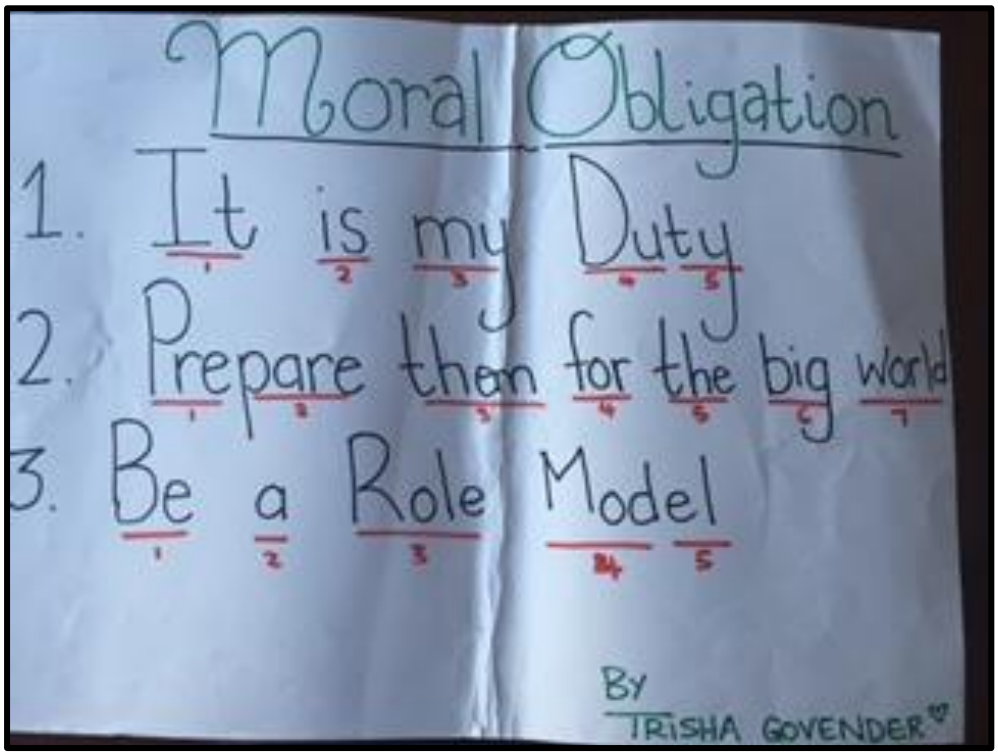


Figure 1.2: Haiku poem indicating research focal point

From the central points identified in my letter, I formulated the three lines of my haiku poem. Both the haiku poem and the found poem served to convey the same message. It was this message that brought forward principal concepts that laid the foundation for my research topic. These poems prompted self-reflection regarding my duty, my role as a teacher. In three simple lines, the haiku poem outlined the great task I was choosing to take on. This was to learn how I could foster opportunities in my Science classroom for my students to grow, to shape their learning and paths.

Henriksen (2014) explained how arts-based techniques (even those done by the researcher) motivated research participants to unwind, to indulge and express themselves, to become inquisitive about their own stories and development. In starting this research process with an arts-based approach like poetry, it not only reflected my central message clearly for me to build on, but it encouraged me to continue in such a fashion as it yielded promising revelation into the focus of my study. Using an arts-based approach to initiate this research allowed me to tap into my aesthetic nature, express myself, and allowed me to excavate parts of my self-structure I had long forgotten.

During further unearthing of the concepts surrounding my haiku, I was able to come up with my research topic, *Fostering holistic education in a Science classroom: A teacher's self-study*.

1.5 Unravelling the modus operandi

In South Africa, the current prescribed curriculum is known as CAPS. CAPS stands for Curriculum and Assessment Policy Statement and is the combined efforts of policy stakeholders in the education department over 17 years to rehabilitate and bring a transformative curriculum after apartheid (Department of Basic Education, 2011). The Department of Basic Education CAPS document for Natural Sciences (2011, p. 8) states:

> Science is a systematic way of looking for explanations and connecting the ideas we have. In Science, certain methods of inquiry and investigation are generally used. These methods lend themselves to replication and a systematic approach to scientific inquiry that attempts at objectivity. The methods include formulating hypotheses, and designing and carrying out experiments to test the hypotheses. Repeated investigations are undertaken, and the methods and results are carefully examined and debated before they are accepted as valid.

Before embarking on my Masters research, my view on the idea of Science in the curriculum document was one of a very rigid, almost robotic method of doing Science. When I read the definition, I had the idea that this was a subject full of rigorous methods, protocols, implements to prove phenomena that students must accept. Reading this definition allowed me to remember how I felt in my Science classes during my high school years. This feeling of Science as a subject of rules, regulations, laws came from my experience as a Science student during high school, which many memories prompted by artefacts (report cards, drawings, letters, and photographs) discussed in Chapter Three, helped corroborate.

The idea of introducing creative aspects in Science education is evident in the aims of Science education in the curriculum document. However, I felt that this may not have been translated and filtered when I was in the classroom, both as a student myself and as a teacher now. As a teacher, I found that with the amount of content to cover, these aims became diluted and lost. There was only mention of the arts as another subject, with no regard for STEAM initiatives. I should explain that STEM stands for Science, Technology, Engineering, Mathematics, whilst

STEAM stands for Science, Technology, Engineering, Art, Mathematics (Hunter-Doniger & Sydow, 2016). As discussed above, the mention of indigenous knowledge is, however, noted in the curriculum document. This forms part of the aims of Science education as mentioned earlier. The CAPS document for Natural Sciences (2011, p.9|) also states that:

> Natural Sciences at the senior phase level lays the basis of further studies in more specific Science disciplines, such as Life Sciences, Physical Sciences, Earth Sciences or Agricultural Sciences. It prepares students for active participation in a democratic society that values human rights and promotes responsibility towards the environment. Natural Sciences can also prepare students for economic activity and self-expression.

This statement led me to believe that the boundaries of Science education are expected to be pushed into more holistic development. I believed that the holistic development should incorporate creativity (arts-based techniques) in learning in the form of lesson plans, achievement tasks, tests, and exams. How I approached my subject and taught it needed to reflect an innate desire to extend teaching and learning beyond the confines of memorising theories, content, rules, and laws to be deemed a passable candidate in society. My Science lessons had to be adapted to include art as an avenue for educational enrichment.

I started to become aware that incorporating art into the stitches of Natural Sciences could prove invaluable. The focus of STEAM, not STEM (Hunter-Doniger & Sydow, 2016) is that STEAM approaches introduce the arts to help initiate creative ways of thinking in subjects like mathematics and Science. I anticipated that these expressive approaches could prove useful in lessons and students' lives (Hunter-Doniger & Sydow, 2016).

The CAPS (Curriculum Assessment Policy Statement) document for Natural Sciences Grades 7-9 (DBE, 2011) stipulates the teaching and learning content and assessment for Science. Throughout my early years as a high school Science teacher, I felt constantly pressured by the document guidelines, senior teachers in my subject area, and the school management into finishing the prescribed content. The content and assessments had to conform to a limited view of how we should teach children: it had to be uniform. The method I used had to reflect a standard; it had to focus solely on my students' logical and linguistic ability to better prepare them for their exams. I recalled constant subject meetings where management members reiterated being on the same content page amongst combined classes or shared classes. This

persistent reminder made me feel like teaching Science was like trying to catch the clock. I was the nervous rabbit in Alice in Wonderland, chronically watching that clock.

Later, as I became more experienced in my subject and teaching Science, I tried exploring some more creative activities in teaching whilst keeping to time management. For example, I got the students to use clay to construct molecules. The CAPS document for Natural Sciences makes provision for creatively teaching Science (making molecules out of clay, using household items to run experiments), but on paper. In practice, in my pursuit to finish the curriculum, this initiative became disoriented.

Although I do know that there has always been a manner in which facilitation of the prescribed curriculum must be done, in my opinion, for years, Science education and the testing in South Africa have been substantially linguistic and logical (Schiller, 2006). When I have issued tests, exams, or even pop quizzes in my classes, the questioning had been largely set to see how much content the student can remember or how they can apply the theory to work out a Science problem. This in turn was to be used as a benchmark against the curriculum plan, depicting where students should be academically. There was a lack of questions that target the creativity or imagination or ingenuity of the students in these transcripts I have administered. The goal was to see if my students remembered the factual parts of the content. Testing these factual parts, I had left out creative ways of testing. My Science tests were set to test the theory, the rules, and laws.

In an attempt to channel creative outreaches in my Science classroom, I wanted to explore holistic approaches. As a teacher-researcher, I felt the need to make my lessons receptive and approachable by all my students. According to Hunter-Doniger and Sydow (2016), teachers have the task of recognising and fostering or cultivating inclusive means of teaching to produce and enrich individuals equipped for ‘life after school’.

When I tried teaching some of the age-old content such as Newton’s Laws, the outdated method of following specific pedagogy for specific content seemed daunting for me and my students (see Chapter Four). There appeared to be little room for creativity and little room for developing imagination when faced off in a Science lesson, trying to filter down curriculum. I fell into the trap of pushing out the content first, but when I started my Masters programme, I realised that I needed an element of creativity and inclusivity for my mix of students.

I was concerned that students who did not understand the work thought they were failing and continually hated those sections (this was evident when I would do revision, they either did not care for it or wished to centre the whole remedial task on just that section). I recognised that needed to try drawing out the inquisitive and receptive nature of my students that would allow them to excel in their leaps and bounds in Science learning. I started to see that it is paramount to understand that failure, in this case, is necessary and students should not be punished for making mistakes but see it as an opportunity for growth (Hunter-Doniger & Sydow, 2016). Sometimes when faced with a problem, some of my students felt like they failed to provide me, the teacher/facilitator, with the solution I wanted.

Rather than abandoning my new ideas and chastising myself for not sticking with the old ways, I wanted to explore adapted and holistic learning. I saw my self-study research as an opportunity for myself to reflect and come up with alternatives solutions, thus expanding my learning and teaching ability.

1.6 Concepts and ideologies: A brainstorm brews

In constructing my dissertation, I found it necessary to unpack the different factors that built the foundation and gave rise to my dissertation. This included the socio-cultural perspective, unravelling holistic education, learning to create a safe space, focusing on the relevance and the build of the student, and moving from STEM to STEAM.

1.7 A socio-cultural perspective

The parameter of this study was framed by the socio-cultural perspective. The socio-cultural perspective enabled me to see the student through the socio-cultural lenses, i.e., the diverse social and cultural aspects that made up the student, that influenced the student, and that constructed the student (Gerhard & Mayer-Smith, 2008). This framework placed into account that I, as the teacher-researcher, did not learn in isolation, but rather through the intricate network of the many key role players involved, the school context, and the ethos of the school (Gerhard & Mayer-Smith, 2008).

During my years of teaching Science, I have experienced dealing with and teaching students from different socio-cultural backgrounds that came with various degrees of unique socio-cultural problems. In teaching Science with these students, my lessons would be prepared for

tackling a range of socio-cultural issues that may seep in. Mudaly (2011) explained that Science education was not without social issues and that using Science education to delve into socio-cultural issues became a useful tool to expand students' thinking across different plateaus. Mudaly (2011) argued that "A socio-cultural perspective of Science education conceptualizes learning as not only understanding and memorizing scientific facts and processes, but also understanding social and cultural realities in students' lives that make the learning of Science revolves around students' interests" (p. 5). Using a socio-cultural perspective and lens to view Science education as a human activity that was filtered through social/political/cultural issues took into account the context I lived in and the social issues I experienced and witnessed in my Science classroom (Mudaly, 2011).

I was aware that I needed to heed that students come from diverse backgrounds, and I might not necessarily know their challenges. Different socio-economic backgrounds play a context to such students. Their experiences might differ in comparison to what I may have previously been exposed to or aware of. Awareness of this difference can cause a shift in understanding students' circumstances. This helped me identify the social, cultural, political baggage I had, some of which was hidden and required unearthing. Socio-cultural perspectives were key in understanding that school dynamics were not without the influences of culture or society, and this lent itself to fostering aspects of holistic education (Lee, 2014). Schools that had such socio-cultural issues presented an opportunity for holistic education practices. This was important to my study as it highlighted that gaining an understanding of socio-cultural issues and how they impacted my Science lessons, would aid in understanding the students on a deeper, connected level. I anticipated that this would make planning the lessons easier and more effective.

In my current school, I had students with different learning abilities. This was evident during exams when we had concession students that required either extra time, or a reader to assist in understanding exams set in a purely linguistic and logical format. Finding a holistic approach was important in my class, to make my students feel comfortable enough to become receptive to new methods of teaching the same subject. Schiller (2006) showed that a holistic approach to teaching and learning accommodated for students with different learning abilities and inclusivity. The CAPS document (2011, p.5) outlines inclusivity as one of its principles:

> Human rights, inclusivity, environmental and social justice: infusing the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa. The National Curriculum Statement Grades R-12 is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors.

It allowed me to bend mainstream techniques and utilise methods that spoke to the different aspects of a student's thinking. According to Schiller (2006), for long-lasting, substantial learning, a holistic teacher must dig deep into the individual, and a key to awakening students as change agents that can drive social development can be developing programs and teaching material that targets their holistic needs.

Teaching and learning Science was often implied to me by my history of Science teachers, lecturers and seniors as being available to all, regardless of individual context. I recalled a Science teacher in my Grade 8 year saying that Science was everywhere and that I was doing Science without even knowing it. Lee (2014) looked at three fundamental questions that dissected and opened up the same concerns that were subconsciously looked at, and that teachers unknowingly asked themselves. If I looked at Science education as a way to impart culture, it would have encountered issues; there will be a point at which traditional/cultural knowledge will be at odds with school/curriculum knowledge, it is our duty to find a balance (Lee, 2014). Even though the CAPS document for Natural Sciences has highlighted that Science teaching should promote an understanding of the how indigenous knowledge systems have developed through the different cultural contexts, it stands to reason that we are expected to bridge the gap between the two worlds. In reality, this task would pose a great deal of effort and work with so many varied socio-cultural issues, students with different backgrounds, and a growing school culture. In my class, I would prepare to teach the content, as well as make it readable and applicable to all the different cultural contexts within the confines of my classroom.

1.8 Holistic education

Holistic education encompasses teaching and learning involving discovering personal, social and cultural identities, finding meaning and discovering the dimensions of what makes a person who they are (Forbes, 1996). A holistic approach should incorporate a range of characteristics (Orion, 2007). These include learning in an authentic and relevant context as much as possible

organising the learning in a sequence that shifts gradually from the concrete to the abstract, adjusting the learning for varying abilities, integrating the outdoor environment as an integral and central component of the learning process, and focusing on both the cognitive and emotional aspects of learning (Orion, 2007).

In my opinion, the prescribed Science curriculum limited the topics and lessons to producing results of a logical and linguistic nature (Abbey, 2004). I felt that this seemed to be a shortcoming of the prescribed curriculum, as it yielded a limiting interpretation. The department CAPS document pointed out cells, human reproduction, digestive circulation and digestive as topics for Term 1, while Term 2 covered compounds, chemical reactions, acids and bases. The trend of Science work seemed to be theoretical in nature, learning how things worked, rules for making them work or why they worked in that manner. Abbey (2004) argued that teacher-researchers have become too caught up in believing that our uniqueness may interfere with the rationale behind the conventional logical and linguistic focus of the school. I believed that integrating the practices of holistic education in Science lessons could help instil values that become life lessons and help to develop not just the academic mind of the student, but the emotional and spiritual aspects as well by allowing aspects of this to portray itself in their pieces of work (Forbes, 1996).

Eliciting holistic education in my classroom will come from establishing a balance. Having to maintain this balance will mean making connections with the content and students, incorporating an inclusive atmosphere and perpetuating this balance is key. Furthermore, Lawrence and Dirkx (2010) highlight three interlocking principles of holistic education, viz., connectedness, inclusion, and balance. Connectedness referred to the interlocking and interconnecting strands of education within a classroom that holistically enabled learning; inclusion referred to the inclusion of all students of different learning strands; balance referred to the coupling and juggling of gaining both the conventional approach and the holistic approach (Lawrence & Dirkx, 2010). In seeking establishment of holistic education, I had to incorporate the three principles, i.e., connecting by crossing over strands of education to each other, incorporating lesson aids that catered for students (thereby developing inclusive lessons), and balancing what curriculum dictated I adhered to, with what I wished to accomplish holistically (Lawrence & Dirkx, 2010). Abbey (2004) explained the concept of holism as including aspects of balance, interconnectedness, awareness, and respect. Holistic teaching dwelt on the foundations set by self-discovery whereby students became self-aware, accepted

this awareness and teachers were there to facilitate this process (Abbey, 2004). According to Abbey (2004), teachers that created holistic classrooms were open, passionate and compassionate, connected to all dimensions (student relationships to all school stakeholders, contexts in and out of the classroom, etc.), and they were more aware of their surroundings and students.

I conducted my research in a predominantly urban school, close to many facilities that marked it as urban. Haberman (1991) talks about how the pedagogy of urban teaching adopted a formal manner of mainstream education. This was relevant to my study context as my teaching was accompanied with a lot of access to urban tools, like projectors, laptops, urban structures and facilities; things one would not necessarily find in a rural setting school. In having access to these facilities and tools, my teaching pedagogy mirrored urban trends, by using technology and access to technology as a main technique in my teaching. Haberman (1991) informs us that a growing number of reformers of urban schools were now starting to change pedagogy to foster a holistic approach. This was very important to my study as it centred on an urban school. With urban culture schools, a multi-dimensional trend arose with different technologies, architecture, trending cultures and behaviours that existed in our urban world and filtered into schools. These had an impact on how we hoped to achieve holistic education in our schools.

The mainstream idea of relying on linguistic and logical approaches in Science classrooms was slowly paving way for a more holistic path. I, as the teacher and researcher, have incorporated aspects of art to help initiate thinking that was not prefixed to mainstream thinking in relation to STEM subjects. Holistic education tore away from the formal level of linguistic and logical applications of intelligence and aimed for applying education in a more informal, well-rounded approach (Schiller, 2006). Schiller (2006) showed me that teachers who were stuck promoting mainstream education left little room for accommodating students with various abilities and capabilities.

In my early teaching years, I became focussed on churning out students that could function at a workplace, but lacked social integrity. These students have learnt the right answers, but not that they can question why these answers were right. I felt, in my Science class, that the thinking pattern had become uniform, with an evident lack of creativity. This was often seen when I asked students to explain answers and received a verbatim response rather than their own interpretation. For me, interpretation and the use of my understanding in my own words

stemmed from a creative response. Haberman (1991) argued that teaching students the 'do's and do not's' of conventional education that focused on the linguistic and logical, we were left with students who were not truly equipped to face the real world with the set of social values, understandings, and skills that made them better able to cope with an ever-changing society. Also, Abbey (2004) believed that we have become conditioned to live and play out our lives in simple cognitive, logical mannerisms, without guidance and influence from the self, intuition, imagination, creativity, and so on. She argued that it was our need to be able to control and manipulate every aspect of life that had filtered into the schooling system and driven out all areas of future human development, other than language and logical skills (Abbey, 2004). Haberman (1991) informed us that a growing number of reformers of schools were now starting to change pedagogy to foster a holistic approach. Holistic education moved away from the formal level of linguistic and logical applications of intelligence and aimed for applying education in a more creative, integrated approach (Schiller, 2006).

1.9 Creating a safe space

My classroom was my sanctuary. I wished to fashion it as my realm of knowledge and vessel of life lessons. To make it user and student friendly, I aspired to forge an environment that was conducive and inclusive of holistic education. Schiller (2006) explained that I could have attempted to create a holistic environment in the teaching material, assignments, and homework that I set out. Instead of challenging only the logistical and linguistic skills of students, these adapted forms of work fostered creativity, as they did not just pull from the conventional framework of education but also from other dimensions that the multiple intelligence theory and social-cultural learning theories set out (Gerhard & Mayer-Smith, 2008; Schiller, 2006). Hunter-Doniger and Sydow (2016, p. 160), like Henriksen (2014) stressed creating a safe environment where such learning can take place. In order to foster true creativity, teachers must cultivate a safe environment for growth.

To engage students of today, we must earn their respect by fostering engaging curricula in our classrooms (Hunter-Doniger and Sydow. 2016). This was significant to me as the teacher-researcher and to my study, as I always wanted to ensure my students felt safe in my classroom. My classroom had always felt like it needed to be a sanctuary of sorts, to all my students. My students needed to feel free to be expressive, and safe to express themselves.

Schools are evolving. We are becoming institutions of change. Schools are introducing new technology, new cultures, new ways of learning and living – this evolution is in keeping with the evolution of humankind. Forbes (1996) explained how when school culture evolves and changes to become more diverse and inclusive, the values and views central to holistic education become defined (Forbes, 1996). Also, Forbes (1996) mentioned how pedagogic approaches adopted by holistic education catered to the human as an entity of more than just academic prowess. The setting for a holistic school is "one that calls for an open, honest environment where respectful communication is the norm" (Forbes, 1996, p. 6). This meant that schools that have adopted a holistic approach incorporate an environment where students were open, confident and comfortable in such conditions that did not force or impede such growth beyond the academic parameter.

1.10 Relevance and the build of the student

In seeking to incorporate holistic education in my classroom, I felt the need to help build the soul of the student, i.e., to build the student with strong moral fibre. My perception of strong moral fibre is that it is entwined in the life threads that stitch the soul of a person; it is what governs the moral compass, picking right from wrong in any and all situations. Glen (2011) described how methods of holistic education shared a connection with not only the intellectual world but also with the spiritual and emotional world. He argued that this aided in developing the nature of the human mind. I had found that teaching Science through factual/theoretical concepts made it seem mundane and of no importance to students' lived experience, but I anticipated that teaching it through context-based approaches helped it to seem more relevant to the student (Mudaly, 2011). Taylor and Taylor (2019) pointed out that in our advancement in our scientific community, our global footprint meant a step back in preserving our world. Taylor and Taylor (2019) emphasised the importance of incorporating arts into STEM in order to facilitate this transformative way of teaching and learning. Teachers, school policy developers, even parents were gearing students towards a technologically dominant era, which came with a price (Taylor & Taylor, 2019).

1.11 From STEM to STEAM

In my schooling days, subjects traditionally thought to be complicated or challenging were typical STEM subjects and were taught in the way they were introduced – scary, rigid and enforcing. I experienced STEM subjects as they were subjects taught with rules, restrictions

and within boundaries of thinking; there was only one right answer. Hunter-Doniger and Sydow (2016, p.160) reported:

> The arts develop 'twenty-first-century skills', including creativity, problem-solving, critical thinking, communication, self-direction, initiative, and collaboration, which every student needs to survive successfully as an adult in an increasingly complex and technologically driven world.

It is important in this study that seeking to establish alternative (twenty-first century tools and techniques) were sought to collaborate with these traditional subjects.

The move from STEM to STEAM called for divergent thinking, to invoke seeds of creativity, as it coerced students to think outside the box. This method called for students to start reflecting on their existing thinking patterns and solutions and how to better them. Introducing arts into traditional STEM techniques called for inquiry-based education or lessons, which meant students doing their learning with mere facilitation from the teacher and feedback when necessary. This also meant, that I as a teacher needed to develop lessons that allowed students to make discoveries for themselves. I needed to take a step back and become facilitator, rather than ring leader. I, as the teacher, had to set out tasks where a student could not only unravel for themselves but made that learning comprehensive.

Hunter-Doniger and Sydow (2016) focused on a study of a middle school in South Carolina (United States of America) that undertook transforming their school curriculum from STEM to STEAM. Hunter-Doniger and Sydow (2016) showed how during their study statistics from the drop-in math and Science scores evoked a call for finding methods to better them. These methods called for the introduction of art into their pre-existing curriculum. However, with an improvement in these STEM subjects, a decline in creativity scores had been noticed. This proved problematic as we seek to equip students with skill sets suited for this century and its ever-changing dilemmas (Hunter-Doniger & Sydow, 2016).

Starting with the European Industrial Revolution, building and inventing machines and tools aided in making living our lives easier; but in doing so, teachers neglected in equipping said students with the skills on how to combat the destruction of the very place we live in (Taylor & Taylor, 2019). We were failing in developing conscientious students that were equipped with

handling these dilemmas in diplomatic, transformative, innovative, creative ways. Taylor and Taylor (2019) highlighted how the arts could help to create creative mind-sets that coupled with scientific background, can yield individuals ready to take on the world as it is in its state and turn things around so that we continued as a surviving species.

1.12 Research questions

The research questions that guided this study were as follows:

Question 1: How have my past experiences contributed to my interest in holistic education?

In response to this question, Chapter Three of this dissertation outlines and offers information, by carefully unpacking past lived experiences. I focused on any memory work that I felt had a significant impact on my current teacher learning and development. Investigating the sum of this question and possible validations helped me to understand where the drive to invest in holistic practices emanated from. I reflected on both positive and negative experiences to delve deep into where this desire to change my conventional pedagogy to one that is more multifaceted, with a look at the value of holistic education in the lives of students. I started by glimpsing in on much of my memory work, to help jolt any memory and the corresponding explanation that may have paved way for my current teacher identity. Artefact retrieval (old photographs, old school reports, and certificates), self-portrait drawing, and auto-biographical writing aided in helping me answer my first research question.

Question 2: How can I foster holistic education in my Science classroom?

This question is addressed in Chapter Four, where I portray my specifically adapted Science lessons. The chapter shows the process and products of doing such lessons to evoke holistic education in a Science classroom. I investigated methods of enlisting holistic approaches in the classroom and how I incorporated holistic education into the conventional curriculum. Various lessons were conducted where students' work was collected and examined to show how they would perform and learn under holistic education conditions. Reflection was also used at the end of each lesson as a technique to show understanding of students' work and how it applied to the structure of this study.

Question 3: What is the value of fostering holistic education in a Science classroom?

Chapter Five addresses the final question to this study. This question tied in with the first research question. I examined this question by drawing on what I had learnt, in my role as teacher-researcher and how this had impacted me. I also referred to how I wished to make changes in order to add value to my Science classroom by engaging in holistic practices. I addressed the value of fostering holistic education in my Science classroom in an art piece I drew. I also included aspects of changes I made in my Science classroom since concluding this study. I believed that there must have been something I noted about holistic education that I felt would work or would help with the development of a student's life after school. I asked, what did it give that conventional education lacked?

1.13 Methodological approach: The map of methodology

The research methodology I chose to inform my research was the self-study of educational practice. A more detailed and extensive discussion of this methodological approach is offered in Chapter Two. The adoption of self-study methodology has become popular with researchers who wish to use past lived experiences and present experiences as a foundation for making progress in current teacher learning and development issues. Samaras and Roberts (2011) explain self-study as the motivation of such researchers and teachers to view their current pedagogy and how to improve achievement gaps by reflection on lived experiences. Samaras, Hjalmarson, Bland, Nelson and Christopher (2019) state that "Self-study is about the study of changing one's role in teaching by examining oneself, rather than the study of the effectiveness of instructional strategies by examining only student outcomes" (p. 197). The guidelines of self-study, as seen in Samaras (2011), served to effectively motivate teachers to see the "flaw" in their plans themselves and come to self-realisation to bring about change. We must discover ourselves, what makes us capable of our teaching abilities. Samaras et al. (2019) helped me realise that self-study is not about what I could do that works for bringing about holistic teaching and learning, but about learning about and from myself.

According to Samaras (2011), concerning data capturing and research methodology in keeping with self-study, your research inquiry and interest should stem from observations, personal experiences, and events in the classroom. Phase 1 involved collecting data before the commencement of the study. It served as a pre-requisite for my study, what I observed that prompted my study. Phase 2 referred to collecting data about my research questions, with more purpose and focus. In Phase 2, I described the activities and changes to pedagogy to be

implemented. Phase 3 was a reflection on some of the impacts of my research design and attempts (Samaras, 2011).

This research was qualitative in nature and closely followed the interpretivist paradigm, where the aim was to seek to understand and interpret data to make cognitive meaning of it (Merriam, 2002). This paradigm fulfilled the research design of my study due to the nature of the paradigm seeking enlightenment, where human experience was fundamental for building meaning (Merriam, 2002). Merriam (2002) indicates that "qualitative research lies with the idea that meaning is socially constructed by individuals in interaction with their world" (p. 3). Following this, the qualitative research approach in this study sought to find a connection with the reality of the subjects and the key research concepts indicated.

According to Samaras (2011), in designing my research, one needs to anticipate the structure of how to advance one's pedagogy. Samaras (2011) also reinforced that in refining the research questions, data were received from the pedagogy strategies I as researcher choose. In self-study, data is collected to provide an insight into my practices and how to improve it (Samaras, 2011).

1.14 Conclusion and overview of the dissertation

In this chapter, I shared the introduction to my research as well as its focus and purpose. I also discussed the approach I undertook to derive my title and the concepts associated with the research. This chapter discussed the research questions I answer throughout this dissertation. The methodological approach, being self-study, was also briefly discussed.

In Chapter Two, I discuss how the research methodology played out, with specific reference to the context of my study. I deal with the reasoning around the selection of my research participants, as well as the roles each played. I discuss why the self-study method was suitable for such a research topic, and offer descriptions of said self-study methods. Finally, I discuss the ethical issues, the validity of the study itself, as well as challenges experienced.

In Chapter Three, I delve into memory work. I sought sustenance from past lived experiences. In doing so, I effectively answer my first research question, *How have my past experiences contributed to my interest in holistic education?* My focus is on memory work and artefacts from throughout my schooling and education career, spanning old photographs, art-work, and

journal entries. This forms the base of understanding where the desire to approach and introduce holistic education into the Science classroom arose from.

In Chapter Four, I address my second research question, *How can I foster holistic education in my Science classroom?* Through examination of my research lessons, I look at different pieces of work by participants that were given to evoke a sense of holistic teaching and learning. Upon reflection of the said pieces of work, I provide a link as to how holistic education can be fostered in a Science classroom effectively.

In Chapter Five, my findings are discussed in various forms that are both narrative and arts-based in nature. I refer to my data collected and exhibited in Chapter Four and explain the reasoning and strategies in Chapter Five, having a better understanding of how to foster holistic education in Science classrooms. Chapter Five showcases my findings in an arts-based format, and they are discussed in detail. The arts-based approach is also illustrated in Chapter Five to effectively display the value of fostering holistic education in my Science Classroom. Thus, Chapter Five is used as a platform for reflection on the study overall.

CHAPTER TWO: THE BLUEPRINT

(The parameters of my research approach)

2.1 Introduction: planning the journey

My self-study research aimed to delve within the lived experiences and memories of my past, with the understanding that it could aid in reflection and explaining present situations and experiences. Furthermore, I hoped to understand how I could foster holistic education in my Science classroom. I believed that understanding the importance of fostering holistic education in my Science classroom would contribute to the development of students after they would leave school in pursuit of careers or jobs or further education and training.

In Chapter One, the focus, purpose of the study and objectives were discussed, with the main issues to be addressed in this dissertation in the form of my research questions. The rationale (reason behind my study) and concepts and ideologies, which included the socio-cultural perspective, holistic education, STEM to STEAM, creating a safe space and relevance and build of the student, were all considered in length. Also, my research methodology was briefly highlighted, with a conclusion on an overview of my dissertation.

What did the journey of the 'self' entail? In this chapter (Chapter Two), I discuss the research methodology, focusing on what route I chose and the justification for this choice. I also review the research context, the research participants, the data generation strategies, interpretation of such data generated from these strategies. A look into challenges, ethical concerns, and validity frames the conclusion of this chapter.

2.2 Research methodology: reading the map

Like a cartographer would read a map that he or she sets, edits and later be able to read the layout and terrain of the land, I wish to also draw out the lay of the land in my study. I chose self-study methodology to frame my research. The research methodology of self-study was in-keeping with the focus of this research. Self-study research has a starting point, using a system of maps to guide you as a researcher through it, eventually arriving at a point of reflection and understanding. Self-study methodology is research aimed at taking a look at the beginning of the life, development, experiences and the growth of the researcher involved (Lassonde, Galman & Kosnik, 2009).

Self-study shifts the roles of teacher-researchers, making me responsible for my own learning (Dhlula-Moruri, Kortjass, Ndaleni & Pithouse-Morgan, 2017). It has aided teachers in promoting, changing and implementing productive pedagogic practices (Hamilton, Smith & Worthington, 2008). Self-study can aid in personal teacher self-upliftment with a prime factor being that the teacher experiences a change to their self, their identity to develop and perpetuate progress (Hamilton, Smith & Worthington, 2008). Self-study methodology acts as the platform to ask improvement-aimed questions, in order to bring about educational progress. It showcases the voices and stories of teacher-researchers, and to engage in such self-study research, is to continually study the self (Bullough & Pinnegar, 2001).

In understanding self-study research, I realised that I needed to question my practices as this would be crucial in teacher research. This critical reflection on teaching practices would enable me to understand, examine, and dissect practices to be more open, more explanatory, and more developed (Lassonde, Galman & Kosnik, 2009). Questioning and reflecting on my practices humbled me. My methods were not perfect, and I recognised that self-study would offer me an opportunity to develop my practices.

I anticipated that self-study methodology would allow me to critically evaluate my past lived experiences and reflect on these events, noting points in my educational history that were crucial in my development as a student and now as a teacher-researcher. I understood that reflective practice as a form of initiating self-study would allow me to be the researcher of my practices, to develop my art-form of teaching (Lassonde, Galman and Kosnik, 2009). I understood that self-study methodology would push me to reflect on my practices in order to understand them, and if needed, adapt them in the present (Hamilton, Smith & Worthington, 2008).

Samaras and Roberts (2011) viewed the rationale for self-study as the motivation of such researchers and teachers to critically review their current pedagogy and how to improve this by reflection on their lived experiences. The guidelines, highlighted in Samaras and Roberts (2011) for self-study research, motivated me to see the areas for improvement in my plans and practices and come to self-realisation to bring about change (Lassonde, Galman & Kosnik, 2009). There are no perfect teachers. Teachers that are willing to embrace change will improve their practices. Lassonde et al. (2009) argued that self-study requires a degree of self-exposure that allowed the dissection, reforming and re-inventing of the teacher in understanding the self.

Self-study allowed me this eye-opener that if I needed to improve, I must embrace the desire to change and step back and view my practices as a third party (Samaras & Roberts, 2011).

2.3 The interpretivist paradigm: a qualitative research approach

Our world has many images and therefore viewed differently all the time. Merriam (2002) indicated that "qualitative research lies with the idea that meaning is socially constructed by individuals in interaction with their world" (p. 3). Cohen, Manion and Morrison (2011) explained that there is no simple definition of qualitative research, but that it includes a variety of techniques that can be drawn directly from experience, to better sustain the research.

The research paradigm that underpinned this study was the interpretivist paradigm, because my aim was to seek understanding and interpret data to make personal and professional meaning from it (Merriam, 2002). This paradigm emphasises the research design of my study due to the nature of the paradigm seeking enlightenment, where human experience as fundamental for building meaning (Merriam, 2002). The interpretivist paradigm allows for the construction of abundant understanding of real-life experiences in school, of students, teachers and how they all fit together (Taylor & Medina, 2013). Following this, the qualitative research approach in my study sought to connect with my participants. This was to be accomplished by exploring the key research concepts outlined in this dissertation. According to Cohen, Manion and Morrison (2011), this type of qualitative research gives meaning, provides a platform for participants to express themselves and sparks curiosity. It sparks an interest to research phenomena scratching at the surface of teacher development. I wished to gain a better insight and understanding of my own and my participants' perspectives in order to best answer my research questions.

2.4 Location of the study

I am a senior/FET phase teacher, teaching Science at Grade 8 - 12 level in a public Durban school. Following the policy as specified in the Curriculum Assessment Policy Statement (as explained in Chapter One), Natural Sciences as, in Grades 7-9 (Further Education and Training, FET phase), as a learning area is split in my current school into Science and Biology with

separate teachers teaching and facilitating it. I teach, facilitate and co-ordinate the Science aspect of Natural Sciences in my locale.

The school is a well-resourced school that caters for both girls and boys from Grade R to Grade 12. It is a dual-medium school that offers all subjects in either English or Afrikaans. In my experience, the majority of students reside close to the school with families of a stable nature. We cater for students from different racial groups. The enrolment at the school is at approximately 700 students. At this point, it is important to remember that racial categories of people in South Africa was imposed by Apartheid laws pre-1994. This system of categorisation and identification is one that is still in use in current South Africa as means of identification regarding ethnicity.

The classroom and school facilities are well equipped, with plenty of opportunities for sporting, academics, cultural and religious meetings being made available for students. The school has many facilities. There is a school hall, lecture room, library and media centre, art room, computer rooms, laboratories, crèche and after-school care facilities. The school also possess two sports fields, a netball court and swimming pool. The school offers a range of sports from hockey, netball, rugby, cricket, athletics, chess, and cross-country. There are religious clubs, a feeding scheme, a debating club and dance sport available. The high school subjects include Visual Art, Computer Applications Technology, History, Physical Sciences, Geography, Engineering and Graphic Design, Tourism, to name a few. The school has a structured system of operation, management teams, Grade controllers, subject heads, sports managers, school governing body (SGB) personnel and book-shop/uniform facilitators.

Participants in my study were a class of 29 Grade 9 Science students. I selected this particular group of students because they were at a pinnacle point in their schooling career. These Grade 9 students were at the point of deciding on subjects of interest that were to be completed during the next three years at high school, followed by individual post-school opportunities like university enrolments or working opportunities. The reason I chose the Science class was that I had direct contact with the participants and thus influence in the teaching area. This was also a subject I felt could be adapted to teach the required content and still make room for the aims of my research. I also firmly believed that picking a Science class to base my research on had its advantages, as this was a subject in which I had the most experience, and could therefore adapt accordingly. The Science field was close to my heart, as it was (and still is) a subject I am passionate about since my high school days, as detailed in Chapter Three.

2.5 Research participants

As this is self-study research I, myself, served as the main participant. I looked at my past and present context, who I was as a student and who I am as a teacher. Seeing that this was a self-study, I intended to study myself. Through this study, I sought to understand what about myself, my past and present contributed to this need to foster holistic education in a Science classroom.

The other participants were chosen on the basis that they could offer viewpoints and information that could assist me to better understand myself and my practice as a Science teacher. My participants comprised 29 Grade 9 students that were completing Science as a compulsory subject before moving onto the FET (Further Education and Training; Grade 10-12) phase. Of the 29 selected participants, seven participants are female, while 23 participants are male.

I had made note of the tendency for boys in my school to take Science as an elective subject over girls making the Science choice. My senior Science classes saw more male than female enrolments. Science is a practical, technical subject that often is seen as more appropriate for boys. I am unsure if it is the thrill of working with your hands, or the desire to be innovative, that spoke to boys choosing Science. I have noticed that boys seem to see Science as a male subject because when I teach Science, many theories and phenomena mention male scientists making these discoveries. I am concerned about the non-appearance of women in the prescribed Science curriculum and about the lower number of girls opting for Science. These concerns prompted my 'Women in Science' wall, as discussed in Chapter Five. This point in their schooling career was seen as the doorway at which choices were made that would impact these students for the next three years, as well as for the entirety of their careers post-tertiary training. The participants chosen were students I saw and interacted with daily, and with whom had adequate time to conduct my research.

2.6 Demographics of study group: 'Player stats'

Participants	Pseudonyms	Gender	Race	Age	Language
Me (TG/#1)	TG	Female	Indian	27	English
#2 [redacted]	ANNA	Female	Indian	13-14	English
#3 [redacted]	HAZEL	Female	Indian	13-14	English
#4 [redacted]	YALE	Female	Indian	13-14	English
#5 [redacted]	ROD	Male	Indian	13-14	English
#6 [redacted]	VAN	Male	Indian	13-14	English
#7 [redacted]	MIKE	Female	Coloured	13-14	English
#8 [redacted]	SAM	Male	Indian	13-14	English
#9 [redacted]	DON	Male	White	13-14	English
#10 [redacted]	JÁN	Male	Indian	13-14	English
#11 [redacted]	NED	Male	Indian	13-14	English
#12 [redacted]	JAKE	Male	Coloured	13-14	English
#13 [redacted]	EVAN	Male	White	13-14	English
#14 [redacted]	MATT	Male	Indian	13-14	English
#15 [redacted]	ASH	Male	Indian	13-14	English
#16 [redacted]	CAILOU	Male	Indian	13-14	English
#17 [redacted]	LUKE	Male	White	13-14	English
#18 [redacted]	DAN	Male	Indian	13-14	English
#19 [redacted]	PETER	Male	Indian	13-14	English
#20 [redacted]	QUINTON	Male	Coloured	13-14	English
#21 [redacted]	DAVE	Male	Indian	13-14	English
#22 [redacted]	HOLLY	Female	White	13-14	English
#23 [redacted]	TRENT	Male	White	13-14	English
#24 [redacted]	LEE	Male	Black	13-14	English
#25 [redacted]	TODD	Male	White	13-14	English
#26 [redacted]	CATHY	Female	Indian	13-14	English
#27 [redacted]	TOM	Male	Coloured	13-14	English
#28 [redacted]	SHILO	Male	Coloured	13-14	English
#29 [redacted]	KEN	Male	Indian	13-14	English
#30 [redacted]	JACE	Male	White	13-14	English

Table 2.1: The biographical information of participants

2.7 Critical friends

According to Samaras and Roberts (2011), a critical friend encourages and engages in thought-provoking questions. A critical friend aids in offering sound variations or different ideas in the hopes of adding substance to the study. My critical friend was my fellow work colleague, Mrs Netisha Ramjatan, who has completed her Masters studies and is teaching at the same school as myself. Mrs Ramjatan has given me permission to use her full name and surname in my dissertation. She is a senior teacher with 11 years of teaching experience, specialising in languages and teaches FET (Grade 8-12) English home language. English home language, as opposed to a first additional language, is a language subject that is fundamental and is considered the student's mother tongue (the language that he or she grew up learning, speaking and reading within their family, social, cultural circles). Mrs Ramjatan graduated in 2005 with a Bachelor of Arts degree in Psychology, in 2010 with a Postgraduate Certificate in Education, and in 2013 with her Honours in Education. She started at my current institution in February of 2017 and completed her Master's programme in 2015 via the University of South Africa (UNISA), entitled 'The Effects of Sibling Parenting on Orphaned and Vulnerable Children in the Role of Parents'. We met at the start of 2017 when she came into the school as a replacement teacher and have since become close friends and work colleagues, seeking to help each other better ourselves in our fields.

Since mid-2017, I have asked Mrs Ramjatan to read and correct any language errors, as well as offer her input and opinion of certain facets of my self-study research. I explained the nature of my study to her in depth and sought her permission with the aid of a consent letter. She even helped in reading some of the articles I read to offer another perspective on the matter. When I showed her my adapted lesson plans, she (being the senior language teacher) suggested I look into metaphors as a creative take in Science language. She helped in the construction of that particular lesson, detailing what a metaphor constitutes and what examples to use to better explain to my Grade 9 participants, detailed in Chapter Four.

Apart from my critical friend, my supervisor, Professor Kathleen Pithouse-Morgan has been a pivotal key in my research. I met Professor Pithouse-Morgan during my Honours year when I did an elective subject of teacher development studies. Since completing my Honours, I have remained with her as a student for the duration of my Masters. We met every two weeks during the duration of the program to discuss, evaluate and reflect on the week's work. Professor Pithouse-Morgan regularly sent articles, links and extra work that made my mind think and

work in a more multi-dimensional frame to achieve the best outlook on my research. She helped me when she suggested I use a programme called *Grammarly* to check my work, format, sentence construction, etc. This proved fruitful as I felt that my work in my chapters suddenly had more of a cohesive flow.

The use of critical friends allowed me to gain support and information from external viewpoints (Samaras & Roberts, 2011). As Samaras and Roberts (2011) mention, the use of critical friends in teacher self-study methodology aids in adding validity and assurance to claims made. The use of critical friends has helped me look at my research from different views to best understand my work and goals. They have helped in shaping my thought pattern, as well as steering me in the most appropriate journey through this research without being too one-sided or forceful. Their opinions and thoughts on the matter shed light on many research conundrums during this research period.

2.8 Data generation/Expanding the map

Research Question	Data generation activities	Data Sources
1) How have my past experiences contributed to my interest in Holistic Education?	• I wrote about important points in my school career that influenced the need to promote holistic education in Science teaching and Learning currently. • I collected documents, pictures, cards, letters from school events in my past to help trigger my memory of my school history of learning. • Letter to my little sister. • I used art as a way to better visualise and understand my history and memories. • Sessions with my supervisor to discuss the meaning of all this autobiographical work.	• Autobiographical-writing and Journal entries • Report cards, school photographs, letters and cards from my students • Paintings, self-portrait • Audio recordings
2) How can I foster Holistic Education in my Science classroom?	• Students were asked to write a story, using facts about the chemistry that they learned in the previous lesson, entitle: *"The Night the Lab Exploded"*. • Students were asked to create a metaphor for what Science means to them. This formed part of creative language. • Students were asked to anonymously write a letter to their Science teacher detailing a memory (good or bad) that stuck out for them and why. • As a reflection technique, I audio recorded lessons that helped me gather data for analysis.	• Students stories • Students metaphors • Students letters • Audio recordings of lessons

Table 2.2: Depicting the data generation techniques used

Research practices were utilised in the process of generating meaningful data. These were Artefact Retrieval, Journal Writing, Arts-based approaches, Autobiographical Writing, Audio Recording and Developmental Portfolio. Both journal writing and artefact retrieval, a solely personal/self-reflective instrument, where I generated data about my own lived experiences to build meaning and significance for this study.

Upon discovering new land, a cartographer would add to the plateau of an already established map. This process of editing, adding, re-envisioning allowed people to read the map with a deeper accuracy. This type of metaphor meant that my data generation (like expanding a map) provided guidelines, tips, ways that I must steer clear off and paths to take to reach my destination.

2.9 Auto-biographical writing

I chose to use self-study methodology as an approach to unravel and re-live my past. I expected that dwelling on memorabilia from my past lived experiences would play back my high school years and allow me to gain new insight into those memories.

A form of self-study method that I chose to use pointed out by Taylor and Settlemaier (2003), was autobiographical writing. Autobiographical writing allows teachers to develop a critical awareness of their own past experiences, and the impact on their present context (Taylor & Settlemaier, 2003). This self-study method also helped me, as a teacher and a researcher, to reflect on some of the experiences and memories that may have otherwise seemed unimportant or unnoticed. It was these experiences and memories that actually shaped my current context and identities (as a Science teacher). By understanding ‘what makes me who I am’, I became more open to change and suggestable to bettering my own teaching strategies (Taylor & Settlemaier, 2003).

2.10 Artefact retrieval

Artefacts are physical manifestations that can be used to recall and remember some instances in our teaching and learning (Allender & Manke, 2004). Dhlula-Moruri, Kortjass, Ndaleni and Pithouse-Morgan (2017) described artefacts as objects with a personal attachment that may have been modified by their keepers, detailing experiences and memories that may have long been forgotten or overlooked. Allender and Manke (2004) argued that artefacts or objects, not only aid in helping to reflect and remember but also in coming up with new ideas for teaching and learning. Artefacts, or object study, as Mitchell (2017) notes, become important when teacher-researchers question the significance of these artefact. What is the object? What use does it have? Who used it? These are questions I asked myself to help identify, open up and understand the impact that artefacts have on self-study methodology and learning (Mitchell, 2017).

Artefact retrieval was pivotal to accessing memories and data about my past, the student I was, and to understand the teacher I was becoming. Artefacts and the use of artefacts was an untapped source of information. The past resurfaced with artefact retrieval and helped me understand the past to rectify the present and change the future. Artefact retrieval sent my mind working back in time to a point that was so significant to my learning and teaching, and to my development (Allender & Manke, 2004). Artefacts such as old photographs and old school reports helped me to generate memories of my past experiences that contributed to my interest in holistic education. Each of these memories was recorded in my reflective journal and helped me reminisce as it became a catalogue of old memories and new reflections. I used artefact retrieval (i.e., looking at old photographs, certificates, report cards) to delve into my past experiences and to reflect on the time at which these memories were sparked, and filled my journal with memories and reflections. I also used my journal as space where I reflected on those memories elicited from my chosen artefacts and my current teaching practice (Hamilton, Smith & Worthington, 2008).

When I thought of school, I pictured a romanticised version of how things should unfold, such as going to classes and acing papers, being popular and getting asked to school dances. However, these artefacts spoke a different story to me now, 20 years later. They spoke of pride, fear, anxiety, happiness, and innocence, amongst other emotions. I only saw this epiphany as I rummaged through my old keepsakes, as I reflected and saw them through learned (older) eyes. I learnt of the different meanings in these memories that were not there 20 years ago. Allender

and Manke (2004) explain how contrasting artefacts spoke of our different stages of life, how working with artefacts can allow us to retrace how we have metamorphosed into the teachers we are now. My collection of artefacts spoke of different experiences and passage through school and adulthood, but my chosen artefacts helped hone in on my voyage of self-discovery.

I was fortunate that my mother was somewhat of a hoarder when it came to my school memorabilia (as she did with my sister). She held onto everything from certificates, report cards, trophies, school pictures, and even our prefect ties. Sifting through was a challenge to find those artefacts that brought new insight and meaning to my past. I found myself questioning which piece of history best described how school was for me, simply by looking at it, reading it, feeling it. I eventually used the following types of artefacts. These were an old high school report, primary school photographs from school picture day, my Eskom Expo for Young Scientist photograph during 2004, my old paintings I did as a child and 'Thank you' cards from my experience during my teaching practice in 2012.

In Chapter Three, I elaborate on how each artefact was used and how it helped me realise why fostering holistic education in my Science classrooms were important. For example, looking at my Eskom Expo for Young Scientists photograph, I could see the innate desire to be creative in my work displayed from my posters I had done by hand to the hand-made models. There was a need to be exciting and outspoken in a subject that was dictated by scientific methods, rules and laws. Even my topic at the Science fair, Exo-Biology, *The Study of Life on Other Planets*, spoke volumes that I wanted to be different from the usual *paper maché* volcano or home-grown bean sprouts. Thus, the task of sifting through the vast amounts of artefacts that brought significant revelations and reflections that are meaningful to this research became a challenge. However, the challenge yielded a sweet victory in bringing these memories to surface once more.

2.11 Reflective journal writing

Journal writing was a tool to help me reflect on my history so I could understand why things happened and how I can make changes now. In reflective journal writing, I discovered facets and parts of myself from my past. Meyer and Willis (2019) used the analogy of Dumbledore's *mindekar* (a device used to store memories from a much-loved children's book series by author, J.K Rowling) as a tool for bringing up past memories, actions, thoughts with the act of reliving

them in order to gain further insight at each reflection. In reflective journal writing, as I reflected on my past, I started to discover my identity. For me, that identity as a teacher was highly motivated by monumental events and memories of my past and current context. In reflective journal writing, as I tried to make sense of my role as a Science teacher, I began to understand the relationships and behaviours of my students. The atmosphere and energy of my classroom began to unfold in my reflective journal.

Journal writing allowed me to detail the events of the day, to reminisce and reflect. I was able to playback each Science lesson, like watching reruns of my favourite TV shows. Meyer and Willis (2019) conclude that reflective journal writing can be used as a tool to develop ways to address challenges. Writing in a journal and reflecting helped me understand my students, as well as how to do things in class that would yield positive results. It became a working manual for my everyday teaching and learning. Unpacking the events of the day helped me appreciate certain things, like when student 'Ned' shared a completely unrelated story of how his dogs were scared of loud noises especially during religious celebrations after we did a practical on explosive properties of metals (Chapter Four). This made me realise that these students were comfortable enough to tell me about their lives, and held my opinion in high regard. It was also a place where I have been disappointed in myself and how I managed a situation, like not being able to read a student's body language when they were upset or scolding student 'Lee' for not doing his homework. He later told me that he was sorry as he only went home at 7pm the previous evening due to transport issues.

Keeping a reflective journal also showed me some prime aspects in how my class was managed. It showed me that the perpetuation of the lesson was determined by me. For example, on a particular day, I had hoped to allow for self-discovery learning by instigating the topic and allowing students to learn by discussing. The lesson became noisy with students talking above my voice. Eventually, due to my frustration I projected the notes on the white board and made my students write the notes down for the duration of the lesson. Upon reflection, I realised that when I changed the dynamics of the lesson, when I became upset and set the guideline for the lesson, the students followed suit. The lesson became dull, slow and boring. By the end of the lesson, they were lethargic, tired and moody for the next lesson. The day started like any other; me at the front of my classroom, fervently trying to capture attention.

It's easy as a teacher to feel overwhelmed, especially when you're trying to get your voice heard over 30 other students. I started my lesson in a way I thought would get my students excited. It did. But the excitement also ushers in noise and a sense of letting loose. My students automatically think, "Free lesson!" when I say "let's have a discussion". They equate learning and doing work to rigid methods, i.e., taking down notes, listening to me drone on. The noise made way for scolding, which paved the way for punishment and eventually took us home to "when is this lesson gonna end?" I had done it. I was in control and my actions made them want to wish the lesson was over. However, looking back, I showed them that eventually, learning Science is a one-way street – there is only one way to do it. I took away the creativity, the enthusiasm, the excitement by simply following an age-old method – "take out your books and write!

Journal entry, 10 May 2018

Journal writing was initially a difficult task for me to do, as I was never one to keep a diary or to pour my soul and emotions onto a page. However, the more I stuck with the task at hand, I more I found that keeping an electronic journal was appealing to me. I did not use any specific technological App or journal writing computer program, but rather typed out my journals on Word and saved my entries in my Masters Folder.

2.12 Arts-based approaches

The use of arts-based techniques is commonly found rooted in the principles of art or even resembling an artistic nature, to better understand a researcher's self and unpack their development (Abbey, 2004). Arts-based self-study research practices, like artefact retrieval, drawing, collage construction, all evoked the journey through the past and helped me to look back with learned eyes, with the experience now of making sense of these memories. These research practices helped me to visualise and reflect on my own practices, habits, learning curves, idiosyncrasies and behaviours. They helped to make sense of them in order to bring change where necessary. Arts-based inquiry helped me realise wholeness and to bring up a subconscious awareness (Abbey, 2004). It was used to connect me to my past and make meaning of the present, as it allowed for thinking and meaning-making outside of the confines of the logical and linguistic mind-set (Abbey, 2004).

As the main participant, I used metaphor drawing and a self-portrait (Chapter Four) to visually make sense of my current situation. I used drawings as a way of re-living some of my memories; sometimes writing it down underestimated visualising it (Pithouse, 2011). Using drawings as a self-study methodology technique opened up my work to readers, placing it under a spotlight, which may come under analysis (Pithouse, 2011). There was always a fear of 'what if my drawings aren't good enough", but this fear faded when I realised that my work was not inadequate, nor did it need to reflect perfection; it just needed to reflect me. The use of self-portrait, for myself, showed me my identity, both inside and out. Self-portraits helped to view all aspects of the person in their current professional context and re-evaluate possible positive changes (Pithouse, 2011). According to Samaras (2010), the use of self-portraits aid in understanding the research; they motivate thinking for researchers in unwrapping identities associated with classroom behaviour and pedagogy. It helped me to find a place to focus on and incorporate emotions, thoughts, messages that I would not have been able to articulate using words.

Apart from utilising arts-based techniques on my own self-study research, I incorporated these techniques in my Science classroom with my students. Samaras (2010) agrees that art and language serve as means to showcase our identities, make meaning of it and verbalise it with understanding to ourselves and others. It provided a platform to be expressive and less conscious of the limitations otherwise placed on what to say (Butler-Kisber, 2005). New, expressive forms of data generation made me aware of our interests, teaching experiences and insights (Butler-Kisber, 2005). Using arts-based techniques (drawings, story-telling), redirected a usually mundane topic (like mechanics or Newton's laws) and transformed it into a fun, revitalizing method of learning (see Chapter Four).

These approaches allowed me to tackle serious issues and mitigate discussions without having to lead the discussion. My students were accustomed to me leading discussions and steering the journey. I usually began each lesson in the directive manner, giving them instruction so they too could achieve the desired effect in the lesson. However, with arts-based approaches, my students become captains of their learning journeys; they unravelled every fibre of creativity in their own learning. Using arts-based approaches, my students were able to open up with more ease in class and take control of their learning. They could construct their own understanding of the content; in a way they could interpret.

2.13 Letter writing

I also delved into the world of letter writing. It took me back to my teenage years of trying to write in my diaries. I was given a diary by an aunt in my teenage years as a way of expressing my thoughts, my emotions. It was also an archive of my deepest secrets and I felt a thrill having something so personal and secret that I made sure it was well conceived. In Chapter Three, I unpack an artefact of a letter I wrote to my youngest sister. Writing that letter gave me a platform to use, one where I could voice everything, without the anxiety of saying it to her face, or calling her on the phone. Sharing this letter with her meant that this piece of me, she could read in her own time and keep for herself. It was something that would never be over. According to Kirkhorn and Airth-Kindree (2010), letter writing has said to have had a fairly therapeutic contribution to both the writer and the recipient. With my attempt at letter writing, I found myself unleashing raw emotion, something I worked on keeping in check. My letter would always have new meaning with each re-read.

Letter writing also provided a teaching moment. This moment was not just for me, but for my students with whom I used this method. Letter writing in my Science classroom with my students became an enriching experience. Given the current level of technological advancement humans have developed, many of our students are experts when it comes to instant messaging, email, Instagram or any form of social media and connecting with people using technology. Kirkhorn and Airth-Kindree (2010) concur that this may have meant an almost loss of customary letter writing. One challenge with initiating letter writing with students is administering guidelines. A challenge I experienced was that, as I am not a language teacher, I was unfamiliar with the formality of letter writing. When students questioned the type of letter they were to write, I had to research and eventually opt for informal, making sure it adhered to the requirements I wanted. My students, in keeping with Einarsdóttir (2007), sought approval when it came down to how their letters should be done. It was for that reason, and to prevent all students' letters from becoming generic, I issued them with a basic guideline so they would be able to be more flexible and original in their own letters. This was also a challenge noted in Kirkhorn and Airth-Kindree (2010). To show their experiences during my study and what they gained from this study, all participants were finally asked to write a letter to me (teacher, researcher, and main participant). In this letter, they could explain all they had learned and the value they had gained from this study.

In accordance with Kirkhorn and Airth-Kindree (2010), this teachable moment helped to build relationships and create a sense of familiarity with the writer and the recipient. It is Chapter Four where I discuss some of the letters received from my participants that highlighted such findings. I anticipated that letter-writing would be very useful in generating data that reflected their diverse perspectives and identities. As a teacher, letter writing was a beneficial endeavour in my Science class, as it provided an insight into both the negative and positive memories and moments that developed my students.

2.14 Developmental portfolio

I composed a developmental portfolio (Samaras, 2011) to house all my accumulated collections (of adapted lesson plans and activities aimed at holistic intervention, of chemistry, and language in Science) that were in line with the CAPS curriculum but were altered to teach the content in a more creative and holistic way, to enable students to reflect in a creative stream of thought. Students' classwork was also collected in the portfolio. Lessons and student participants' discussions was audio recorded for data generation and interpreting purposes, as well as a form of reflection. Samaras (2011) reiterates how self-study requires an open view documentation process, whereby teachers engaging in self-study make their pedagogical and research approaches clear to others and themselves. Being able to keep a manual of all recorded work, lessons and pieces evoked a sense of renewed learning every time I perused the pieces. The portfolio served as a learning tool for me in adapting future pedagogical approaches.

2.15 Audio recordings

Another technique that greatly aided my understanding and explanation was the use of recorded sessions during my supervision meetings and the audio recordings of myself. My audio recordings included lessons planned and taught to my research group during the data generation process, and the recordings of discussion sessions between my supervisor, Professor Pithouse-Morgan, and myself. Audio recordings also included conversations with individuals that gave me particular pieces of work on which I required elaboration. There were times when I did not find the time to sit down and examine my work and read and make notes. In those cases, I looked at certain pieces of work, artefacts and passages and recorded my thoughts about them. It was only after playing back and transcribing, did I come to many more theories and ideas. I

played my audio recordings of my sessions with my supervisor on multiple occasions and found that this yielded a deeper insight into my study each time. There would have been points and ideas missed in the moment, but having them recorded and played back allowed me to reflect and elaborate on a deeper, more informed level.

The type of conversations I had with participants varied depending on the participant and the piece of work they had submitted. Sometimes, group discussions were done, especially with other participants that were familiar and belonged in the same social group. These group conversational pieces were useful as participants were able to assist one another and put each other back on track. They could help one another to remember certain facts and information, and kept the conversation going by asking questions themselves (Einarsdóttir, 2007). Other times, when the need arose, individual or one-on-one sessions were necessary. These individual conversations, coupled with other techniques, helped the participants recollect and reflect on data. They may also have been more open to discuss certain aspects of data that they may have felt too reluctant or shy to say in front of other participants their age (Einarsdóttir, 2007).

The recordings helped me substantively since they gave me new insight into things I may have missed earlier. By replaying audio recordings, intentions by the participants were made clear (Masinga, 2012). Listening to audio recordings helped me find information that was present but went unnoticed, such as surrounding noise, the atmosphere of the lessons from the voices, and things students may have said that went unnoticed. Playing back the audio recordings meant that I could pick on aspects of the recorded conversation, the underlying tones, changes and breaks in the voices (Masinga, 2012). This all helped add value to the parameters of the study. It also helped me understand my pedagogy, what I needed to improve or change based on the overall psyche of the class gauged on from the audio recordings.

Listening to the audio recordings again was also seen as a way in which I could reflect. After my first recording session with my research participants, I noticed a few challenges in my classroom dynamics. For example, I had to constantly repeat my instructions. Being in a Science classroom, students were accustomed to clear-cut instructions, with either right or wrong answers. However, since I was doing things differently or more holistically, my research participants were confused and kept asking me to repeat instructions. Even after they had done the task, they kept coming to me for reassurance, to check if their work was what I had asked for, at times. I realised that I needed to create a less rigid environment in my classroom, perhaps leading with informal talk and discussions to place more ease on my students. After breaking

the ‘Science-ice’, I found students more acceptable of my unconventional methods. Listening to the recordings gave me a chance to evaluate and change my approaches. The more I listened to my audio recordings, the more insight I gained into what my participants intended saying and meant. I was able to fully dissect these conversations. The audio recordings served as a guideline to follow for the next audio recorded session, where (as Masinga, 2012 agrees) I was able to pick out when I may have dominated the session, or when I dictated and controlled the ambience and atmosphere of the session.

2.16 Data analysis

As Samaras and Freese (2006) illustrate “self-study research as a process of ongoing discovery...think of your research as a journey toward a greater understanding of one’s self, one’s teaching, as well as one’s students” (p. 83).

Data analysis is much like watching a flower bloom. The process involves rigorous and continual observation, finding new meaning or an extended meaning with each new view, finding what the inner workings are and how do the parts all fit together and function. Analysis of my data would entail my uncovering of myself – both personal and professional – and my students.

As Merriam (2002) explains, data analysis was “simultaneous” (p. 14), in that analysis took place as data were generated. This ensured meaningful analysis and comprehensive analysis was allowed to occur at once, rather than wait till the end and risk the loss of salient analytical points (Merriam, 2002). The analysis was also inductive in nature, whereby meaning emerged from engaging with the data (Merriam, 2002).

The analysis procedure involved running a fine comb through my data. Reading my students’ work, my transcriptions of recordings, viewing my drawings, my notes and journal entries became second nature, as I viewed it through fresh eyes each time. I kept all my notes, data, information filed and coded to make the organisation easier to access for myself, as the researcher, and the participants as patrons to the study.

In understanding the messages my artefacts, photographs, letters, and paintings reflected, I wrote about the history behind that moment in time (extended in Chapter Three). I reflected on what was going on at the time, and then related to how I felt about it then and now, albeit

conflicting emotions arising. My supervisor read my stories behind each artefact and offered useful insight. These were found to be useful in answering my first research question.

Using the students' work during the data generation process proved useful in answering my second research question (Chapter Four). Each piece of work showcased how to incorporate aspects of an arts-based approach into teaching and learning, while still delivering CAPS content.

I also created a summative drawing in Chapter Four, where I used imagery and colour to voice my thoughts and intuition. The drawing in Chapter Four consolidated my findings and helped me to picture and piece together the journey in making my Science class holistic. This drawing depicted the value of fostering holistic education for me. As an arts-based approach to analysis, this drawing helped me visualise what could not be put into words. Tidwell and Jónsdóttir (2020) highlighted the use of art in self-study projects a need to express, a desire for social, cultural and personal understanding. According to Tidwell and Jónsdóttir (2020), the use of drawings to summarise findings and portray final (sometimes hidden) messages in key in arts-based approaches in self-study. For me, drawings are without verbal limitations- expression is endless and often renewed upon each view. Again, my drawing was presented to my critical friend and research supervisor for analysis and this helped me unpack my work at a more finely tuned level of understanding.

Reading my notes evoked a sense of inquiry into my students' psyche', into their behaviour and/or thinking. The work they produced revealed a new angle of insight every time I analysed it. Samaras and Freese's comment (2006), "Expect the unexpected…" (p. 88) reminded me that I would get responses not blue-printed to my study and that was okay. This added value to the study by presenting more questions and hopefully, explanations.

2.17 Ethical issues

When it comes to including children in research, ethical issues, consent, confidentiality, all come under the spotlight. The participation of children in research proves a rich vault of data as they offer honest and valuable information. Einarsdóttir (2007) explains that children are social actors that come with their own views, opinions and voices. They have competencies and must be heard. They mimic social behaviour, learning from predecessors on how to socially

construct themselves. Young children are honest and reliable informants with a plethora of information that researchers can learn from (Einarsdóttir, 2007).

Children as participants came with a new perspective. In cases where children can be extremely honest, I, as the researcher was reminded to be able to take note of what can be deemed useful. For example, as described in Chapter Four, during task 3 (the scientific metaphor), student 'Quinton' had expressed how he "does not really like Science because I don't really plan on doing it next year...I don't understand it, and it's too hard for me". This kind of directness helped me reflect on my own practices; it made me question if my methods attributed to his dislike of Science, his honesty and feelings about my Science classroom. It made me question if that is how he felt about Science in general or just Science in my classroom.

Imagination is another key factor with regard to the contributions of children as participants. For instance, in the task, "The Night the Lab Exploded", student 'Sam's' story was beautifully described and written. It had many aspects of a good read, but it strayed from the main focal point behind the task and centred around his character finding happiness and love at the end. Once again, as the researcher, it was important to be able to pick out the valuable points from tasks where imagination takes centre stage.

In my understanding, when imagination and perspective are used in studies, it provides elements of interpretation and opinion. Such data might not be clearly rooted in facts but it offers valuable insights into what matters to participants and how they understand experiences. Ethics becomes an issue, because as the researcher, I have to show respect for my participants by allowing space for and appreciating imaginative responses.

Confidentiality is an extremely important and often intimidating aspect in ethical issues, especially concerning children. As a researcher, I am sworn to anonymity. As their teacher, I am sworn to secrecy. However, it is noted that sometimes when the secret becomes detrimental to the child, confidentiality protocol starts to fade and my role as a guardian displaces that oath. For instance, in my letter writing task, student 'Trent' expressed how he loved learning about Science and that if it wasn't for me, as his teacher, he would have probably resorted to suicide. This immediately set off alarms in my work ethic. I called him in and spoke to him regarding this letter. He assured me he wasn't serious when he wrote that. However, I requested to speak to our Grade head, who followed it up to ensure all was well in his home. In this case, the safety of the child surpassed the need to remain confidential to protect the integrity of data.

Building a relationship between the participants and the researcher becomes a focal point in gathering reliable, honest data. However, when participants are young, these relationships are complicated (Einarsdóttir, 2007). Children see the adult as a power figure whom they will either fear or wish to please. This was evident when I was continually asked to check if they were doing what I asked them to do. It showed that they wanted to ensure I got what I wanted from them, in terms of work and data. This imbalance of the power control can interfere with the validity of the data. Einarsdóttir (2007) explained that to remedy this issue, the researcher would have to use child-friendly methods that enable the child to showcase their competencies and interests, and that they do so in an environment in which they feel safe and comfortable. I established a relationship with my students by challenging myself to learn their names by our second lesson in their first year of high school. This was not just names, but surnames as well, as well as finding out information from them, like their birthdays or if they had any pets. I found that the more I queried about their lives, the more they opened up to me and trusted me.

Informed consent was sought so that the participants entered into the study voluntarily and understood what that entailed. In obtaining informed consent, comprehension is key, and the language used is very important. Informed consent was delivered in English as all participants were fluent in speaking, reading and understanding this medium of instruction. According to Einarsdóttir (2007), all participants must understand that they are also free to withdraw at any time should they wish to do so. Gallagher et al. (2010) agree that for informed consent to be true, participants must have full comprehension of the study, the consequences of their participation and that they have participated without any influence by external factors. The problem arises when the participant may be too scared to tell the adult no. It was therefore imperative to firstly make the consent process an ongoing one, i.e., to ask for permission for their participation at the start of every activity. It was also crucial that an adult (parent or guardian) was sought as an abridged consent to the participants' involvement. Children might need to be reminded many times along the research process of the parameters of the research as they can easily forget or become confused as to why they gave their permission to participate. Having an adult to co-sign permission for underage participants aided in helping the decision process, if children were given the choice of participation. Another issue was that if the informed consent was true consent. Researchers have to pay attention to other cues of non-consent, like body language. A participant may verbally agree to the conditions but other gestures and movements may indicate otherwise. I have had to stay vigilant when engaging in this process with my participants.

The protection of participants' identities is crucial so that the participant and their work is unrecognisable in later work or research pieces. I have had to be careful to not completely promise confidentiality as there could have been numerous cases where this would not have been upheld. If a child was in danger or I, as the researcher and teacher, picked up a case of child abuse from the data, I would have obligated by law to inform the necessary authorities of the identity of the child. In a case where child abuse or neglected is detected, this breach of confidentiality supersedes the premise of the ethics of any study.

Permission was sought and granted by the principal of my school to research the school, with the Grade 9 Science students that are registered in my classes. My research participants were children between the ages of 13-14. Each participant was given a choice, together with her parent/guardian, as to whether or not the student wished to participate in the study. All students in the class participated in the Science lessons, but only the work of those that gave their consent (27 out of 29 participants) was used as data sources for the study. This was initiated with the issuing of a consent form (Appendix C). All participants' parents/guardians were provided with a detailed consent form assuring them of not only confidentiality but also, that participation was not obligatory or to be subsidised in any form of monetary value. All participants remained anonymous throughout the duration of the study. The research and all underlying frameworks were discussed with the participants during a lesson in which I introduced and discussed the research to be undertaken. If consent from more than half the class was declined, an alternative study group or alternative participants would have been sought.

All participants' and institutions' identities were kept anonymous and were referred for identification via the use of appropriate pseudonyms. All findings were shared with participants during an organized meeting/discussion in lieu of one of my Natural Sciences lessons, where all outcomes were delivered in the form of a sit-down discussion, with appropriate findings put together in a presentation. Participants were invited by way of verbal communication, upon which I revealed my data, followed by questions and explanation between myself and my participants. Participants relayed verbal confirmation of the arranged meeting to discuss data. During the meeting, participants responded well to my findings and showed understanding of the data analysis. Students were guided through the focus of the study, the aims, objectives, and justification for such a study. All findings, as well as the implications of these results, were explained in a language suitable for their age level.

2.18 Validity

This study was guided by Feldman's guidelines for validity in self-study. This included an understanding of what constituted data in the study. It also meant possessing the ability to provide a clear synopsis of the data generation methods. Feldman (2003) asserts that this is the "construction of representation of data" to provide clear guidelines as to the analysis of our data and how it is represented. This included multiples sources of data ("triangulation"), and providing evidence of the value of the changes in my teaching (p.28).

Validity is prime in self-study research as the research itself evokes reflective processes, and it is important to maintain accuracy (Feldman, 2003). Bullough and Pinnegar (2001) highlight fourteen guidelines for consideration by self-study researchers in the pursuit to ensure validity in their study. These encompassed finding moments that are central to teaching to learning to promote insight and interpretation. Understanding these moments is a journey of development and a few mishaps that aid in making a person a teacher. This provides a narrative that takes hold of the reader and allows a teaching moment, to discuss a few guidelines (Bullough & Pinnegar, 2001). I have included a variety of data generation techniques which, as Samaras (2011) indicate that the use of many data sources makes a study more trustworthy and reliable. Even in Science experiments, having many trials meant that your data produced would be more likely to happen again should someone repeat your experiment. With self-study, multiple data sources provided a spectrum of results, utilising a broad band of explanations and reflections for my study.

2.19 Research challenges

One of the challenges I expected was time constraints. In fulfilling curriculum requirements, and adhering to structured time frames to finish the syllabus, time taken to conduct the study did run the risk of running short. This was resolved in suggesting extra-tuition classes that looked at both instilling curricula and doing so with the study objectives at hand.

Another challenge I experienced was with my research participant group. Many students failed to provide data on time for some of the tasks. This led to delays in processing whatever data were handed in. I had to resort to constant reminders and eventually, badgering them to get as many sources as possible.

My personal challenges included relocating to Gauteng province in 2016 to fill a teaching post in a government school. This meant that I had to suspend my studies for the remainder of the year. Significant life changes also prolonged my research process. I relocated back to KwaZulu-Natal in 2017 and got married in 2017. The adjustment meant that I sacrificed research time. I went on maternity leave from February to June of 2019 to have my baby boy and this lifetime milestone pushed my research process back. With these life changes, I found it difficult to keep track of my work and juggle spending time with it as I had previously, and my new family. It was a challenge to spend private study time on my research with regard to time management. The quality of my work did not diminish, but I found it tiring to try and keep the same hours I had back when I started this research journey.

2.20 Conclusion

In this chapter, an exploration of the self-study methodology and its implications was provided in detail. I have indicated my choice of methodology with justification. It formed the basis of how my study took off, with the idea being my reflection of my own experiences as a starting point to this study. I have provided a detailed description of my data generation methods, as well as some of the possible concerns and challenges and how I would overcome these.

Chapter Two has thus provided the justification for my chosen methodology, citing both personal and professional benefits. The different ways data were collected, as well as the challenges from participants and research constraints were discussed. Chapter Two embodies the blueprint of my study with the hope of laying out the detailed workings of my proposed journey in my study.

Chapter Three details my own lived experiences evoked by artefacts, auto-biographical writing, and self-portrait drawing. Each artefact is carefully unpacked, detailing the context of it as well as its significance to my study. Each artefact that is explained will offer more insight into my first research question, *How have my past experiences contributed to my interest in holistic education?*

CHAPTER THREE: GENESIS

3.1 Introduction

Genesis is significant for, as it not only meant ‘in the beginning’, but being the very first book in the Christian Bible, it symbolised the start of my actual research process. Genesis meant the first unfolding of my personal role and the unveiling of my research investigating how I could incorporate features of holistic education into my Science classroom. During this self-study, introducing a holistic approach to my science teaching and learning was needed. This meant I aspired to develop my persona as a Science teacher, and in turn help my students come into their own. This study focused on integrating aspects of holistic education into mainstream curriculum. I hoped to gain a sense of change into how the content could be taught and be received. I also wanted to explore how changing my practice might impact a student’s well-being inside and outside the classroom. The idea to look at my past lived experiences became a stepping stone to this process.

Chapter One focused on the “heart and soul” of holistic education, detailing my understanding of holistic education and the implications for this approach in a Science classroom. These key ideas involved facilitating well-rounded students, students who can think under various situations. This also included being able to learn in ways more applicable to the context, strengths, and weaknesses of the student. The chapter centred around the reason I wished to base my self-study on, the aims of such an endeavour and the value of it. This all embodied the focus and purpose of my self-study. Chapter One identified the need for this research and laid out the blueprint, with justification, of how I could navigate this research.

Chapter Two focused on the research methodology and research process. The methodology was self-study, and thus required a lot of my own past experiences as fundamental pieces to this research. This chapter elaborated on selecting a self-study approach to better understand myself, my impact on my students and how the fruit from my past lived experiences could be found in my work with my students. This called for repetitive reflection and thus helped build strategies to improve the approach. Self-study methodology aided in unpacking myself to gain a deeper understanding of my journey and what had led me to this research. Chapter Two also detailed how data were generated, and the justifications for such generation techniques, as well as how these coincided with the self-study methodology.

In Chapter Three, I acknowledge and describe some critical past experiences that have contributed to my interest in holistic education. The purpose is to provide a clear map of how I reached a point of change and aspired to implement this practice into my pedagogy. Digging deep into my memories and lived experiences meant analysing artefacts and auto-biographical writing. This chapter responds to the first of my research question, *How have my past experiences contributed to my interest in holistic education?*

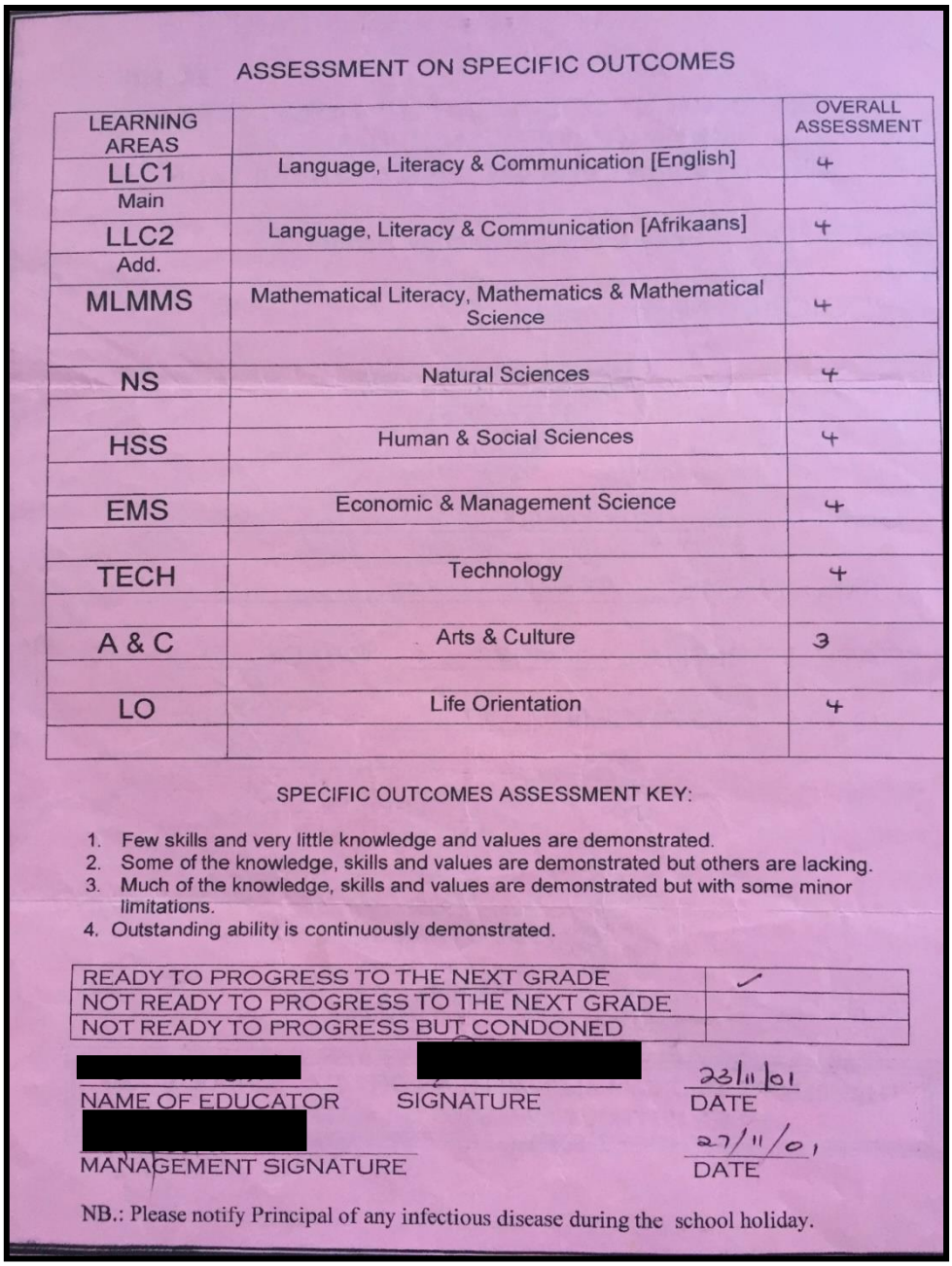
Chapter Three will start by unpacking past experiences from various forms of memory work. These include a detailed look into artefacts, auto-biographical writing and self-portrait drawings. Artefacts will be represented by an old school report card, school photographs and letters. Auto-biographical writing includes pieces of writing I had done, while my self-portrait drawings represent my take on how I view myself. The conclusion ends my chapter by answering the first research question posed above.

3.2 Exploring my past experiences through artefacts

Chapter Two spoke of the aid of artefacts and tools that assisted in reaching into those memories and lived experience. The use of artefacts aided in resurfacing memories as a tool of collective reflection (Allender & Manke, 2004). My artefacts had the innate ability to recapture emotions and long ago lived experiences, as they became those memories frozen in time. Chapter Three addresses each lived experience concerning an artefact, where I connect each lived experience to an artefact, explaining the significance each artefact possessed concerning this study.

What follows is the unravelling and introspection of selected artefacts. Each artefact details the nature of the emotion tied to it, as well as the emotions it triggers now when I reflect on it. This walk down my memory lanes stops at an old report card, old school photographs, art work I had done as a student, letters to me as a student teacher from students I taught, a letter I wrote to my sister. The aim of the section is to provide the history to my story. It is to fill out the identity conundrum of who I was, that made me who I am now.

3.3 Artefact 1: An old school report: "Great Expectations"



ASSESSMENT ON SPECIFIC OUTCOMES

LEARNING AREAS		OVERALL ASSESSMENT
LLC1	Language, Literacy & Communication [English]	4
Main		
LLC2	Language, Literacy & Communication [Afrikaans]	4
Add.		
MLMMS	Mathematical Literacy, Mathematics & Mathematical Science	4
NS	Natural Sciences	4
HSS	Human & Social Sciences	4
EMS	Economic & Management Science	4
TECH	Technology	4
A & C	Arts & Culture	3
LO	Life Orientation	4

SPECIFIC OUTCOMES ASSESSMENT KEY:

1. Few skills and very little knowledge and values are demonstrated.
2. Some of the knowledge, skills and values are demonstrated but others are lacking.
3. Much of the knowledge, skills and values are demonstrated but with some minor limitations.
4. Outstanding ability is continuously demonstrated.

READY TO PROGRESS TO THE NEXT GRADE	✓
NOT READY TO PROGRESS TO THE NEXT GRADE	
NOT READY TO PROGRESS BUT CONDONED	

[redacted] [redacted] 23/11/01

NAME OF EDUCATOR SIGNATURE DATE

[redacted] 27/11/01

MANAGEMENT SIGNATURE DATE

NB.: Please notify Principal of any infectious disease during the school holiday.

Figure 3.1: Grade 8 school report (2001)

The report (Figure 3.1) was chosen from my Grade 8 year in 2001. It was the final report of the year and had signified my completion of the first of five years of high school. It reflected to my peers, teachers, and parents whether I had coped the first year and would manage the next four. The reason I chose to use a report card as an artefact was that it portrays my academic nature. It displays my perceived prowess or lack thereof, of the academic stepping stones to furthering my education and the measures against which I was graded.

Subjects done were in keeping the OBE curriculum policy; this policy was labelled as Outcomes Based Education, which the intention of providing a multi-faceted form of educational means to meet specific educational needs. It was a platform for the technical aspects of the school. This meant providing students with tools to work better with their hands, in application and practice. The OBE curriculum attempted to be diverse and inclusive, with subjects like arts and culture and life orientation. The grading system incorporated the use of a numerical system ranging from 1 (being a failed symbol) to 4 (indicating a distinction).

This type of artefact to me symbolised my own school experiences where I felt emphasis and prestige was placed on developing academics. This made me feel that academics became the sole representation of the student as an individual. It depicted the level of importance of academics and in doing so, aptly showed the achievement in those areas deemed logical and linguistic. This was evident in my scoring a less than perfect score for the subject, Arts and Culture. Arts and Culture focused on learning traditional aspects, cultural laws and practices, indulging in creative thought.

I remembered anticipating the workload, and ensuring I paid extra attention to those subjects I was told to excel in because, in my family, I was told by my parents and close family that I needed to top the class. It was and still is something that I have seen in my close family circles, where aunts and uncles have indoctrinated my cousins. My cousins were pressured to excel in these Science and Maths subjects to become doctors and lawyers. This meant taking these subjects even though they had no desire to pursue these subjects later. I recalled this sense of apathy and disinterest in my "artsy" subjects, although I thought I was a creative child (my creativity spanned making models of art from foil to painting pictures of scenery). I remembered answering a maths question paper in my Grade 8 year of high school that required us to construct a cube on graphical paper and my teacher being very impressed with the picture of an elephant I had drawn on the cube to make it look pretty. My interest in art was innate. Even with a task so defined in accuracy, numbers and measurements, I sought a creative spin on it as a child.

Looking back to my schooldays, I see myself almost as a robot. Instructions were clear, goals were set by my makers. It was my duty as instructed by my parents to follow them and excel. Plain and simple. Any score less than perfect was questioned with a disapproving look, which was more shaming than the report itself. I remembered the proud looks from my parents, as well as when my dad would look at my report and proudly predict my future. I always idolised

my dad (and still do). He had a way of telling me what my future would be that made me want to see it come to fruition. This report was a symbol of my worth in school. It was never a choice of my subject preference but always had to be a clear picture of overall excellence. This plain pink piece of paper had to show that.

It must be acknowledged that I am a descendent of indentured labourers, and my ancestors endured many hardships that saw them enslaved, with education becoming a way out. My ancestors made many sacrifices to put my grandparents and, subsequently, my parents through education. The belief was that education was vital to moving from the sugar cane fields into a better-paying job with more benefits and less hardship. Having an education gave my ancestors a foothold to climb the ladder out of poverty, impoverishment, and into a world of opportunity.

3.4 Artefact 2: My old school photograph: "Smile! You're on Candid Camera!"

Figure 3.2: Primary school class photograph (1996)

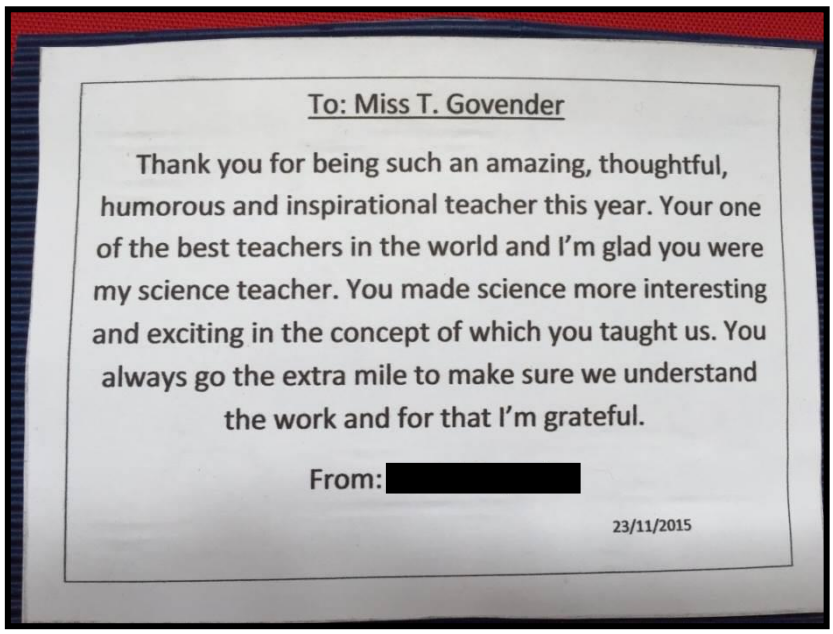
Photographs for me are not only memories frozen in time, but I feel they capture the emotion in time as well. They have a way of telling stories by simple single shot or frame. Faces smiling, so unaware, so conditioned at such a young age. This Artefact (Figure 3.2) was of an old school photograph from when I was about 8 years old, in a primary school, 1996. I was young and impressionable. I loved school because I was good at it. Well...I thought I was since I believed that school was just something conformed to a single explanation: it was a place where you learn about new things. This was something I often heard my parents, aunts and uncles recite.

These new things were stuff you had to remember to move on with your friends to the next Grade. Teachers bore the older curriculum and teaching was as instructed. You sat. You listened. You regurgitated. That meant you had learned and were a smart child.

Failure to comply meant being regarded as stupid or lazy. Surprisingly, being called stupid was far more offensive than lazy, as my teachers could cure laziness but not stupidity. This is what I was taught, this is what stuck with me. In this photograph, I'm smiling; I'm in the front row, which was an unwritten and unspoken accomplishment amongst the students. We never realized that it was due to height. To 8-year olds, to be seated in the row with your teacher and principal meant many envious peers. It meant you were favoured, you were recognised. It was an honour. Only later in my schooling did I learn of the procedure that we mistook as an honour and an opportunity!

This artefact evoked mixed feelings. One feeling that resurfaced from this photograph was that of joy. I looked happy in the photograph. But as an individual now looking at my younger self, I felt sympathy for this younger self, almost pity because she was unaware and oblivious to how school and academics shaped the rest of her schooling career. It was like looking into a pond of water, watching the ripple effect distort the image and change it, until the constructed final reflection stared back.

3.5 Artefact 3: Letter from my student: "The First Impact"



To: Miss T. Govender

Thank you for being such an amazing, thoughtful, humorous and inspirational teacher this year. Your one of the best teachers in the world and I'm glad you were my science teacher. You made science more interesting and exciting in the concept of which you taught us. You always go the extra mile to make sure we understand the work and for that I'm grateful.

From: [redacted]

23/11/2015

Figure 3.3: Appreciation card from a student (23/11/2015)

Letter writing, as mentioned in Chapter Two, is a tool that has a therapeutic contribution. It serves as a way of unbridled communication between the writer and recipient. A letter, of deep thought and emotion, is capable of shedding information and releasing the soul at the same time.

The artefact above (Figure 3.3) was a recent treasure I acquired from a student that I taught Science to. It was a "thank you" note for teaching her science in her Grade 9 year. At the end of the year, she was leaving to a new school offering subjects she was more interested in. As a farewell gift, she gave me this letter. In those few lines of words, the student expressed gratitude for teaching her and helping her through the course. She was a quiet student who struggled in Science. I always took the time to go the extra mile with her, as I saw her capabilities beyond her meekness. I gave her extra tuition and shared content that made her learning more comfortable. I held this dear and it is on permanent display on my desk to remind me that what I have done was worthwhile, that it did not go unnoticed and that I was appreciated by my students.

In reading this note, I remembered a TED talk video I watched by Rita Pierson, entitled "Every Kid Needs a Champion" (2013). Her words reminded me that every child needs someone they can relate to, someone they can count on. And this note I received was evidence I was on that heroic path. It was not out of ego but it reassured me that what I was doing incurred obstacles but also success. This was my reward. It reminded me of receiving a certificate of excellence in school when I was a student and excelling in various subjects. This displaced that achievement as a certificate of excellence in making a difference in someone else's schooling career. It did not matter what my peers thought, what other teachers thought; it mattered what my students thought and how they responded to me when I taught and engaged with them. It mattered to me that my students knew what I was attempting to do, and they received it and gained a sense of positivity from it.

3.6 Artefact 4: School Painting: ‘Colour Burst’

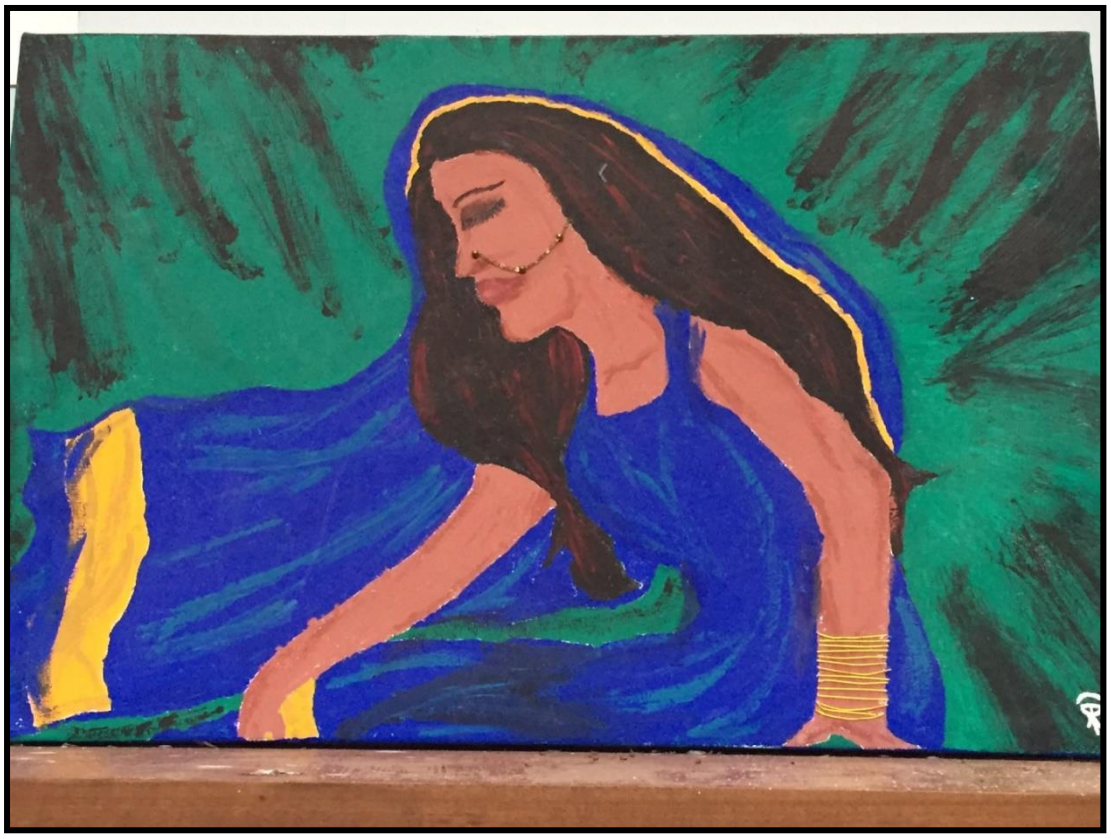


Figure 3.4: School painting

Being a child that excelled in academics and was motivated to hone those linguistic and logical skills, my creativity took a “back seat”. However, I never neglected it as a tool to help me cope with pressures and strains of always trying to keep up to standard.

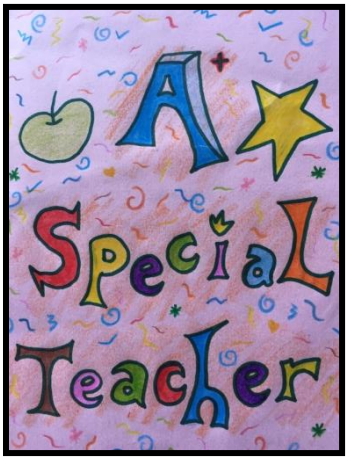
I loved painting. It was a form of art I discovered on my own, and it provided me with such insight. It was an area of untapped ability and no restraints, no one to judge it and place value on it, as to whether it meant excellence. It was expressive with the use of no words, and up to anyone’s interpretation. I loved that there was no method of doing it, or steps to be taken or that there no wrong answer at the end.

The artefact I used (Figure 3.4) was one of a painting I did when I was in Grade 10 back in 2003. Art was a past time, as my high school did not offer Art as a subject to pursue. It was of an Indian girl with downcast eyes, almost expressionless, but a hint of content in the way her mouth was shaped. The message of submission in her shielded eyes was quite contrary to the explosive and expansive use of deep and vibrant hues of green and blue, colours I found to represent an explosion of energy.

I chose this particular piece of work as it was around the time that I made an effort to explore other areas that intrigued me. It allowed me to breathe in a world where this was deemed as pointless, and the sole focus on subjects I had to study. Looking at this painting, I saw the need to display more than just the submissive, bare minimum required of me. The colours spoke more than the actual drawing. The display of bright colours showed the need to be "out there" and expressive and cultivate the need to be different from the emotion and content expressed by the girl's face. I found myself comparing and finding similarities between the painting and myself. I was submissive in my academics, studied what I was given, my subjects carefully guided by my mother, yet I wanted this the explosion of energy and vibrancy of colour in my grey school days.

Indulging in this form of expression reminded me of being a child learning to paint for the first time, unaware of the imposing instructions, with the ability to do whatever I wanted. My uncle lived with my family during his childhood and teenage years. He was very artistic and was always the one who painted our family birthday banners. This interested me as a child. Watching him, I became encouraged to pick up a paint-brush too. The world was a blank canvas, waiting for my life, my history, my future to be poured into the crevices of the canvas.

3.7 Artefact 5: Card from my student



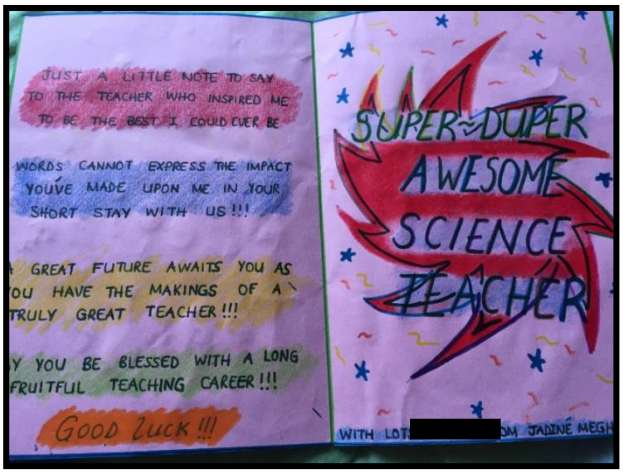


Figure 3.5: Cover of Thank You Card **Figure 3.6: Contents of Thank You card**

The artefact above (Figures 3.5 and 3.6) was something I received not as a student, but as a student teacher, during my teaching practice course at a high school. This was in May of 2012, and I had been teaching Natural Sciences and Life Science at a local high school in Verulam. The school was co-educational with a largely Indian demographic. Subjects offered to pursue through the FET phase were basic; they did not offer subjects like Art, Consumer Studies or Computers and Information Technology. The students had access to a library, sports field and canteen. I taught Life Sciences and Natural Sciences, with content covering the Heart, Blood System and Chemical Reactions. My approach was predominantly information giving. I stood at the front of the class and poured out all I knew. I would occasionally walk around and question students to see if they had remembered what I had said. At the end of my stay at the high school, a student had written a letter in a card she made as a "thank you" to me for teaching her for the previous 3 weeks. She was a quiet, Indian girl, the studious type in that she hardly spoke up in my classes but excelled in pop quizzes and homework tasks.

It was quite a surprise, knowing that in the little time I was there, "I" had made an impact. Even if in just one student, I had done something special. The gratification and pride began to swell, not in an arrogant way but simply because I had inspired a person to be better in some way. This encounter left us both changed as a result. I looked at this artefact and felt pride, joy and fulfilment in every aspect of my teaching career. It felt good and satisfying to know that my efforts were not in vain, and that even if it meant more work and stress from me, it was worth it.

I walked away feeling inspired, sharing the emotion with her. Knowing that the way I had approached my lessons, altered them to cater to a student, not for the simple task of just teaching content, had made a lasting impression, was good. As a student, I sought recognition, but mostly I think it was understanding from my teachers that I craved. It was a pinnacle point in my career choice, knowing I gave the time and effort to understand and that it was received with appreciation. My hope soared...soared like an eagle, giving me more insight the further I ventured. The more I adapted my approach, the greater the response.

Too often, I had felt stagnated in my learning career as a student at school. I felt my teachers were indoctrinated in this culture of teaching for the sake of pushing up graduate numbers. It had become a culture, a norm to discuss "how are going to finish curriculum?", rather than "how do we help them understand?"

This letter, this beautiful piece of writing, gave me hope, that my slightest endeavours to be different, to be accommodating to their needs and not my deadlines, would make it would be a worthwhile journey. My student was right: " it would be a long, fruitful teaching career".

3.8 Artefact 6: School Science fair photograph

Figure 3.7: School Science fair photograph

This artefact (Figure 3.7) was of a high school photograph of myself in 2004, participating in the national finals for the Eskom Expo for young scientists. The Expo is a national competition that showcases studies, experiments, phenomena that students in Science, Mathematics and Engineering want to explore. I had participated in the regional finals in Durban a few months back, taking home gold with 19 other finalists and thus represented the province in Pretoria for the nationals. My parents, my teachers and my peers were extremely proud of me.

I chose this artefact because it displayed the desire and level of competitiveness expressed by parents and society during my school days. This photograph summed up that all the teaching and training was to gain worldwide recognition of advanced cognitive ability in the field of logical and linguistic subjects that are deemed important.

Yes, I indulged in some creativity to best broaden the nature of my message, but essentially, the message was that this was a display of my capabilities, of my intelligence. I was expected to be at the top based on my cognitive abilities in the area of Science. This showed the calibre of parenting I received and equally important, the level of education to which I was exposed.

It felt like I was a boxed-up doll on display amongst the other toys, and depending on what more I had to offer, I would be selected. The scrutiny and close examination we were under told us we were pitted against the best and the brightest, where there could be only one victor.

I did not get through nationals and move to internationals, but I was told that representing the province at such a level was an honour enough. It was disappointing. Not winning was not the disappointment...being told from my family and teachers from the beginning that that was what I needed to do, and then being told something contradictory like “winning isn’t everything”, was disappointing. I began to feel frustrated with my seniors for misleading me with the goals of this endeavour, and with myself for not just staying true to what I wished to achieve through this.

3.9 Artefact 7

To My Little Sister

Being the youngest little girl in our family, you are always the one to receive the most lectures on how you should live each day. You are fresh out of university, having followed in both mum and my footsteps and pursued the noble profession of educating young minds. I can assure you, it is a journey worth savouring and a real eye-opener to those who doubt what teachers get up to.

A journey of four years to prepare you with an armoury of skills to go out and join the education department would have bestowed on you the ability to tackle most obstacles you would most likely encounter in your classroom. I would like to impart onto you some pearls of wisdom - something I experienced first-hand and have made it my duty to change, and in so doing, am currently engaged in my Masters aimed at researching how I can achieve this. This all may sound very confusing and I am not trying to pose any riddles, so here goes.

My past experiences as a student during my high school years prepared me as much as "textbook smarts" go. When I started my post-school career at university, I struggled to cope with university society. I wasn't as well-rounded as I thought I was. My difficulty to adapt led me to make a conscientious decision, that given the opportunity, I would never solely shape the young mind of children to be completely conventional, but place room for holistic development.

My research aims at looking at how we, as teachers, can integrate Holistic Education into mainstream education. As teachers, we are constantly pressured into finishing the syllabus and conforming to how we should teach children - it must be uniform; it must reflect a standard; it must focus solely on a child's logical and linguistic ability. There is no room for creativity, no room for developing imagination. We develop students to become lawyers, doctors, labourers - what about developing the human fibre, the nature of people, or the soul of a child.

My research focuses on my Science class and how I can incorporate these holistic approaches into a curriculum I am expected to blindly abide by. I believe this is important because I believe in the art of better equipping these young minds to cope with the drama, the 'ups, and downs', the politics of this worldly realm. By isolating their development to just content, both logical and language skills, we are simply saying that it is ok to snuff out creativity, to produce robotic individuals that carry no capacity to make conscientious decisions.

I do believe that in the four years of university, you have grown to be a more open teacher - open to advise, suggestion, to employing new methods of teaching. Thus, what I'm saying is that once you find your niche', you will begin to do what you can to grow your students, to nurture them, to protect them, to advise them, and in so doing, you create individuals that become assets to society, that become such multifaceted beings in society. All I am saying is that in trying to cope with the demands of completing the mainstream curriculum find the time and seek out the opportunity to instil these principles of Holistic Education. It will spark a passion that is forever fuelled and satisfaction knowing that the work you are doing is worthwhile.

Your Sister

A teacher by passion and a student for life

Figure 3.8: Letter to my little sister

This letter to my little sister served to advise, as a remembrance, as a guideline, as a learning tool, as everything I wished to convey to her as she journeyed through this path of becoming a teacher. I remembered all my experiences, the lessons they taught me and most importantly, the teacher I was trying to be. I shared this letter with her, imparting my experience with her. In this letter, I hoped to shed some pearls of wisdom. However, I realized that like every student, my sister would learn from her own mistakes, her own endeavours, her own experiences. She would use mine as a stepping stone to her own path. I could not mould her into "me" but could simply ask her to be open, spontaneous, welcoming of new ideas, suggestions, and techniques. I could not hand her a guideline and tell her what she needed to do and accomplish to be a certain type of teacher. This meant I was doing the very thing I experienced and was trying to prevent from happening in the future. She, like many of our teachers entering the profession, would find their niche and in doing so, their true identity in the classroom. Choosing to embark on letter writing offered answers for me, so I encouraged her to use it as a tool as well as she grew in her profession. It would soothe the soul and provide valuable insight for her.

3.10 Exploring my past experiences through auto-biographical writing

Auto-biographical writing was a tool for me to explore significant events in detail in my life. These events stuck in my memory because of the value they later added to my life. Writing was used as a tool to express myself, to find meaning in my past lived experiences. It provided a voice when I felt my actual voice was incapable of truly expressing my thoughts. The use of past lived experiences served as a bridging tool, to manifest and construct future behaviour. I reflect on these lived experiences after each analysis to help me explain and make sense of my current teaching practices.

3.11 Auto-biographical writing 1: The School Bully

My earliest childhood memories of school filtered back to my primary school days. I was probably only 7 or 8 when I could formulate coherent memories of what school was like. It was fun when we got to go out for lunch and serious when we were told to sit behind a desk and do our work. I was always much of a 'pleaser' (or in kid terms, the 'teacher's pet') in the sense that I did what teachers expected me to and that too, even more than what they asked. I

loved learning, so it was not for approval or to become the teacher's pet, but often it became an unwanted prize for showing genuine interest in your education. At early primary school age, I learned the truth... some people will dislike you, not because they know what an unlikeable person you are, but simply because you are just that...YOURSELF. I rejected any unwanted attention for merit and excellence in my work because I wanted to be liked by my peers, not hated because the teacher suddenly took notice of me because I was "an A student". I knew it was not their fault, they were simply rewarding what they deemed "excellence in self". My teachers reasoned that due to my academic prowess, I was a good, well-rounded individual who would grow up and do amazing things. I liked my memories of my teachers; every one of them had a unique twist of how schools should be run, how lessons should be taught, how students should behave. It was both bad and good memories, all of which I would never trade.

The one memory that always stuck out for me was during my high school years. I tolerated high school. Simple as that. It was not because I was failing classes, or had no friends; I was a straight-A student, was popular with my peers and teachers, and even part of school leadership, becoming a prefect. In essence, I had become the role model of the school. All this I tolerated, it was a means to an end, and I was being told what to learn with no expression of my true self. Granted, I loved learning but forcing a person to learn what you want and not what they find intriguing makes them hate learning. I could handle myself in an exam, in a debate with fellow school peers, in a class discussion about why Shakespeare's Juliet felt the desire to purge herself of life for the sake of a man...but place me in a social conundrum, and I was a fish out of water. I was gasping for air. Social etiquette is not a subject I was taught or enrolled for school. With the focus on academics, learning how to live my life, and how to interact with the world outside the classroom, took a back seat.

During my junior high years, I participated in various extra-curricular activities to gain more exposure, to find what I was good at. In one such endeavour, I had entered an essay writing competition, but sadly was the only one who turned a piece of work in. The teacher who collected the work was notorious as an iron-clad authoritarian, whose look alone would have anyone trembling. I mustered up what little courage and confidence I had and proceeded to hand in this extra work. To my shock, instead of a simple thank you, I received a tongue lashing in front of 40 other students my age because I had handed it in late. I was confused, scared, and in tears. I did not understand - I had the sense to hand in something where others had not, yet I was the one getting the reprimanding. I was angry, more so at myself, being such a "well-equipped and intelligent" individual, I lacked the backbone to stand up for myself, to inform

my teacher that what she was doing was wrong. I had just stood there and had taken it all. It was not because of respect; I did that because I knew nothing of what to do when in a situation of this nature. I had acquired all the skills to be a good student, nothing on how to be a strong, good person. To my snow-balling horror, she further embarrassed me by coming back to the class I was in and demanding the work from the others. This made me feel like a snitch, not something I wanted to be remembered as. After all the drama, my parents became involved in the matter, which further isolated my learning. Again, I was not shown how to deal with the situation in the future, it was just taken care of without me.

Today when I look back on the situation, I do not blame or feel resentment towards the teacher because she may have had reasons for her behaviour, or reasons that fuelled her mood. When I presented myself, I was just the catalyst to ignite this negative memory. I have learned from this, however. I know that in similar situations, I have to learn how to approach it and handle them, no thanks to anyone else, but myself, because I had to learn these skills on my own.

3.12 Auto-biographical writing 2: My Favourite Teacher

During my more easily remembered high school years, one very positive thing stood out for me – my favourite teacher. When I looked back, I remembered those teachers that made a difference in my life, those teachers that bothered to get to know me, those teachers that would not let the system dictate how they taught or even what they taught. One such individual for me was my Biology teacher. It was the interest and enthusiasm she showed in me that sparked my love for Science and that pushed me to pursue a career in Science. This helped me realise I must be the change I want to see.

My Biology teacher was a vibrant, energetic person who was full of life and her smile instantly gave me a sense of relief the very first day I walked into Science class. I instantly knew that I was going to love Science whenever she taught it. She catered for every student, made time to engage with them after class, to ask how they were, to find out more than what the uniform displayed. She motivated us to excel, not just in her class, which I found remarkable...a teacher motivating for excellence in subjects not even her own. During my Grade 11 year (2004), the national Eskom Expo for young scientists had started, and my Biology teacher thought it would be a good idea to talk to us about it and try to motivate us to participate. I volunteered to participate, seeing how Science had become a passion and also knowing I could use the

exposure and opportunity. She worked diligently with me and made the time and effort to perfect my idea. She never thought my idea was too far-fetched or childish, she simply encouraged me. At the provincial level, to be honest, neither participant from our school expected a win, so it was a huge shock when I was selected (with another pupil) to go to the national level, when we won gold at the provincial level. The look of pride and happiness on her face showed me that she was genuine, she was truly excited for what we, as novice Science fair students, had achieved. She proved to us that all our ideas, thoughts and input are sacred, important and just as meaningful as anyone else's.

She was a teacher that always knew when a student was upset and would do what she could to make them smile. She spoke to me like a parent would, treated me with kindness and always let me or any student speak up even if our answers were wrong or questions sounded silly. She made time for me, and I knew I could confide in her on anything. Her character was so warm and so welcoming that I doubt any student had a bad word about her. Her representation of a teacher was so different and yet so mesmerizing.

3.13 Auto-biographical writing 3: A Science Project

During my high school years, doing Biology as an elective subject, I was given a project to complete as part of my assessment mark. The project entailed working in a group of 4 members and required a great deal of planning and stringent adherence to the method – for me, this was a typical Science project. The project was for my group members and I to 'Adopt-A-Spot'. We selected a municipal plot of land (with the relevant permission and authorisation), cleared it up and maintained it.

My team and I located the spot in a communal residential area that was in the same area as my aunt (this made it easier for me as I often had to walk to her house after school to wait for my mother to fetch me) and that posed a pollution, dumping and pest problem. Together with investigative techniques, researching protocols, we questioned the residents, found out what they would prefer and started the process. Before we embarked on this scientific process, our Biology teacher had provided us with a guideline document to follow. We followed the steps of establishing the area, clearing it, and turned it into a vegetable garden for the residents to continue after our project was over.

It was extremely difficult at first. I was a kid, speaking on the phone to an adult working for the local government, trying to explain that I needed land to do Science. At that moment, I thought this was what Science must be, that I was learning and that this would help me after school. Apart from the actual project, my group members and I had to construct a report, a poster or presentation with lots of before and after pictures, which was very new, exciting and fun for us to do. It helped that the project was given to us by my favourite teacher (see Memory Writing 2).

The area was maintained for a while by my aunt and her neighbours, until the municipality cleared it up to make room for a project of their own. Needless to say, the only time I found myself in environmental Science was during an elective module during my BSc program at university, and the Science was more theoretical than hands-on. My group members and I followed scientific protocol in aiding residents of this block of lower income apartments find a solution to an environmental hazard, but prompted by a creative opportunity. For me reflecting on my high school and early university years doing Science, it was clearly up to the interpretation of whoever who standing at the front of the class.

3.14 Exploring my past experiences through creating a self-portrait

In this research, a self-study, I am the focal point of interest. I decided to create a self-portrait drawing, not just as a tool to show people how I viewed myself but as a drawing board for myself, where I could critique my character, my flaws, my imperfections.

Drawing helped me re-live some of my past experiences. Self-portrait, in particular, helped me see myself in different frames. It allowed me to pull away from scrutinising physical features and hone in on my emotional and psychological connections with how I saw myself.

This self-portrait (Figure 3.8) was done as an expression of how I see myself now, in the present. My supervisor, Professor Pithouse-Morgan, suggested I embark on this construct as a way of identifying myself and how I see myself: my self-concept.

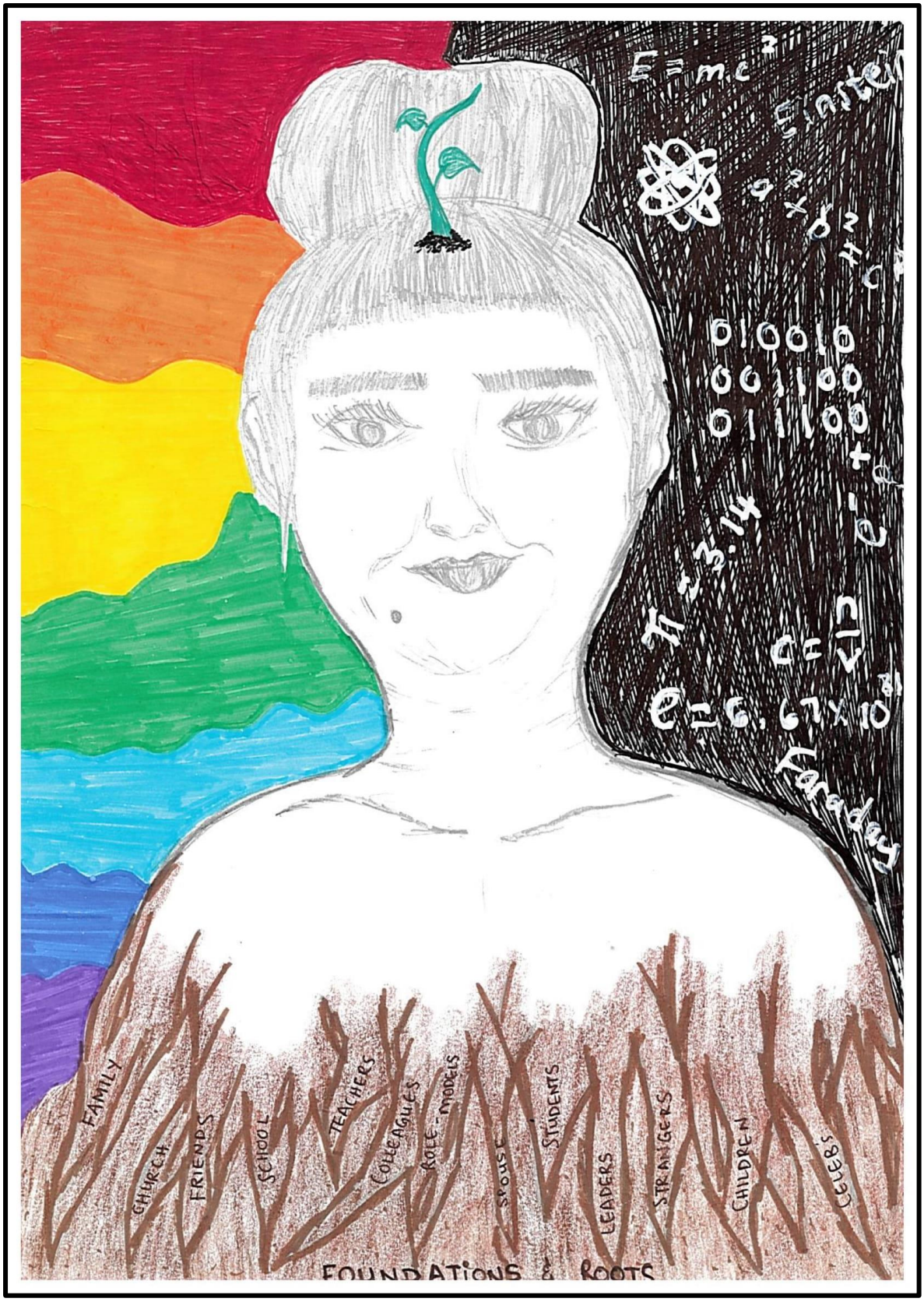


Figure 3.9: My self-portrait: through the looking glass

The start of my self-portrait was very superficial, in the sense that it showed what I think are my physical attributes. As in any self-portrait, the main idea was to show people how you look, how your hair sets, what beauty marks, acne or wrinkles you have, whether you have a large nose or too small eyes. Much of the time, people seek to highlight the perfections and downplay the flaws as an attempt of showcasing what they wish the outside world to see as themselves. I opted to do the opposite, even drawing my mole on my chin that even family members have suggested I get removed, as if it was an imperfection that characterised my existence. The portrait was who I am, flaws and all. All of what I am, I present to the world, to my classroom, to my students. I also decided then to include the metaphysical aspects of my self-concept and self-image. These include where my roots were grounded, and what my personality had to accommodate concerning the split my mind often encountered, i.e., the logical *vs* the creative.

As a teacher, I saw myself as split down the middle. In other words, I saw myself as a strict, by the rule-book, follow-the-curriculum, finish the-curriculum kind of individual. I also saw myself as a nurturer (and wished to be more of this than the former, hence the picture of the plant on my head in my self-portrait); someone who wished to grow and help others to grow in becoming learned, ambitious people. I drew certain aspects like my hair always neatly pulled back, lending to the strict, no-nonsense, regimental type of teacher. I also drew my imperfections (and these are my so-called physical imperfections which are deemed as such by society and family), like my mole and layers of fat and tissue on my neck, showing that I am not at all the perfect teacher.

To me, the perfect teacher embodied all skills and tricks of the trade. They could teach flawlessly (measured by the success rate of their students) and balance all aspects of the teacher roles and responsibilities, engage all duties meticulously and still be ready to motivate the learning generation. This was an idea that was formed in my mind when I started my journey into education. I had heard many renditions of what I was to do, what I would need to have in my classroom, or even how I could teach for better results. I never really thought about what my learners might need instead. When I started teaching, I set off immediately on this plan formulated during my training. But as I grew in the profession, I realised my goal was flawed. In my now open, newly learning eyes, I was not the perfect teacher. Students needed more than the churned-off curriculum or lessons in how to dissect or draw scientifically. As a teacher, my own goal was to nourish the mind of my students, and I felt I was doing little of that.

In teaching and testing Science at school, answers are rarely vague. The monochrome colour choice is because Science is often seen as a ‘yes or no’ kind of subject. Even in teaching laws or theories, there is rarely room for expressive thinking. In testing Science knowledge, not much is left for interpretation, opinions, imagination. A teacher tests the theory that was taught to see if the students ‘understand it’. In my Science lessons, even though I might have expanded the dynamics to include such debate over the theory, the result was that students must still learn the ‘black and white’ of Science knowledge to convince me that they knew the work.

My peers, family and students all played a role as my rooting system. In the world of plant Biology, there are 2 types of root systems. The tap root system as a single penetrating root seeking a source of water. The adventitious root system that is branched and far-reaching, searching for multiple sources of water. I depicted an adventitious root system because I felt that my roots and my foundations all came from different branches and different areas that continued to nurture me.

As for what I wanted to change in my teaching and my classroom, I wished to combine both aspects of my mind and thinking, i.e., both the creative and logical aspects. I wanted to instil both varieties of teaching and learning in my classes.

3.15 Conclusion

Henriksen (2014) explained how teaching and learning that connects the arts and Sciences is essential because historical evidence demonstrates that these connections are already innate for the most effective and innovative STEM practitioners. This is true for teachers who wish to use arts-based techniques as a way of delving into their past. This chapter included an account of my history, including events that have shaped and moulded me into the person I am now. Artefact retrieval, self-portrait drawing, letters and auto-biographical writing were all a source of this historical flashback.

Artefact retrievals are a physical manifestation of our past lived experiences (Allender & Manke, 2004). Artefact retrieval allowed me to relive these past experiences, make sense of them and find the meaning behind them that have helped unravel mysteries of my identity as a teacher. Exploring my past schooling career involved a great deal of memory work, sifting through and reflecting on old photographs, reports and letters. I had trouble sifting through the vast collection as, in my family, anything that aides remembering the past never gets thrown out.

Drawings, like my self-portrait (Figure 3.8) and my Grade 10 art piece (Figure 3.4) that I created, helped me to dig deep into my emotional psyche. My self-portraits helped me forge links with my past, to see how the foundations and roots of my past have helped me grow into the individual I am now. These were tools to help relive history, with experienced and learned eyes now. A new set of eyes helps us make sense of the past contexts of these artefacts, to explain past experiences; in so doing, they evoke feelings and mannerisms which can be used as a framework for our present behaviours. At the time of putting art to canvas, (a student at the time, I encountered a range of feelings and insecurities, which I could later (as a researcher) reflect on. These drawings helped narrate my innate student life through my naïve eyes. It helped me explain the demure attitude I had towards schooling and learning: the character I was being moulded into as a student.

Showing my early schooling artwork to my critical friend and supervisor helped unlock more reflections to help explain my need to alter the typical science education delivery. Samaras and Roberts (2011) agree that the use of critical friends helps to gain insight from an external viewpoint.

The auto-biographical writing and letter writing helped me realise that at a young age, the pressure of the standard educational values and unlocking specific academic achievements had started. I held in my hand the power to disrupt that shift. I *can* promote this holistic approach so that students steer away from the typical notion of STEM subjects.

My past experiences shown a colourful array of memories, good and bad. However, they have all had a significant bearing on my direction in life. They have lifted my eyes to the prospects of holistic education. I could use my past experiences to highlight what I wished to perpetuate in my classroom as a teacher and keep out at the same time. The use of arts-based techniques in my holistic educational classroom can be a fruitful endeavour, I realised, as it allowed me to open up as a student. It allowed me to be more receptive, more adventurous, in my learning, and more in-tune with my individuality.

In Chapter Four, I will provide an account of the data generation lessons that were conducted with my Grade 9 science students. The chapter will explore my second research question, *How can I foster holistic education in my science classroom?* I will unravel this conundrum by presenting and reflecting on carefully holistically constructed lessons about the curriculum.

CHAPTER FOUR: BUILDING MY HOUSE OF STONE AND CLAY

4.1 Introduction

As intriguing and confusing as the title of this chapter may seem, there is method in the madness. “Building my house of stone and clay” was an homage to the fabled story of the three little pigs where each piglet had to construct a house. The stages of each build were further developed until the last pig used a method that was able to provide security to not just himself, but his brothers as well. This analogy seemed very fitting to the parameters of my research. The aim of my self-study research was to seek ways to introduce holistic approaches into the Science classroom, thereby adjusting and accommodating existing teaching practices to become more holistic in nature, in order to ensure the survival of efficient teaching and learning in my science classroom.

In Chapter Three, I addressed my first research question, *How have my past experiences contributed to my interest in holistic education?* This entailed analysing various artefacts and pieces of work I had done during my years as a student and a teacher in order to pin-point the core of my research. Analysing and reflecting on my past helped me understand the different experiences in education I had had, and how I wished to have experienced some things. This chapter helped me understand that Science teaching and learning had become very rote in my classroom, with little room for holistic approaches.

In this chapter, Chapter Four, I look at my research methodology more intensively by addressing my second research question, *How can I foster holistic education in my science classroom?* For this reason, I developed special ‘delivery-altered’ lessons aimed at teaching the content and which showed learning had taken place in a holistic manner. This approach utilised an arts-based technique that initiated the move from STEM to STEAM.

I selected my Grade 9 Science class as my primary subject group, in which various holistically adapted lessons were administered. My subject group comprised 29 students, both male and female, of various racial groups. All lessons were delivered in English and audio-recorded to aid in providing a fair, unbiased and completely wholesome rendition of the adapted lesson.

The use of a reflective journal, pictures, photos were selected as tools for the purpose of dissecting my second research question and providing solutions. All students’ work was completely anonymous, with names blocked out, pseudonyms used and faces blacked out or not included. Students’ work reflected the outcome of these adapted lessons. Photographs of

the context of the classroom was taken and used, as it showed the environment and setting in which learning took place. This helped in linking how learning was affected and influenced by the environment.

In closing this chapter, I included a creation of mine in an arts-based format (collage) that drew on my findings from my students and summed up what I had learnt through holistically-driven lessons done in Science. My work was collectively analysed and critically assessed with the aid of my critical friend (Mrs Ramajatan) and supervisor, Professor Pithouse-Morgan.

4.2 Science lesson 1: "The Night the Lab Exploded" (8 March 2018)

A good story captures; it also has the ability to linger in the mind, as well as excite each time the story is retold (Engel, Lucido and Cook, 2018). These are qualities I wished to achieve in delivering my Science lessons. Story-telling became a tool in my lessons, as I wished to allow students the freedom to create their own learning in Science, with the desired effects I wanted to achieve in teaching Science. As Engel et al. (2018) explain, using a narrative technique (story-telling) speaks to the default setting of thinking, and thus incorporates itself into the natural way of learning. The use of this technique allowed my students to see Science as something in everyday life, just as Engel et al. (2018) proposed using it, to see scientists as 'real people'. However, my first lesson was open to both story-telling and drawing techniques.

The use of drawings in self-study research methodology has been widely used to help shed light on many social issues (Pithouse, 2011). I used drawings as a tool in both my lesson planning and my own research pieces for many reasons, reasons shared by Pithouse (2011). These included using drawing as a technique to reflect on the past in order to recollect, represent and scrutinise many long-forgotten childhood memories. Pithouse (2011) explains how that drawings aided researchers establish some connection with one another on an emotional level, especially as shared experiences meant common grounds. Drawings were also a way to keep track of and record one's present context, in order to fully dissect the dimensions and learn everything we can about ourselves, the environment we find ourselves in and why (Pithouse, 2011). This helps identify the different faces we use in different situations, as well as useful aspects that can be seen in our practices, be it strengths or weaknesses (Pithouse, 2011). Pithouse (2011) added that drawings helped remember details, emotions and substance to the stories we would tell, and that in conjunction with narratives (lesson 1 below), it became less boring and more substantial.

At the start of my lesson, I explained to my students what I would be doing with them in a few of our "different" lessons. I was able to speak to them with simplicity as they understood what a research project was. I explained how I was completing my Masters in education and how I needed their help in accumulating data to support my research. I explained to them what holistic education is, by asking: "How many of you were ever bored with what I taught during our Science lessons?". A lot of hands went up. I asked them why they were bored. Answers included, "…there is always so much information", "I can't relate to anything" and the like, my favourite being, "…it's just not interesting enough". So, I explained that holistic education would attempt to teach the content in a way that appealed to them. A good start would be the first lesson in a series of holistically adapted Science lessons, whereby they (the students) would have to create a story. I explained to them that we were still following the curriculum, but that our method was going to be very innovative. The current topic for the week was chemical reactions. So, using what they knew about the properties of chemical reactions, the volatile nature and the outcomes of chemical reactions, they would have to put that knowledge into a story, entitled "The Night the Lab Exploded". Their story had to include factual renditions of all they learnt in class, together with a method they were most comfortable with, i.e., in the form of a comic strip, a dialogue, or a comprehension passage.

Immediately, many hands went up. My all-time favourite question is when a student asks me if this piece of work is for marks. Especially in a Science class, where, in my opinion, they are conditioned to think that everything they do is something to be tested in, a simple creative piece of work becomes an attempt to get good grades. My answer to that very persistent question was negative. I explained that firstly, they were not obligated to comply with the activity, and secondly, this is not for marks. This activity had more long-term rewards than an "A" on their report card. This activity would help to build a better framework for teaching and learning Science in my Science classroom. They were relieved that this meant no pressure, and that they were allowed to be as creative and open as possible. I proceeded to provide paper to each child and even encouraged them to use as many ideas, colours or methods as possible. At the end of the lesson, I received 4 pieces of work.

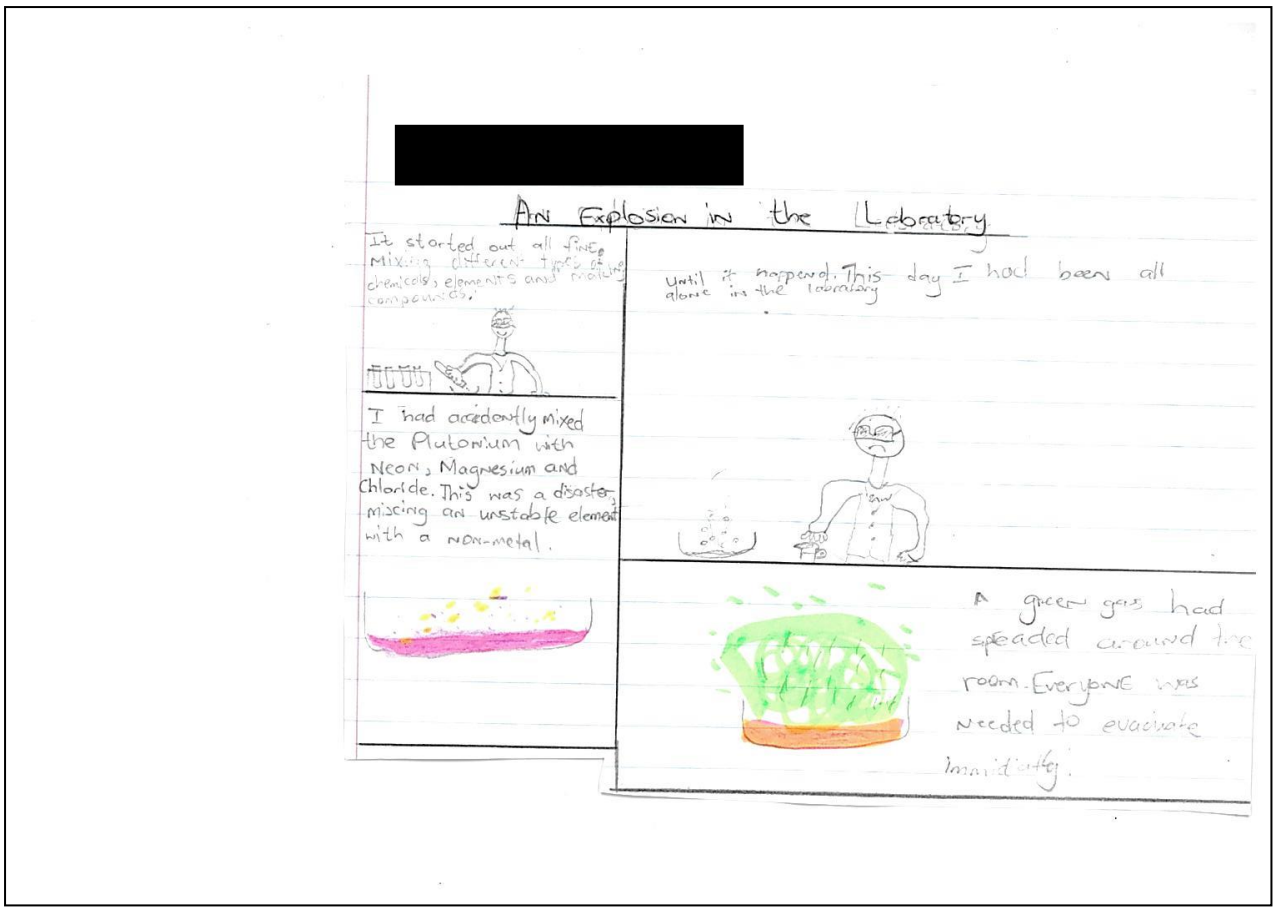


Figure 4.1: The Night the Lab Exploded

The picture in Figure 4.1 was a piece of work handed in from lesson 1. Even though I received 4 pieces from a class of 29, it told me that students already had this sense of "everything I do, is for marks", so by telling them it was not for marks, there was not much enthusiasm in completing the task. The subject, Science, can be viewed as cut-throat, in the sense that learning something that will only score you marks is important. This paid homage to Darwin's proverbial "survival of the fittest" principle. In this case, it was survival of the smartest. I also noticed that even though I encouraged various techniques, the pieces of work were very bland. Three out of the four pieces opted for dialogue/comprehension with no attempt to include a picture. The reason why no drawings were done raised defences like ... "but, I cannot draw ma'am...I'm not good at drawing". I explained that to be creative, you did not have not be an artist; being creative was about expression in any form, even bad ones.

4.3 Journal Entry: Science Lesson 1 (11 March 2018)

It was a hot, noisy day. I had lessons back-to-back so far, and was really not looking forward to another fifty-minute session with the students. A feeling of exhaustion and dread was all I felt. Students bustled in from their previous (English) lesson. I waited for the noise to subside. I stood at the front of the class, eyeballing my noise-makers, until eye contact was made and silence was achieved. I felt very much in control, like a general watching her charges, waiting to give out orders. This was the stance I had always taken. The students quickly settled and greeted, leaving me to start this game of mind control for the lesson. My Grade 9 students were a spirited bunch, having always tested the boundaries of my rules. I had an open policy in my class - if they had a question, they must be able to ask it without fear of consequence; no question was too ridiculous, provided it fell within the learning context of the lesson. I started by explaining what I would be doing and why this particular lesson would be different; it would be the start of my research data collection. My students were a bit confused at first, especially after I told them I would need their help. Their question, "Why would you need our help?" resonated with me, telling me that they viewed me as some expert in my field who would want their help as if they would not be able to offer any valuable or substantial assistance. I found this to be very significant. My students expected me to be a master in my class. They did not think I could use anything they gave me or that it would be worth using.

Reflecting on my first lesson, I thought about how I have contributed to the learned perception of my students to believe things were done and handed in had to be for marks. I sometimes did this unconsciously. By sending these messages, I felt that I had created students that would only take pride in a task, or do something perfectly only if they knew it would count towards a grade and not towards learning. The absence of pictures in their work also spoke volumes of the lack of imagination or failure to unlock that imagination when it comes to STEM subjects. To me, this absence made it seem as if they only knew how to represent information in words. This first lesson served as an eye opener to the problem that is so evident in my classes. Receiving only four pieces of work was also very disheartening initially. There was a sense of failure to effectively explain what I wanted

each of my students to do. However, upon further visitation and reflection, I realised that most students just did not hand in the work because it was not for marks. The idea behind only submitting work in if it was marks gave me the impression that my students would only make an effort if they were being graded. I did not blame them, because I too was guilty of over-emphasising the importance of work for grading. I felt that as a teacher, I placed importance on work only if it meant students gained academically from it, only if it meant a passing grade. In my class, it seemed that learning was only beneficial if they were being assessed on it.

4.4 Science Lesson 2: A Metaphor for Science (22 March 2018)

Knowledge in itself, no matter the format, is a metaphor as it can be depicted in a variety of ways to students (Sanchez-Ruiz, Santos & Jiménez, 2013). The use of metaphors allowed me to explore linguistics in Science with my students, as an art form. Sanchez-Ruiz, Santos and Jiménez (2013) explained how metaphors formed an important aspect of creativity in Science education as it allowed students to become original and demonstrate different and a new affirmation of the content, perpetuating their understanding. It is for this reason that I selected the study of metaphors in Science education as the focal point for the next lesson.

My second lesson followed from my first, with the exception that it was not so technical in nature. The day was far more relaxed. My students were energized, having just come from a physical education lesson. Once again, the bustle of the previous lesson filtered in, as I waited silently at the front for acknowledgement and only proceeded when I found all eyes on me. I asked my students what they thought of English as a subject. Many felt that it was easy enough but student Ash questioned, “Why do I need to know what Shakespeare wrote about?” and “Why must I know about parts of speech and metaphors?”, and my personal favourite, “When will I ever use this information when I finish school?”. I wanted a gauge of how they felt about language before I commenced my second holistically- adapted, arts-based lesson. During the topic of chemical reactions, we spoke of the language of Science, and how it was so important to know the type of language we should use. This got me thinking about what students thought about Science, in terms of language. Could they articulate how they feel about Science into a simple language task?

The metaphor is a language tool or figure of speech used to make a comparison between two things, linking emotion and feeling in your comparison. For example, I could say, “The lady was as beautiful as a rose”. This comparison speaks volumes about what I thought of the lady’s beauty, comparing it to one of the most beautiful flowers known to man. I used this explanation in my class, even though most of them already understood metaphor. The condition was that they had to create a metaphor with regard to Science. They would need to start off by saying, “Science is as...” and fill in the blanks, based on their emotion or what they compared Science to. The task was simple, but allowed students to sum up all emotions tied to science in a single sentence, which was not easy.

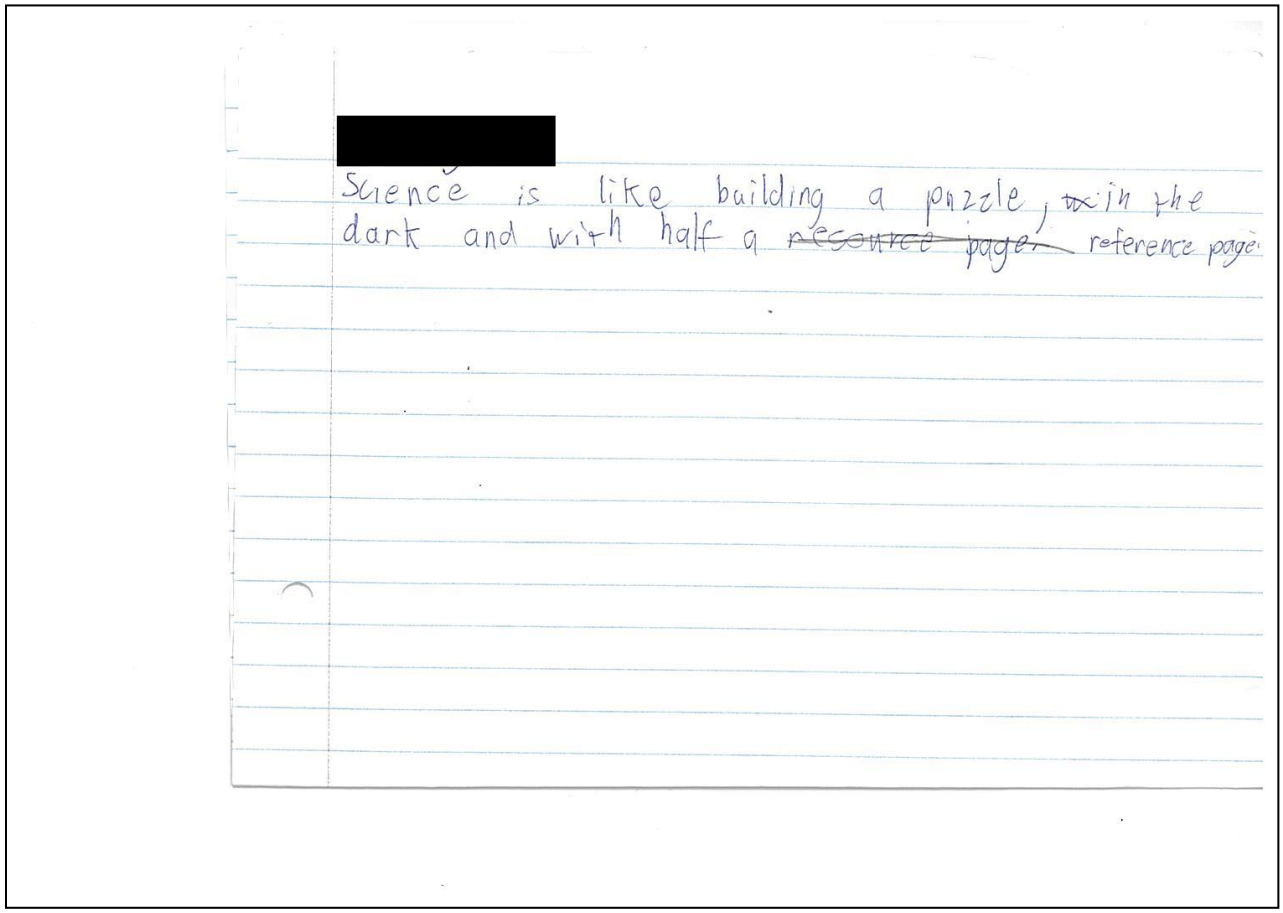


Figure 4.2: A metaphor for Science (I)

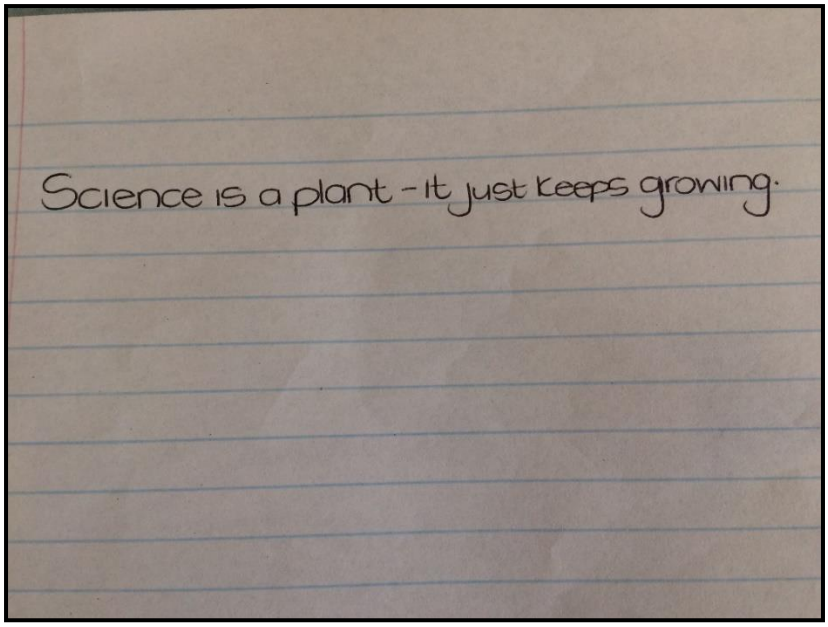


Figure 4.3: A metaphor for Science (II)

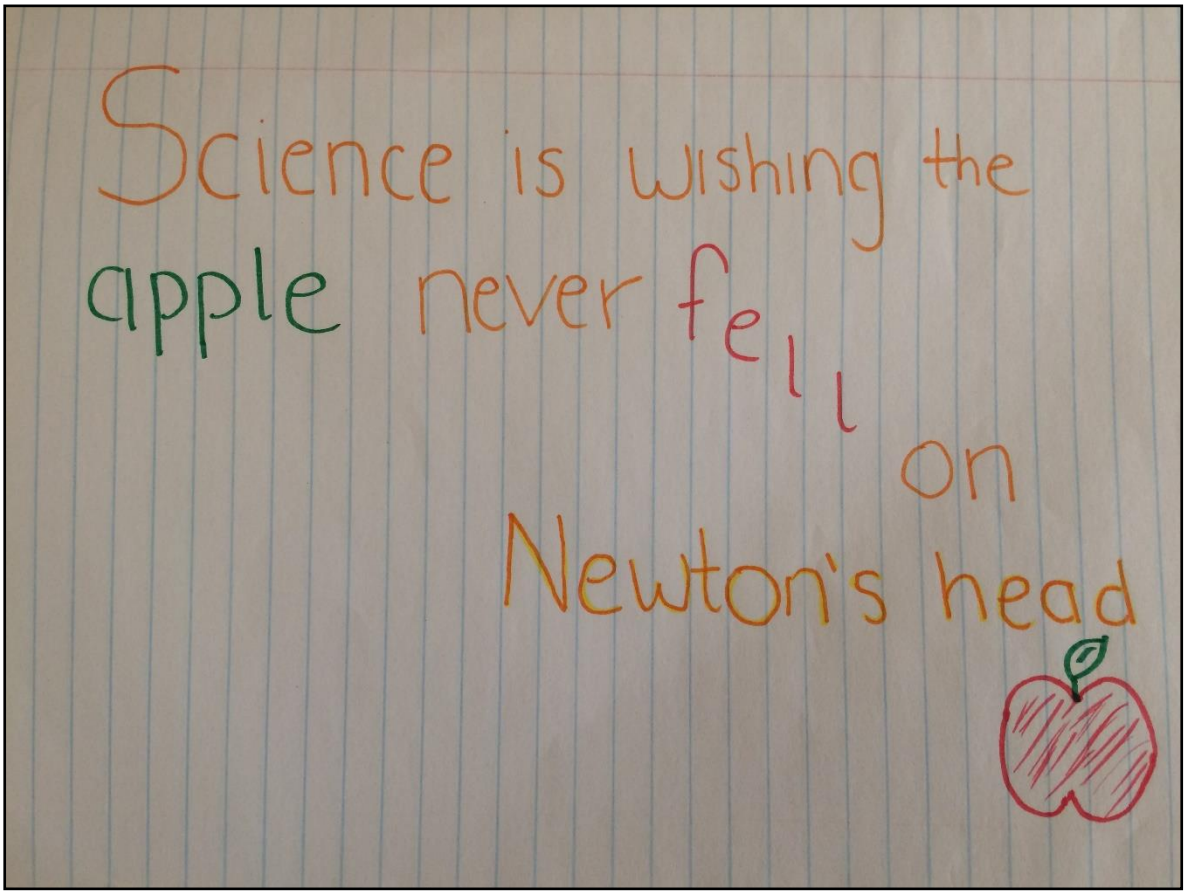


Figure 4.4: A metaphor for Science (III)

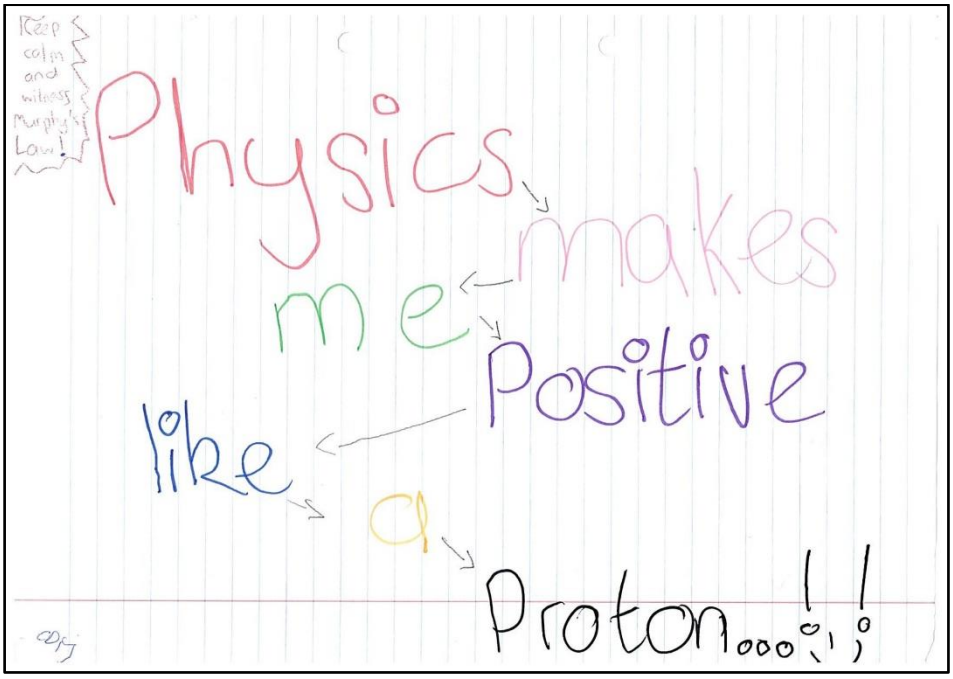


Figure 4.5: A metaphor for science (IV)

The metaphors in the figures above allowed me to gauge what a task the subject was. Science is complicated, it is challenging but it is doable. Figure 4.2 spoke of how Science was like doing a puzzle in the dark with only half the reference page. It showed me that Science and learning Science came with challenges and not very clear instructions as to how to teach or learn it. Building a puzzle in the dark comes with many challenges, whether you are doing it correctly or if the pieces fit. Building a puzzle with only half the reference means you have to find the solution yourself, often guessing if what you are doing will lead you to the correct picture. Many students find it a problem in understanding how to approach the subject. I have constantly had students tell me they just do not get Science, or do not understand after I have done a section of work. Many times, these students expected to grasp the concept immediately, and only after I used multiple ways, drawings, flow charts to explain, did they start to understand the concepts. The student who did the metaphor in Figure 4.3 clearly enjoyed the subject and saw it as one that entailed a life-long, growing experience. Using a metaphor pertaining to nature and growth made me realise that some students saw science as subject that required nurturing. Much like a plant required tending too, with plenty of water, sunlight and nutrients, science education would require adequate amounts of preparation, insight, guidance and innovation. The student who did the metaphor in Figure 4.4 clearly had no wish to expand on it. Figure 4.4 depicts Science as a subject that should probably not have existed, as wishing Isaac Newton never developed his theories of gravity meant he/she would not have had to

engage in learning about them years later. They believe there is only one way of doing it, and if they cannot figure that way, it is over. Sir Isaac Newton was considered one of the founding fathers of Science education. He pioneered many ideas and theories, which has formed the basis of the science curriculum that I have and currently teach today. Simply wishing the apple never fell on his head, implied that his very 'Aha!' moment would never have existed, which would have had a chain reaction in the abandonment of many scientific phenomena we understand today.

4.5 Journal Entry: Science Lesson 2 (25 March 2018)

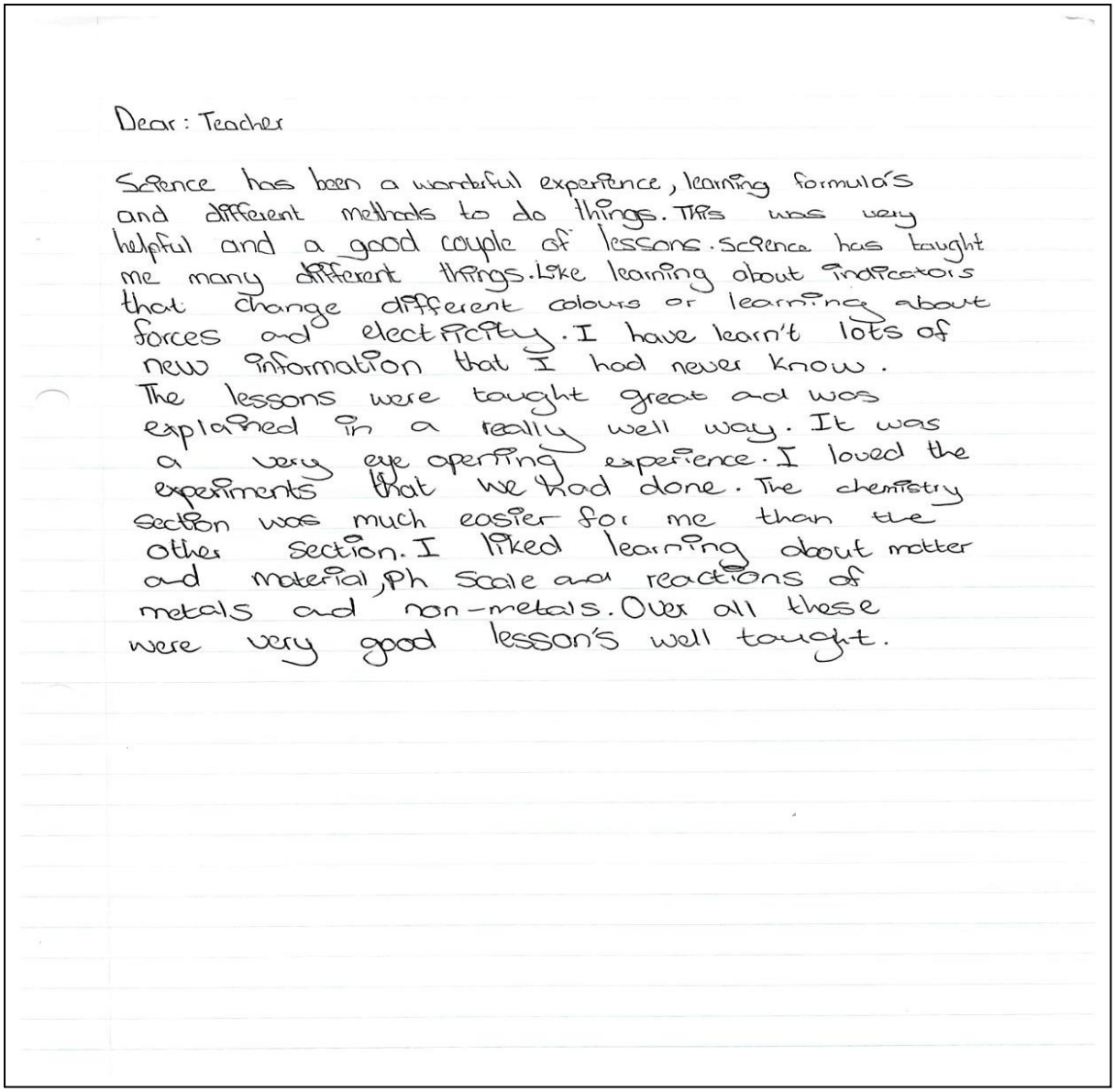
In all honesty, I dreaded doing this particular type of lesson with my research participants. The type of lesson that involved volumes of information waiting to be absorbed by my students. The reason is that I had always heard my students complain quite extensively about how boring and difficult they found the basics and parts of speech in English class, and now they had to hear about it in Science class. They were very surprised to find me talking about metaphors in Science, confused but also eager to see where I was going with this idea. I filtered through the audio recording of this lesson, as well as the other pieces of work, and found that the main issue of comprehension was evident. Students already disliked the subject, so doing a task that stemmed from the learning guidelines of the subject would seem to set me up for failure. Students became detached from understanding how to approach the subject. I found that after I explained the task to them, they actually responded to the idea well and that they knew what I wanted from them. They understood that metaphors were an extension of the English language and that bringing it into another field meant that the use of metaphors invoked a sense of emotion and a spirit of connection between the physical realm and understanding. Methodology and learning techniques pave the way for efficient teaching and learning, and if these are in poor standards, it spells failure for the student. The student's metaphor in Figure 4.2 above summed up the real emotion of what he/she feels sitting in a class, learning Science: LOST. Figure 4.5 gave me hope that there is a positive side to what I was doing.

4.6 Science Lesson 3: A letter to my Teacher (3 May 2018)

In this particular lesson, I asked students to anonymously write a letter to me. I explained to them that this letter needed to sum up how they had felt the adapted lessons were so far, if they were happy or unhappy, what they enjoyed most or least. I asked them to be as honest as possible, with no judgement coming from me. All students were asked to write letters regardless of how they felt. I assured them that all letters (positive or negative) were welcome and that I would use them as a learning curve. Some letters mentioned how difficult or boring the subject was, which I never took personally. I asked them to write the letter as if they were writing to a friend about the subject. I also told them to keep it anonymous if they were afraid of being victimised or coming across as offensive. I had a good relationship with my Science students and asked for their honesty, just as I gave them honesty.

They were very eager to dish out all that they encountered and how they felt about it, what they thought of me as their teacher, and what they loved about science and hated about science. Some students asked if they could take their letters home to complete and bring back the next day, which I allowed.

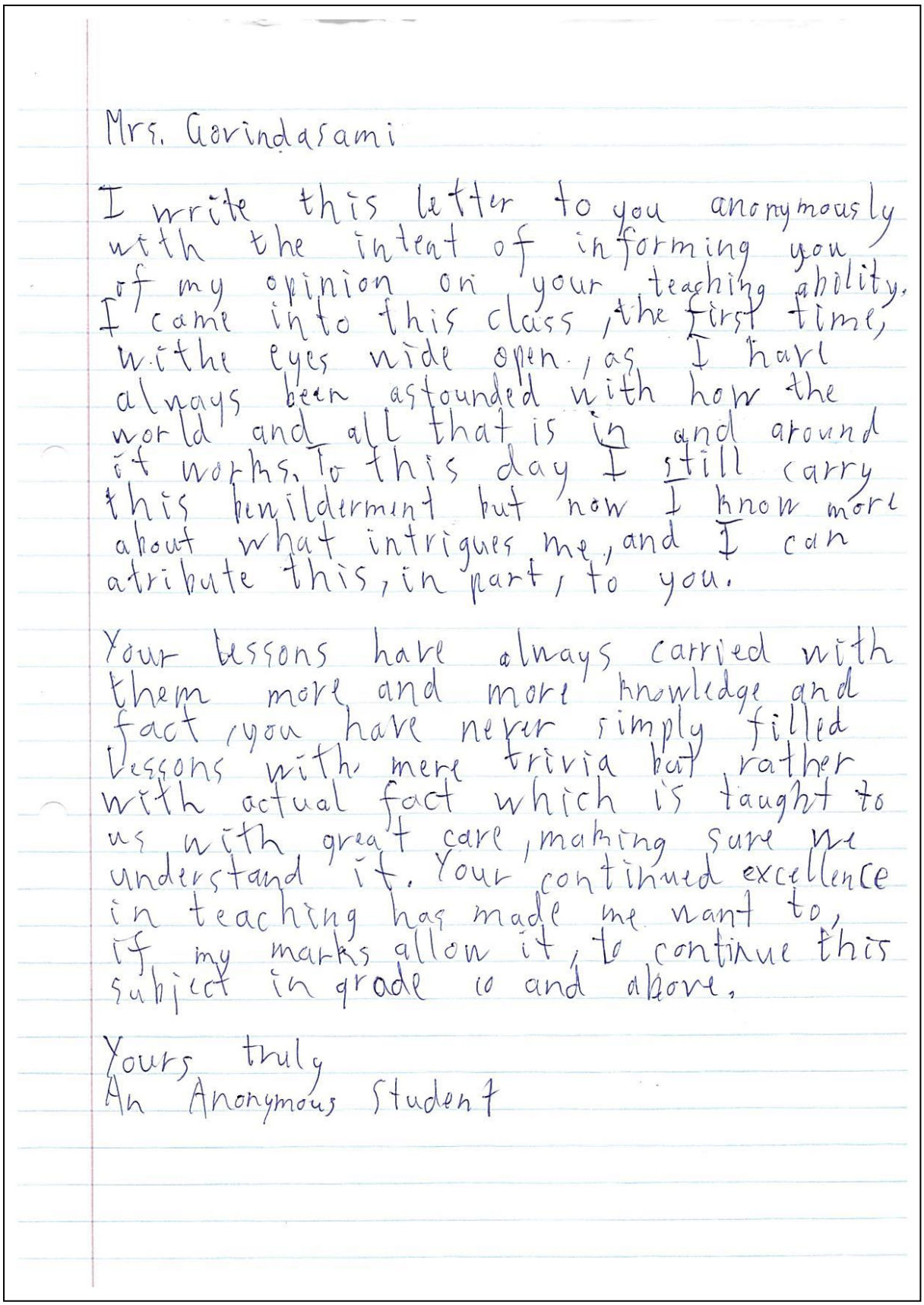
According to Kirkhorn and Airth-Kindree (2010), in their study regarding letter writing in nursing homes, letters have had rehabilitative and emotional healing capabilities. This proves valuable in understanding and building relationships between key individuals in a study. Kirkhorn and Airth-Kindree (2010) also agreed that letter writing can be used to encourage better relationships between participants as well as complete course work, when used as an efficient teaching tool. Letter writing has been used as a qualitative method in self-study research, and allowed for reflective practices whereby participants and researchers re-examined their lived experiences (Pithouse-Morgan et al., 2012). Letter writing was an eye-opening tool, that helped resurface painful memories, as well as serve as a blueprint for fixing such problems from repeating themselves in students (Kirkhorn & Airth-Kindree, 2010; Pithouse-Morgan et al., 2012). I have found letter writing to be a useful tool in unleashing words from the heart, speaking the mind and providing insight into an individual's innermost thoughts, fears and dreams. It has helped me unpack and let loose in instances where my mouth would cease from speaking my mind. In my letters, I had been able to fully pour my soul out and portray myself on a page, which was readable and accessible to all who wish to learn my innermost workings.



Dear : Teacher

Science has been a wonderful experience, learning formulars and different methods to do things. This was very helpful and a good couple of lessons. Science has taught me many different things. Like learning about indicators that change different colours or learning about forces and electricity. I have learn't lots of new information that I had never know. The lessons were taught great and was explained in a really well way. It was a very eye opening experience. I loved the experiments that we had done. The chemistry section was much easier for me than the other section. I liked learning about matter and material, Ph Scale and reactions of metals and non-metals. Over all these were very good lesson's well taught.

Figure 4.6: A letter to my teacher (I)



Mrs. Govindasami

I write this letter to you anonymously with the intent of informing you of my opinion on your teaching ability. I came into this class, the first time, with the eyes wide open, as I have always been astounded with how the world and all that is in and around it works. To this day I still carry this bewilderment but now I know more about what intrigues me, and I can atribute this, in part, to you.

Your lessons have always carried with them more and more knowledge and fact, you have never simply filled lessons with mere trivia but rather with actual fact which is taught to us with great care, making sure we understand it. Your continued excellence in teaching has made me want to, if my marks allow it, to continue this subject in grade 10 and above.

Yours truly
An Anonymous Student

Figure 4.7: A letter to my teacher (II)

Most of the letters highlighted how much my students enjoyed this experience with me, and how they loved the 'practical work' as opposed to the usual mundane lecturing styles. The practical work they spoke of also included curriculum-based experiments and practicals. They made note of my attempts to deviate from the usual techniques of ROTE learning and indicated great appreciation for that, as it did not make Science seem as boring as they thought it would be. The letter in Figure 4.6 started off with an overall positive impression of Science, expanding on how Science had always taught the writer new and wonderful things. There was a sense of open-ness to the parameters of Science education when I read this letter. The writer had a genuine love and interest in the subject. The letter in Figure 4.7 showed great appreciation for my general knowledge trivia as it took the usual mundane atmosphere of Science teaching and allowed them to think about the outside Science rather than the inside one in my classroom. The writer displayed a real enthusiasm in wanting to extend their Science learning in grade 10 (FET phase), giving me a sense of achievement. I felt that this student wanted to pursue an educational career in Science because they enjoyed something that had happened in my class.

The letters my students wrote spoke freely of the lessons we had during the data collection period. It was uninhibited and provided me with a general sense that they had enjoyed those holistically adapted lessons. I also asked my students to include anything in the usual lessons we used to have that came to mind and felt important to mention. Most of my students reassured me that even though they knew I had to teach curriculum, the atmosphere I set in my classroom was one where they knew they could learn exciting things. They spoke of how intimidating and strict I came across at first, and how the more we got to learn about each other, I loosened the rules and allowed my students to be more open and free. They mentioned how they liked the fact that I would constantly check if they understood the content. All the letters I received displayed a general interest in Science, the need for learning such a content-based subject in multiple dimensions, and the desire (in some) to chase the science field because of something positive that happened in a Science class.

4.7 Journal Entry: Science Lesson 3 (6 May 2018)

I remembered explaining to my students that this task of writing a letter was not something that was formal. As soon as they heard 'letter writing', they asked if they needed to be formal, address it someone, have a date…all the requirements of a formal letter writing task. They had thought that this letter was just another English formal task that was going to test their skills in formal letter writing. I felt exhausted explaining it a few times, as they continued questioning the format. So, I told them to try writing it as they would a note to their friend in class during lesson time or simply making a 'Dear Diary' entry at the end of the day. They had to be as informal as they wanted (minding the slang and intense familiarity) and that they needed to write more from the heart and about their feelings during my lessons. I found that they more they understood the etiquette of the type of letter they wanted, the more they unwound and started to relax, pouring everything into their letters. I had letters that spoke of troubled home lives and of how school was their escape. I had letters that spoke of how my class felt very intense sometimes but that I was someone they thought was 'cool'. I enjoyed reading all those letters that spoke from the heart, with no fear of being punished for what they would say or what the teacher make take to offence. It made me reflect back to my diary writing days. I was never one to keep a diary of any sorts, but during my much more difficult high school years of trying to fit in, I would often express my thoughts through a diary. It could have been anything that happened at school, a fight with my sister or even my feelings when my dad was a victim of a hijacking 20 years ago. Just as letter writing broke my front and exposed my true thoughts on paper, it did the same for my students. Letter writing helped me to see my students in a different light. It was a vulnerable, more unyielding light as they wrote freely, uninhabited and unrestricting.

4.8 Grade 8 Extra Lesson Activity (13 April 2018)

As I progressed through the lessons targeted at my research participants, I began to wonder about the implications of these tasks if they were done even earlier. It was for this reason that I decided to do a single, holistically-adapted lesson in my Grade 8 Science class. Permission was sought in the same manner as my research participants and permission slips were handed

out. The lesson that I chose to do was one in scientific method. At the beginning of Science education, we are required to teach the scientific method to students to prepare them for the protocol of doing, recording and discovering Science. This method is often revisited and revised during the course of the year. My adapted lesson for the Grade 8 Science students was on Inquiry. According to CAPS (DBE, 2011), inquiry involves the student becoming the sole researcher and advocate for their knowledge. Through his/her own journey of questioning, investigation and knowledge building, the student will understand scientific phenomena (very little prompting is done by the teacher). What made this lesson more holistic in nature was that it firstly went against my usual proceedings in a Science classroom. I allowed group work, I encouraged discussions; I urged students to facilitate and discover the knowledge themselves. What made it more holistic was that the students had to formulate their own theories, use their imagination, and creativity to eventually come up with a viable answer.

The lesson that involved inquiry was one that was inspired by my Life Science Module Lecturer (Dr Joy Coleman) during my Post Graduate Certificate of Education (PGCE) course in 2012 at university. I started the lesson by explaining that we would need nothing but our wits and scientific ability to deduce, investigate and question; so, all books were put away. I then explained how we have come to learn all the scientific phenomena that had been prescribed to us in the curriculum document. I explained that years ago when people wanted to find out why things worked the way they do or behaved the way they do, they would investigate, question and formulate ideas. I further explained that we would be using these methods to see where our power of inquiry was. I separated the class into groups and handed each group an envelope with pieces of paper cut up inside (the students did not know that the pieces formed an image of a skeleton of a sabre tooth tiger from a prehistoric period and that they would have to try to figure it out before the activity ended). I gave them a scenario and mindfully transported them to the scene. They were budding scientists; a group of hand-picked scientists sent to uncover useful fossils and categorize them. At the end of each day, they would discover one or two ‘bones’ (pieces of paper from the envelope) and had to make deductions as to what type of animal these fossilized bones belonged. Each deduction had needed reasoning and each discovery changed depending on what they discovered at each round. By the end of round 4, most groups eventually streamlined into the same category and by the next round, had figured out the animal. Some groups were unfortunate in pulling out small bones (feet, pieces of the spine, etc.), so they found it a longer route to self-discovery. I ended the activity by giving them

some additional information about the sabre-tooth tiger and showing them reconstructed images from fossils.

4.9 Journal Entry: Grade 8 Lesson (17 April 2018)

I looked at my Grade 8 Science students and saw hope. I thought of hope that these students have that may re-ignite the embers that fire up a love of Science in their hearts, maybe not only Science, but a love of education, of being learned individuals, of becoming holistic beings. I remembered my Grade 8 year. I was new to my high school, being the only transfer from a new area. I had no familiar faces to work with and all my Grade 8 comrades had siblings in school that paved their popularity with teachers. My sister was in Grade 11 when I started Grade 8, but she was a soft soul and would hardly ever announce her presence. So, it was up to me to herald my arrival. How? I got deep into academics. I did what teachers wanted in class without ever really questioning the thinking or wondering why we had to learn certain things in a certain way. It was only in my Grade 10 year, after meeting my Biology (present day Life Sciences) teacher that my inquisitive nature returned. She made us bring spoons to class for a lesson one day and using the concave and convex nature of spoons, asked us to explain what we saw when we looked at this sides. She prompted the idea and let us learn about optical phenomena of light all on our own.

I thought about this when I finished my lesson with my Grade 8 students. I wanted them to discover Science on their own with the same feeling I had 18 years ago...like I was the first to discover this phenomenon, like I was the person who knew all about it because it was my discovery. Finding and being able to explain something on your own rather than reading about it in a book gave me more satisfaction than seeing the mundane, system generated 'A' symbol on my report. I learnt something on my own with no teacher telling this is what it was and it was right. My Grade 8 students showed extreme excitement at the thought of putting their books away. It made me realise that they too craved the escape from the mundane method of soaking up book knowledge. Even when they were transported to the tar pits in San Diego to study fossils (this was their background cue), they looked enthusiastic and excited to be the scientist, to be the ones discovering fossils, unravelling history. It helped me realise that I have often forgotten that Science in my class was also in

dire need of imagination and impromptu lessons that switched the roles around. I was merely a suggestive voice and they were the discoverers.

4.10 All adventures begin with a quest!

I have been in the education sector since 2010, having fallen into the profession by accident and as a means to an end. However, the more time I spent in the profession, the less I found myself looking for another route. My journey started in teaching and would end here as well. In my years of teaching, learning, observing and growing, I have found that students (and teachers) have developed a series of characteristics or even a personality that equipped itself to the Science subject. I found that even teachers would drum up science to be dedicated, disciplined, difficult...I even found myself jumping on the same band wagon. I asked one of my students in my study group (a student I knew had no problem unleashing his artistic side) to draw Science for me as if it were a person. Needless to say, his rendition was nothing like what I expected.

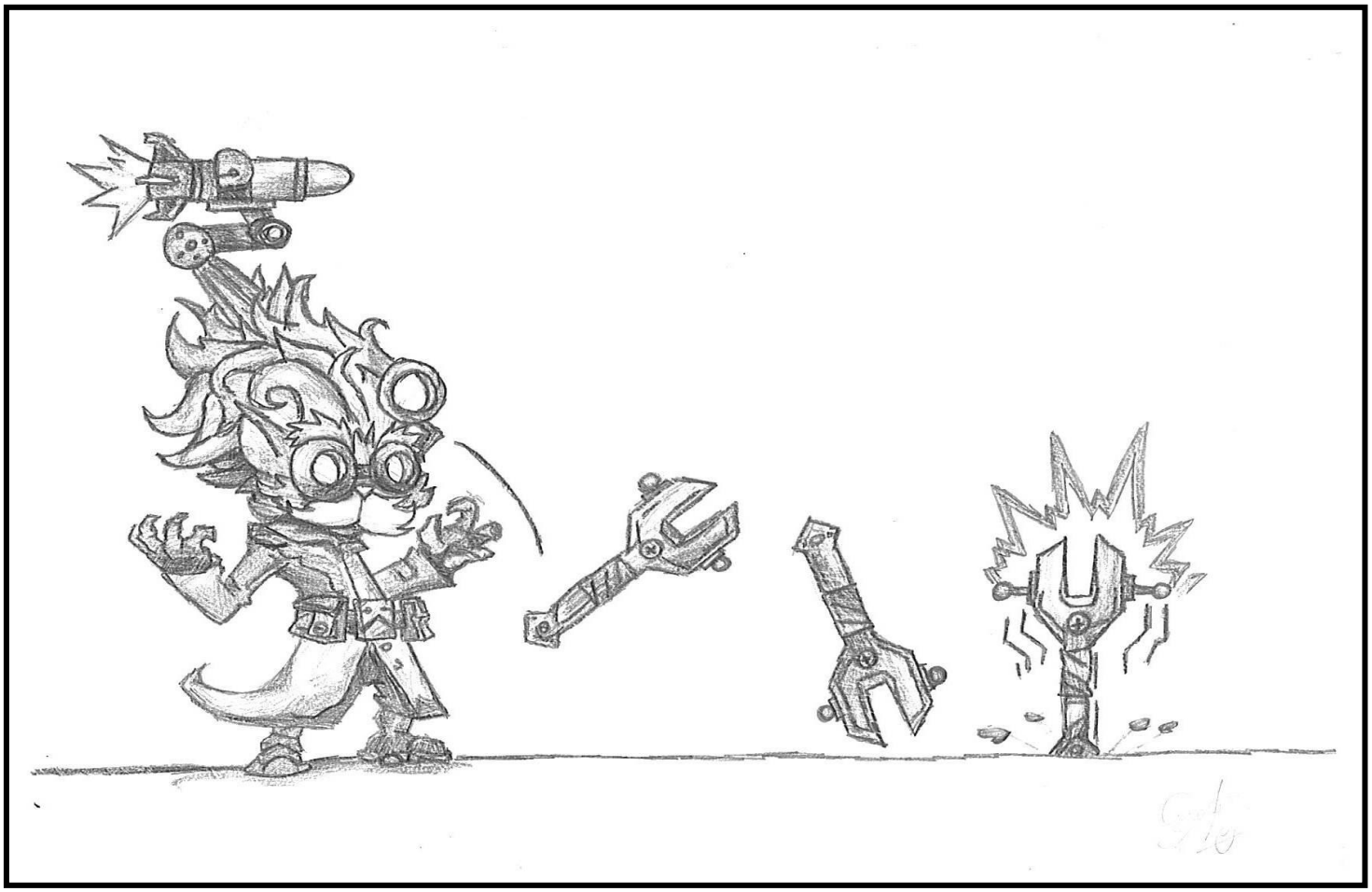


Figure 4.8: Student "D's" idea of how Science would look to him, if it were a person

I sat down with student “D” on the 16th of August after class time. The class had just ended and students were exiting. There was a lot of noise and hype in the classroom and it signalled the end of a Science lesson and the start of a well-deserved lunch break. Firstly, student “D” explained how much fun he had drawing his idea of a Science teacher. He explained it was challenging at first as he did not know where to start. However, with help from a friend and much brain-storming, he decided on a starting point. He explained the first thing you notice is the crazy hair...”it reminds me of a crazy, mad scientist…but the fun kind...not the world domination type”. I drew his attention to his hands. “Why do you think you drew his hands like that?” “It fits with the theme...he is crazy...think of when Dr Frankenstein created his monster...the joy he had at his creation...he held such power in those very hands”.

It led me to understand that student “D” like many of his fellow students, held Science teachers as responsible for creation...creation of knowledge, inventions, science, discovery...we are meant to be the crazy teachers responsible for stretching the boundaries until their elasticity gives way and a wave of “cool, sciency stuff” comes gushing out. It made me think about what my idea of my Science teacher or what I envisioned a Science teacher to be about. I reflected on my Science learning days in high school. From Grade 10 to 12 (2003-2005), I had the same Science teacher. My rendition followed suit and was modelled on my Science teacher, as when I pictured how Science would be embodied, he came to mind. It was uncanny that when I envisioned Science as a person, my Science teacher came to mind.

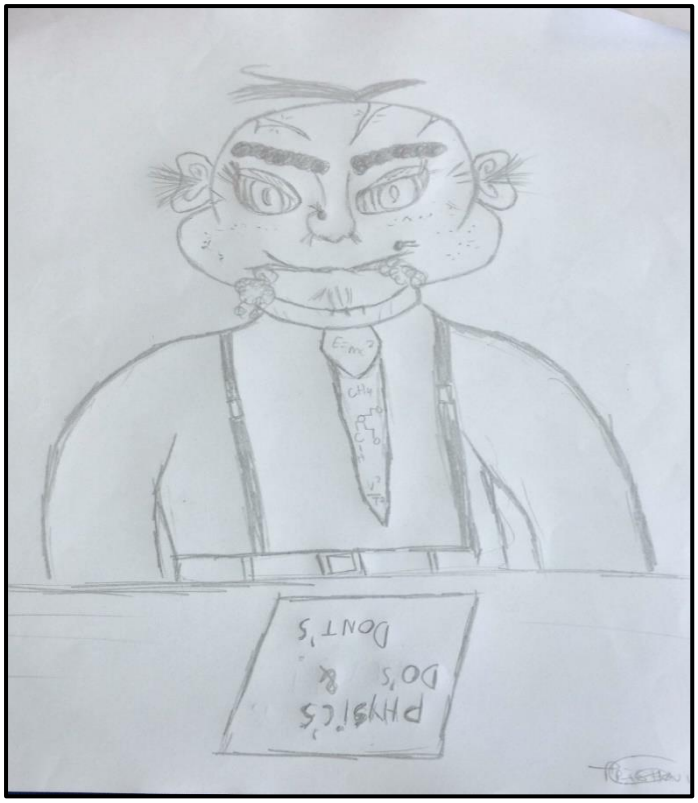


Figure 4.9: How my Science teacher looked to me

I remembered meeting my high school Science teacher for the first time in Grade 10 and thinking... “Oh no, I am definitely going to fail!” Three years later and with an A in my matric year for Physical Sciences, this was not the case. His method of teaching grew on me and it fit into my method of learning Science. My initial statement of my impending doom in Science was due to the visual I had in front of me. “Mr P” was anything but nice. Even before he spoke, we knew he would be mean. He would dish out one liners to us that would make our grandmothers ears go red, just for simply whispering. He had hair sticking out everywhere and his outdated apparel helped little in determining just how old he was. He was always muttering to himself, walking alone to the office, the classroom...almost like he was bargaining with some spectre to grant him more years to torture his charges. He would snap at the thought of a stupid question. I recall the one memory of him doing a practical in class, something that was new and exciting for us. He misjudged quantities and added more of one solution causing the entire block of classroom to reek of rotten eggs. That was when I learnt the distinct smell of a chemical called Hydrogen Sulphide. As we spent more time with Mr P, we learnt a great deal from him. His hard, no nonsense exterior was a result of family tragedy that saw him lose his wife and both daughters. By the end of my Grade 12 year, the Science teacher I first saw in 2003 became a master of Life Lessons to me. I would not have changed him for anything...not

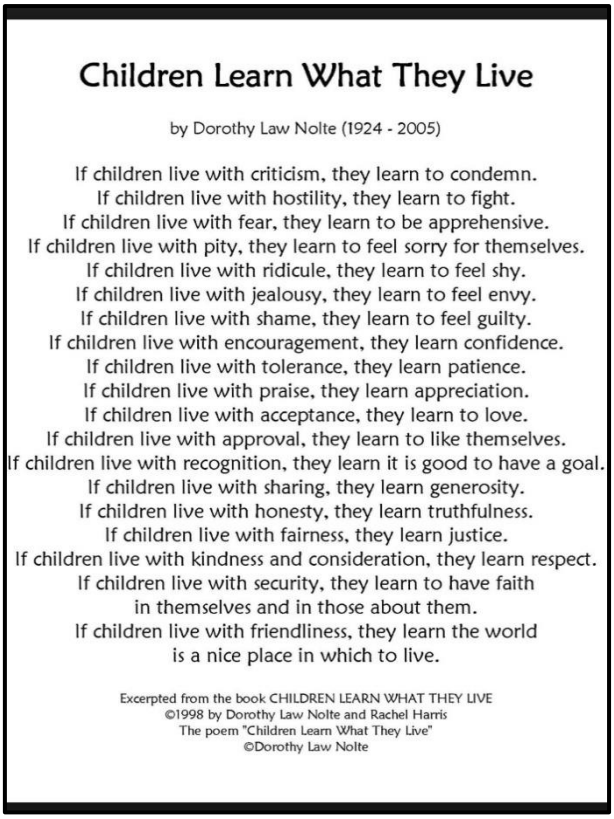
even the much younger Science teacher next door that seemed to have all the attention. My Science teacher was learned, witty, experienced and full of life.

I chose drawing as an arts-based technique that integrated history into my making. Drawings are time consuming, demanding attention for detail, a finer tune, and a lot of thought, especially when it is meant to excite a memory or tell a story (Knight, Bone, Cumming, Peterken & Ridgway, 2015). Drawings can aid in understanding content, as well as initiate the thought of ideas and concepts not necessarily clear at the beginning (Knight et al., 2015). As reiterated by Pithouse (2011), drawings also allow reflection and reminiscence of the past with older, wiser, renewed vision.

On reflection upon my student's drawing and my own, I vowed to be the teacher that had more to offer, had more to teach than what was expected in the curriculum. Hence, the journey started of how I had taken science and tried to change the way students saw it, changed the way they learnt, that made it more holistic, more receptive and less indoctrinating than it was led to believe. I began the journey with a quest. A quest to find a way of fostering holistic education in a Science classroom, eventually ending in a journey of self-discovery. I continued this chapter documenting how each of my targeted lessons were holistically delivered, the outcomes of such tasks, and the reflections after each lesson.

4.11 Making sense of the journey

The poem by Dorothy Law Nolte, "Children Learn What They Live" speaks volumes about the way we should guide children so they develop skills and characteristics not generally taught in a classroom. In her poem, Dorothy Law Nolte (1972) says, "If children live with fear, they learn to be apprehensive" (p.1). This made me reminisce about how fearful learning Science was. We had strict teachers, and currently, we have perpetuated those parameters into our classrooms. Science was to be feared. Even now, students have a fear for the intensity, difficulty or content of the subject. In being afraid, they become reluctant and apprehensive to explore anything outside their comfort zone.



Children Learn What They Live

by Dorothy Law Nolte (1924 - 2005)

If children live with criticism, they learn to condemn.
If children live with hostility, they learn to fight.
If children live with fear, they learn to be apprehensive.
If children live with pity, they learn to feel sorry for themselves.
If children live with ridicule, they learn to feel shy.
If children live with jealousy, they learn to feel envy.
If children live with shame, they learn to feel guilty.
If children live with encouragement, they learn confidence.
If children live with tolerance, they learn patience.
If children live with praise, they learn appreciation.
If children live with acceptance, they learn to love.
If children live with approval, they learn to like themselves.
If children live with recognition, they learn it is good to have a goal.
If children live with sharing, they learn generosity.
If children live with honesty, they learn truthfulness.
If children live with fairness, they learn justice.
If children live with kindness and consideration, they learn respect.
If children live with security, they learn to have faith
in themselves and in those about them.
If children live with friendliness, they learn the world
is a nice place in which to live.

Excerpted from the book CHILDREN LEARN WHAT THEY LIVE
©1998 by Dorothy Law Nolte and Rachel Harris
The poem "Children Learn What They Live"
©Dorothy Law Nolte

Figure 4.10: A poem by Dorothy Law Nolte

"Children Learn What They Live" (1972)

Reflecting on this poem, I have realized how formal I had operated my classroom. I had sought to create a 'family' environment in my classroom. It was a challenge, with students of different backgrounds, cultures, family and social dynamics. Teaching in a Science class with this mix of contexts was difficult in terms of finding a balancing board to stand on and accomplish holistic approaches to Science teaching. However, holistic education encompassed all those differences and more and making it work together by finding commonality. I needed to teach tolerance, acceptance, kindness, show compassion, fairness, exhibit security, friendliness and all this while catering for Science education taught in a new age, with more arts-based techniques, more linguistic approaches, more musical derivatives that allowed my students to break free of the fear of Science education.

4.12 Newton drop's a beat

During a lesson with my Grade 11 Physical Science students, I realised how boring the lesson had become by the sheer atmosphere of the classroom. It was a hot day and my students had come in bright-eyed and bushy tailed but that had quickly dissipated once I started on Newton's

Laws. Students were already tuned out from the moment I lilted on about Newton, his theories and work, and most importantly, his laws that they had to know. I saw the shutters had started to draw close, the mind tuckered out and they had reached a state of "I'm not sleeping, ma'am" and "What time does the bell ring?". So, I did what I set out to accomplish according to my teaching plan and set aside activities for them to practice applying Newton's Laws, while I searched for alternative ways to enrich my lesson.

Enter Google

During my collective processes, where I would scan the internet for inspiration about how it felt to teach Science, I came across the following poem called Newton's Law by Nandita Das (2017). As I found myself reading it, I thought about how Science (of learning about Science) has taken on so many art forms. I was inspired to try my hand at poetry, given the current boredom dilemma in my Grade 11 Physical Science class that had unfolded. Below is the poem by Nandita Das entitled 'Newton's Law', followed by my own poem, entitled ''Tick Tock'.

Newton's Law

I was inattentive in Science class one day
When the teacher at random looked my way I didn't look up, I wouldn't dare
There's no escaping that intense glare.
Asked me to explain to the class
Newton's Law of Gravity and mass My mind was a blank, heartbeats louder For an answer I started to flounder.
I stood before the class trembling with fear "Gravity" I said...and then oh dear!!! I fell off the stage on to the floor
How the class with laughter did roar.
The children tittered in great amusement
They didn't know my sad predicament
The teacher saidt "You've demonstrated gravity" "Although you did it with much levity".
At length I returned to my seat
With many applause did they greet
Now I look back upon this and ponder
I decide to listen and not let my mind wander.

Figure 4.11: Poem by Nandita Das "Newton's Law" (2017)

Tick Tock

Tick tock, tick tock
I see you watch the clock
You're breathing slow
Your head is droopy
I see your eyelids shut

I stand in front
Trying not to be blunt
Your focus needs to sharpen
My words are aged and wisdom pouring
Please listen to my warning

I know it's boring, it's way too much
It's the mind I wish to touch

Tick tock, tick tock
I see you watch the clock
The lesson's end
I hope you've learnt
Science can be your friend

Figure 4.12: Poem by Trisha Govindasami "Tick Tock" (year)

4.13 Unpacking the poetry

As I read Nandita Das's poem, Newton's Law, I found a sense of shared sense of commonality in both my experiences as a high school student and a present-day teacher. I remembered how sometimes in my own Physical Science lessons, I had initially found certain content confusing and draining. This emotion rose to the surface when I saw my students' faces when I tried teaching this particular section on Newton's Laws to them. Das exposed the very face of a student who was not paying attention or was distracted or was confused. I had seen these mirrored glances and awkward faces in my class before.

Lines 2 and 3, “When the teacher at random looked my way I didn’t look up, I wouldn’t dare
There’s no escaping that intense glare” ...reminded me of the very same demeanour my students would undertake especially when I started quizzing them about the previous work and started asking questions to invoke some degree of inquiry. My students felt that no eye contact meant no chance of being the lucky recipient to my questioning. Even the “mind was a blank” response to a question was crucial to my work as a teacher and a researcher. I had always received this response when I asked students why questions in a paper was left out or unanswered. It speaks of the shock to the system that renders the mind completely clean. At university during my PGCE course, we often heard the term *‘tabula rasa’* meaning *blank slate*, with the connotation being that there was an assumption that children were compared to a blank slate in terms of their learning and that we, as teachers, were expected to inscribe upon the said slate. However, the blankness here does not speak of an anticipation of waiting to be filled in and loaded with information, but rather the draining of all information, rendering nothing to reflect.

Das’s use of wit in changing the lesson in her poem from a typical science lecture to a learning experience which would have caused students to remember better was very useful. It helped me in understanding that sometimes, a lesson does not have to have a rigid format with planned questions and time limits. A plan is also useful for when things start to change, but a lesson should focus on achieving learning and understanding, regardless the methodology.

Not only did the student in the poem learn about the crux of the lesson (Newton’s Law), but they also came to a realisation that they ought to pay attention instead of allowing the mind to wander. One of the goals of every teacher’s lesson to have students focused and fully attentive to the lesson. This was seldom achieved in my class, especially with content that is difficult to excite. However, altering my lesson to accommodate the interest of the students may yield a realisation within themselves to motivate themselves to fully capture the lesson.

When I sat down and penned my poem, I used what I saw in front of me as inspiration...my students. Not only did I use my students, but I used the emotion and dynamics of my class during the lesson that they found themselves lost in. I looked to their faces and body language for context and inspiration. My poem spoke of how time seemed to become non-existent or even obsolete when students were in my Science class. They constantly stared at the clock wishing the hands would move faster, wishing for the lesson to end. The need for the lesson to

end had always been significant, for me, of wanting a bad experience to be over and done with as soon as possible. I have yearned to get my message across, to ensure learning takes place but sometimes it had proven fruitless when students became dulled by the sheer force of content they are expected to know. The idea I had was to try to incorporate another art form into Science that helped make learning science fun and productive. My students remembered things that evoked a sense of fun, joy and so melding that with science would mean they remembered the content as well. Like Donald and Barker (2016), an alliance between Science writing and poetry was sought to better fulfil Science education teaching and learning. Donald and Barker (2016) revealed how it was common practice and widely accepted to identify Science and poetry as two opposite ends of the teaching and learning spectrum. However, recent advancements in curriculum development have suggested that a coalition between these two disciplines in education is needed so that can science teachers yield fruitful combined effects in teaching and learning (Donald & Barker, 2016).

Donald and Barker (2016) used a quote from Richard Holmes's book, "The Age of Wonder":

> The old rigid debates and boundaries—science versus religion, science versus the arts, science versus traditional ethics—are no longer enough. We should be impatient with them. We need a wider, more generous, more imaginative perspective. Above all, perhaps, we need the three things that a science culture can sustain: the sense of individual wonder, the power of hope, and the vivid but questing belief in a future for the globe". (2011, p. 469)

This has the implication that there had been an educational rift between Science and all other domains that are rooted in ideologies and practices outside scientific explanations and/or phenomena. However, this battle for superiority within the faculty of education and hierarchical challenge of the subjects fell on a lack of substance, as there was no subject better equipped to fulfil our teaching and learning, but instead a conglomerate of subjects that lend to each other aspects to improve the common focus.

According to Furman (2014), poetry had become a valuable means of initiating inquiry in lessons. In terms of research, poetry had aided in providing substantial density in understanding data, and presenting it in profound and significant approaches (Furman, 2014).

4.14 Consolidating my research

As I sat back in my teacher chair and listened to the school grass in the corridor below being cut, I reflected over the weeks' collection of data, and the assimilation of such content. I asked myself if there was a definite answer to my research probe. Unlike Science education, all problems and conundrums of the universe had definite answers, or at least theories to such definite answers. Holistic education, true to its fluid nature, had multiple derivatives, methods and possible answers, each with its own outcome, still making it 'right'. I opted for a drawing methodology as I found that most of my exercises to my participants required some sort of an arts-based technique, specifically metaphoric drawing. In Pithouse (2011), metaphoric or symbolic drawing was identified as one of the types of drawings self-study researchers may engage in under arts-based techniques. It is the use of symbols or metaphors to depict an important experience or to tell a story (Pithouse, 2011). I found that reflecting on such a type of drawing was important as it helped me to make sense and unpack the metaphor in relation to the message being conveyed.

Figure 4.13: My Vitruvian figure of a metaphorical drawing

My initial blueprint of my metaphoric drawing centered on a piece of art by Leonardo da Vinci. Leonardo da Vinci was a Renaissance man. A renaissance man is collectively known as one that has an interest and seeks to gain knowledge or skill set in various fields. Leonardo da Vinci was one such man whose interests resided in art, drawing, sculpting, architecture, science, music, engineering…to name just a few. His work of art, "The Vitruvian Man", done in 1490, spoke of the perfect proportions of the human body, with complete measurements and proportionality ratios. This spoke of the idea of 'perfection' into something scientifically and biology constructed. My rendition of "The Vitruvian Man" had a take on the current and some

past artefacts that have helped shape me as a student, teacher and researcher, as well as, aspects that I believed held value in the growth and nurturing of today's students and where our current schooling interfaces were headed.

My Vitruvian Man is one that is clothed. The reason behind clothing him was not due to modesty but merely in keeping with educational trends. In my opinion, there had been many fundamental areas of interest in science education that were 'challenging', like the teaching of evolution in classrooms. Certain topics, such as evolution taught in Grade 12, can become conflicting topics to teach, given the sociocultural contexts of schools. Not every family or society or community wants specific topics taught or their children exposed to such issues as they go against some of their beliefs and teachings. This was the case when I taught at School A. Many school role players believe this went against a natural and/or ethical stance and had therefore become obsolete and removed from the curriculum. The trend in siphoning 'good' content was fast spreading, yielding shielded individuals.

My metaphoric drawing also depicted a female persona. Being a female teacher and a woman in science who has had roots in science education and has dedicated most of my school and tertiary learning to the fundamentals of Science, I took this as an opportunity to depict that Science itself does not have a gender. Often times, in my Science lessons when we discuss and learn about the physicists, chemists and scientists, they are mostly men. My Vitruvian figure has features that indicated a female aura. She has hair cascading to her upper torso, and feminine features are showcased in her eyes and mouth. This was an endeavour to tap into the productive capacity of the feminine. By implication, this female figure represents the abundant power to; improve learner confidence, work towards a more learner-centred approach, and centre the learner as a human being with all complexities, thus generating a humanistic approach to Science. The image shows my desire to use Science to nurture the learner's mind, body, and soul. I dreamed of catering to diverse learning styles by leveraging affordances of artistic problem-solving and, expressing Science content differently to achieve meaningful learning.

The other aspect of my metaphoric drawing was the rule book at the bottom. This was something that I had learnt, that you followed the rules and the guidelines and do what was being told to do. I have been guilty of trying to impose my learning styles by telling my students this very structured instruction. This was something I had fallen victim to in my own learning

and thus perpetuated the cycle by doing it in my classroom. The fact that the Vitruvian figure is standing on the rule book indicated a triumphant attitude in seeking to establish a newer, more holistic method.

My metaphoric drawing also had vines sprouting from the Vitruvian figure. Vines are something that is living, and that is continually reaching for life-giving force. Botanically speaking, vines in nature will continue to move and creep forward or towards a light source (being the sun), which is a key ingredient in making food and keeping a plant alive. I used vines to depict that we need to seek life-searching and life-giving ways to teach and learn in order for educational sustenance. Vines flowered from 'learning fulfilled' to 'students fulfilled' on the collage meant that our teaching must be enriching to the soul of the student as well.

In my drawing, the Vitruvian figure was shown reaching for hands from either side, that is, one reaching for the past and one hand to the future, with the Vitruvian figure as the bridge between the two phases. On one end is Education BC. BC historically meant Before Christ and was used to depict events dated in the past. BC in my drawing means Before Change. This meant before the change of curriculum and before new theories and ideologies to teaching curriculum came about. On the other end is the future, that is, Education AI. AI means Artificial Intelligence and is closely associated with futuristic advancements. Here it means After Inception. Inception is the establishment or starting points of an institution, or something that begins its course or existence. This inception is the idea of initiating a new age approach to teaching Science, a holistic approach.

The Vitruvian figure is depicted in a transition stage between our earthly realm and our celestial realm, in the sense where that at the center of my diagram and the fact that learning Science holistically allows us a better understanding of the universe and helps us to bridge these gaps between what we know here and what we want to find out…the knowledge we wish to seek.

The original Vitruvian Man was done on old paper that was dull and composed of a lot of side notes. My drawing was composed of a lot of colour, minimal writing and more images. For me, colour brings my attention, gives me the idea that it is meant for something lively, something that wants to come alive: you would want to engage in it and participate in it.

My drawing was also composed of a lot of new age and new world trends. My Vitruvian figure had markings and tattoos. These are trends that we encounter in our education, the kinds of students we have and the student we were at school, all these are not the same. We encounter a mass of cultural trends in schools today. The growth and melding of all this help to bridge that gap between the past and the future. It is that bridge that we try to place between the two that must be built and engineered with holistic approaches that incorporate all those aspects that are forever growing, always changing and inevitably expanding.

Pithouse (2011) explains how drawings help illuminate all facets of ourselves, even parts we wish were hidden, and that drawings bring them to light with the aim of acceptance and understanding. Participating in this arts-based approach for my metaphorical drawing allowed me to unpack and look at my practices. It helped me reflect and look at possible outcomes of these practices. I found myself scrutinising myself, my work, my techniques, and my identity in my Science classroom.

4.15 Change is afoot

My core method of teaching was very rote in nature; I lectured, I explained, I addressed questions and my students soaked it all up. However, my teaching had evolved. I sought out creative means of administering my lessons; I included videos, art, practical work that involved my students instead of me solely demonstrating. My students' learning became more meaningful, as they remembered things better and related to them more easily. It was easier for my students to remember a lesson that involved a poem or a video than a lesson of me explaining the work from the same book in front of them. My classroom was a typical Science classroom: I had the necessary and standard equipment and furniture. One could almost smell the boredom from the very walls I was expected to use to excite learners about Science. Since my research, I gave my classroom a facelift. I incorporated a lot of colour and interesting models that got students curious and talking. I also seasonally attired the resident skeleton in keeping with the trends. Although these changes may seem superficial and taken at face value, I had found that they allowed my students to relax, to unwind and break away from the norm of a boring, outdated setting of a Science class.

The evidence of change came in the form of the letters my students wrote after the adapted lessons. Having them reflect on the lessons and what they had learnt showed me what changes can be expected from these adjusted approaches in my teaching. This new insight had impacted

my teaching, my thinking, my assumptions and my practices. It has made me more aware, as an individual, of the dire need for arts-based approaches in the classroom. It showed me the value of such methods, not only on the academic ability of my students, but on a personal level. Some of my more withdrawn and apathetic students opened up more, visited my class whenever the need arose to do work they would have otherwise ignored, connected with me by sharing information about their personal lives, even asking for advice. Previously their Science teacher only, I found that I made myself unapproachable due to my 'strict' and 'no-nonsense' attitude and demeanour in my class. That has since changed and I have become more in tune with the varied needs of my students.

I believe this self-study has reframed and transformed my thinking in ways that will improve the teaching capabilities I possess, as well as my identity and practices as a Science teacher. As I reflected on the work and progress of my students, I realised that this self-study has also helped unpack who I am and who I want to be as a teacher. My desire to help my students beyond the call, to help in their growth and academic nourishment, to help make them better versions of themselves was innate. My method of teaching has shifted to making the needs of the student the premise of the lesson and of academic progress, and how to better adapt the curriculum to them, to bring a degree of expression (in arts-based techniques) to help convey the language of Science and education.

4.16 Conclusion

In this chapter, I addressed my second research question, *How can I foster holistic education in my science classroom?* I detailed how my subject group was informed and assimilated into the study, where my arts-based adapted lessons were administered. I used these opportunities to see how I could involve a more holistic approach in my Science class, and how beneficial this was to my Science students. I also depicted my perceptions in a collage on how I viewed educational norms in comparison to the holistic approaches I wished to filter into my teaching dynamics.

This self-study unraveled a lot for me as a Science teacher and researcher. I understood a lot of myself and the person that I had become through careful evaluation of my past, and reflection of my present teaching context. My lessons with my students helped me connect on a more integrated level with them: I was privy to their lives, their identities, the people they wished to emulate and become, and this show-cased all other activities started in my science class.

Each lesson was aimed at still teaching the context, but doing so through an arts-based approach that caused my students to think outside the formal Science methodology realm and dig deep into formulating their own understanding, as well as their own stories. My letter writing lesson, for example, helped my students express emotion in science, a subject that is not necessarily about emotion or feelings in comparison to facts. One student opened up about his life and how difficult he found life as a teenager. In the letter, he told me about how he found the Science lessons to be a break from his chaotic home life. I used this an opportunity for intervention to help him find resolution, and in doing so, acquired a student so much more eager in my lessons. I wanted to foster holistic education in my Science classroom and these lessons allowed an awakening into the realms that helped achieve this, one being fulfilling communication that builds relationships between myself, as a teacher and the students in my charge.

I have learnt that my students are impacted a great deal by my practices, my methods, sometimes even my mood. Understanding the teacher I was, how I fitted into the scheme of things had greatly altered and affected my classroom dynamics (Hunter-Doniger & Sydow, 2016; Jones and Kahn, 2017). What I put out determines the calibre of education. To achieve holistic education in my Science classroom, I must exude a multi-faceted being capable of enriching my lessons with possibilities soaked in opportunities (arts-based approaches, in my study) that navigate my students to enrichment and academic nourishment.

In my closing chapter, Chapter Five, I evaluate my dissertation, while indicating ways of assuring continual growth and change in my Science classroom.

CHAPTER FIVE: WHAT NEXT, CATEPILLAR?

5.1 Introduction

During my university years, I enrolled in a course that taught me about biological and zoological sciences. During this time, I had learnt about the cycles of different organisms. One such fascinating organism was that of the ordinary caterpillar. The caterpillar started off its life fighting for survival, from chewing through its egg to be hatched, to selecting only the finest food so it can grow and achieve the only goal it has. It was impressive to see how the simple looking caterpillar, through focus and determination, could become such a different, varied and impressive creature.

Fig 5.1: The Monarch Butterfly Caterpillar before transformation

Figure 5.2: The Monarch Butterfly after transformation

(Source of figure 5.1: https://www.flickr.com/photos/lastingimages/10484286795**)**

(Source of figure 5.2: https://www.wallpapers13.com/insect-monarch-butterfly-on-purple-flowers-hd-wallpaper-3840x2400/)

When I started in the teaching profession, back in 2010, I was much like the ordinary caterpillar, focused on a single teaching goal, and I saw my students in the very significant larval stages. Just like the caterpillar, I was fighting from the beginning to make sure my lessons were taught, and that I was implementing the 'right' teaching in my classroom by ensuring the curriculum was covered. My students were eating up only what I was prescribed to teach to get to the only goal they were told they had: pass the matric examinations. However, the caterpillar spends times utilising food and conserving energy so that it can endure a period of metamorphosis and change into the beautiful butterfly. Just like the caterpillar, I had to give my students time, invest energy and use a variety of learning material to shape them to be the best version of themselves. Thus, the beauty they had within went through a period of chrysalis

and changed to be exhibited on the outside. I also found myself going through a metamorphosis. This change unfolded the deeper I threw myself into unpacking aspects of my Science classroom and making it more holistic. It was important that I stayed focused on a new goal, like the caterpillar, and continued to strive to implement holistic teaching in my Science classroom, to yield a kaleidoscope of butterflies.

The purpose of this self-study research was to explore how I could foster holistic education in a Science classroom. The Science classroom selected had 29 Grade 9 students, who were in the midst of selecting subjects for the FET phase and at the end of their junior phase at secondary school. I hoped to discover techniques and methodologies, preferably an arts-based approach, to fostering holistic education in a Science classroom.

My main objective in Chapter Five is to address my third research question, *What is the value of fostering holistic education in a science classroom?* In order to gain insight into this question, I will unravel moments in my past, artefacts, old school photographs, art work, reports, journal entries and letters, linking them to the individual I turned out to become and thereby asking myself, if that is what I wished to churn out from my classroom. In this chapter, I will expose my findings and depict an overview in the form of my researcher artwork, in keeping with the parameters of my study. Given the arts-based theme, I will construct a drawing representing my findings with regard to the benefit and value of fostering holistic education in a Science classroom. I will also showcase all my attempts and effects of transforming my classroom and lessons into a more holistic and inclusive one in Chapter Five. Chapter Five will take a journey through a 'Review of my Dissertation'; weave through the discoveries of my 'Personal-Professional Learning' and 'Methodological Learning'; make a pit stop at 'Conceptual and Theoretical Learning'; 'Move Forward' into the aftermath of my self-study research and the implications of it in my Science classroom now, then finally plunge into 'The Value of Fostering Holistic Education', where my combined findings are portrayed in a metaphorical drawing. This will bring the research dissertation journey to its 'Conclusion'.

5.2 Review of the dissertation

In Chapter One, I introduced my research topic. I looked back to the beginning of the idea behind my study. I explored means at which I arrived at my idea (Founding poem and Haiku). I started my journey by acknowledging that my past experiences have had an impact on my individuality, how I am the way I am and my current teaching stance. The teacher I am now is

reflective of the student I was. In Chapter One, I highlighted the focal point of my study as fostering holistic education in my Science classroom. With the development of my haiku, I gathered the focus of such a task; to mould, shape, guide and instil in children, the fibres that will make them great. To me, the way I would go about this would be a holistic approach, and the task included arts-based techniques into STEM subjects. I also looked at my rationale in Chapter One, fostering holistic education in my science classrooms, hoping that it would yield diverse, well-rounded students, capable of multi-dimensional thinking; problem-solvers, innovators, creators, movers and shakers, who help perpetuate and promote scientific sustenance in our communities.

In Chapter One, I showed the concepts and ideologies associated with my research: the socio-cultural perspective (a perspective that promotes the idea that it is social and cultural aspects that build the student, as per Gerhard and Mayer-Smith, 2008). I continued to show that learning took place as a social construct, not in isolation (Gerhard and Mayer-Smith, 2008; Mudaly, 2011). Other concepts I discussed in Chapter One included moving from STEM to STEAM, which facilitates arts-based approaches into science, technology, engineering and mathematics.

The three research questions that my study was built on were introduced in Chapter One, and therefore my subsequent chapters answered each question. This chapter also highlighted my methodological approach (which is elaborated on in Chapter Two) as being self-study, as I wished to use past lived experiences to better understand my current teaching practices and idiosyncrasies.

In Chapter Two, I focused on the parameters of my study. I detailed my research methodology as self-study and in understanding the nature of the teacher, as well as the importance of using reflective practices as a tool to question my methods. In Chapter Two, I looked at the context of my study, and the choice of Grade 9 Science students as my study sample. I had taught this particular group of students since their entry into high school (Grade 8) ad have thus built a good foundation and relationship with these students, as well as teaching them in Grade 9 during my research years. All work was collected by myself for data analysis through a selection of students' work that complied with and was relevant to the points I wished to make in my data analysis. To avoid any department infringements with the prescribed curriculum, all of my lessons were adapted in keeping with the CAPS curriculum, i.e., the content remained

unchanged, but the delivery and tasks were amended. My lessons were specifically designed to incorporate some arts-based methods.

In Chapter Two, I exhibited the data analysis framework which included the use of critical friends and reviews under my supervisor, Professor Kathleen Pithouse-Morgan. My research practices, which included artefact retrieval, journal writing, letter writing and audio recordings, were discussed in Chapter Two. Ethical issues (which comprised getting permission from participants and the institution with consent letters and gate-keepers letter, respectively); validity (which followed Feldman's 2003 guidelines) and the challenges (time constraints, teacher and student strikes and disruptions, lack of student participation) that I encountered, were discussed at length in Chapter Two.

In Chapter Three, I examined Research Question One, "*How have my past experiences contributed to my interest in holistic education?"* In Chapter Three, I carefully unravelled all my past lived experiences in artefact form from letters, to photos and to report cards. Each artefact was followed by an explanation and reflection. My Chapter Three detailed my history as a student that impacted my present as a teacher. Writing this chapter helped me reflect about my past lived experiences, figuring out who I am and more importantly, what was done in my past that has set me up as the teacher I am now. Artefact retrieval, auto-biographical writing and self-portrait drawing were all used to give the reader a glimpse into the person I was. I have often found myself unable to link and connect past experiences to my present-day situations. Upon reflection, I was able to isolate and magnify significant details in my past that have had a hand in the current contexts I have found myself in: this is the epitome of reflection.

In Chapter Four, I embodied my data generation process, i.e., the lessons that were adapted and used to retrieve useful data imperative to the study. I took aim at Research Question Two in Chapter Four, *How can I foster holistic education in my science classroom?* In this chapter, I also took direction from Table 1 (Chapter One) of my data generation process. In Chapter Four, I also focused on certain approaches to teaching Science in my classrooms. I looked at revised lessons and adapted them to cater for aspects surrounding my memory work (Chapter Three), such as examining my experience of my Science teacher when I was a student in school, and how it compared to one of my student's ideas of a Science teacher now. The lessons I adapted included techniques as part of the arts-based approach, story-telling, metaphor writing, letter writing, and techniques not generally associated with Science lesson plan formats.

My Chapter Four encompassed pieces of all this work, as well as reflections and journal entries from those particular lesson days. I examined the implications of my artefacts, which included old school photographs, old report cards, school paintings and letters, on my development as a Science teacher and what that implied for my students. I looked at how I was shaped and moulded from the start of my learning phase, transitioning (like a caterpillar) into my teaching phase, and how that journey created the teacher my students see in front of them on a daily basis. I examined my teaching styles, and how they lacked the holistic approach, as well as how they could be repaired by incorporating arts-based techniques into STEM subjects. I also highlighted some of my challenges during those lessons and what was done to try to remedy the situation.

As I reflected on Chapters Three and Four, I discovered new perceptions about myself, my methods in my Science classroom, and how I tried to foster holistic education in my Science classroom. Science and maths were not more important subjects than art, culture, dance, drama, subjects that required an element of creativity. I realised that I needed to make sure I did not emphasise and categorise these as skill subjects, as learners had different skill sets that were just as important and useful. It made me realise that students who did not excel in these subjects may have thought or deemed themselves inadequate, or even stupid.

I also realised how feedback of assessments was reciprocated by students. I thought back to my Artefact 1, my school report card, and how getting all A's meant I was an intelligent student, but realised that this was success on a one-sided coin. There was no challenge in remembering facts and repeating them. There was no test on how to express myself, or how to be confident, or how to function as a contributing member in society.

As I reflected on my class photograph artefact, I realised that at a young age, many norms and practices even amongst my young peers were learned through social interaction and assimilation of knowledge. If one learner spread the word about how strict a teacher was, we all followed blindly by being quiet in his or her class, never asking questions in the class. Students needed to be allowed alternative avenues, such as other forms of learning that would have been present in a drama class, an art lesson, a sporting game. This was evident when I reflected on my fourth artefact, my school painting. This included outlets that showcased their talents, likes, and hobbies that brought out an energy and freedom that could have filtered into my Science classroom.

I also found myself unpacking my own identity. I realised that I needed to let my passion for teaching science become more visible, as I reflected on my memory-writing on my favourite teacher. I aspired to have the same energy and approach my science teacher had with me. I needed to take the time to cater lessons, get to know my students and build relationships: all this took time but yielded fruitful outcomes. My students were more confident, more open with me, more expressive in my class and seemed to acquire a renewed attitude to the subject.

The environment I created was one that not only initiated non-conventional methods of learning, but also provided students with opportunities to refresh, take a break in the 'brain corner', feel safe, open up and be themselves.

5.3 Personal-professional learning

This research embodied the self-study approach, with the primary focus being to improve my teaching practice and create a more holistic approach in my Science classroom. This study was based on how I can foster holistic education in my Science classroom, and thus looked at the different avenues that can realise such a goal.

We live in an ever-changing world with a new set of problems every day. We need individuals that are equipped with the necessary skills and thinking prowess to better handle post-twenty-first century problems. A holistic classroom, in my opinion, seeks to house creativity, exponential thinking and artistic problem-solving as pre-requisites for such forward thinkers. For me, creativity is looking at the content in a unique way and being able to express it differently, yet still achieve learning. I understand exponential thinking to be thinking that exceeds that limitations of the prescribed work, not just completing the task as stipulated, by getting a student's mind working beyond that. Artistic problem-solving means handling solutions and answers to all types of problems in an unconventional way.

This self-study focussed on my own teacher learning, and what could I do to my pre-existing practices to better aid my current teaching pedagogy, which included holistic education approaches. I wanted to be an innovative teacher in my field, to create curiosity, inquiry, enthusiasm, all this in a science classroom that I previously kept very rigid and structured.

This research has impacted me a researcher and educational practitioner. As such, I now know that holistic education is a wide and varied topic that has many important strands of establishment, connectivity and reflection. This realisation has come with the help of readings

like Abbey (2004), Forbes (1996), and Schiller (2006), together with the outcomes of my own self-study. Studying myself, digging into my past, and shovelling through my present context as a Science teacher has helped paint this reality of holistic education for me. Before becoming fully submerged in my self-study, I thought holistic education meant changing the way I taught so my lessons were fun and meaningful, so that students became interested. This meant that if I received more applicants for FET Science, my holistic education techniques were working. However, I have learnt during my research process that initiating holistic education meant discovering who I was a student first, then as a teacher. It meant learning the interconnecting webs in my scholarly years and finding out why I enjoyed and stuck with a subject like Science; what was it that made me stay. Fostering holistic education was about finding all facets of teaching and incorporating the best recipe in making teaching worthwhile for me as a teacher, and my students. Holistic education is a field that has evoked great self-discovery, beginning at the very break down of my own past lived experiences. The practices I wished to incorporate in my class to foster holistic education is unique to my own lived experiences. I have discovered that my past has had implications in my journey as a teacher, and in changing my current educational outlook, and that I must understand and come to terms with my past educational experiences.

My current educational practices have changed by reflecting on what I have experienced and how that has impacted my teacher identity when I am in a class with students. My practices have sought to include more arts-based techniques to otherwise STEM subjects. I have found that when this was done, my students seem more excited, more interested and more receptive (to the method) in my class. Students came up to me and mentioned how different (in a good way) the holistic education adapted lessons were. I have had numerous comments like *Why don't we have all our lessons like this?*

I have learnt a great deal about myself as well, particularly my history. I have learnt that my current teacher persona is a result of how I was taught (whether it was in the classroom or at home), what values I held unbroken, and the hierarchal levels of importance passed down in my family. These were the backbone into my history, my present and my future. I was a very formal, rigid, by-the-book type of person, and this was due to my own learning – social, cultural, traditional, at school, home and church. My fibre as a teacher was stitched and threaded as a student myself. Each yarn of wool used to display the tapestry that was who I was, had been moulded by teachers, both formal and informal.

5.4 Methodological learning

My self-study research methodology aimed at looking at the beginning, the beginning of who I was, the person from my past and how I grew into the individual before my students' eyes (Lassonde, Galman & Kosnik, 2009). Self-study instigates a pattern of behaviour of recalling memory and past lived experiences, with the added task of reflection. It is also imperative that teachers (in keeping with self-study methodology) get into the habit of always questioning our practices, as this allows us to develop a habit of constant reflection, which is key in isolating certain key techniques that may be good or bad in our pedagogy (Lassonde, Galman & Kosnik, 2009).

Samaras and Roberts (2011) introduced self-study as a way teacher-researchers would draw on their lived experiences and as a stepping stone to unravelling the dimensions of their teacher development. Self-study has helped me take a hold of my current practices, motivating me by helping me to make changes and improving my teaching methods. Self-study aims to mitigate self-awareness in areas for improvement in teachers' practices through examining past lived experiences and reflecting on them (Samaras & Roberts, 2011). An acceptance of change needed is crucial for teachers to initiate a turning point, and will be more likely to improve their practice. I established and came to grips with the change I wanted in myself, thus embarking on this path of self-awareness, self-study and self-programming. In selecting self-study, I was both the researcher and a participant, seeking collaboration between my past and present teaching context.

Using memory work has shown me how my past lived experiences influenced me as a teacher, now, during formal lessons and in my relationships with my students. Allender and Manke (2004) agree that the use of artefacts helps in re-igniting memories of the past through collective reflection. Even the unpleasant past lived experiences have offered valuable insight to me, where I learnt to deal with the memory of it and make peace with it. Pithouse (2011) mentioned how drawings (a form of memory work) helped teacher-researchers remember details, emotions and feelings that would have been forgotten, but add substance to the self-study, even those memories that teachers/researchers would prefer to hide. Reflection helped me take note of what I did not want to do anymore in my classroom, or what I did that needed to be changed. Reflection based on memory work, helped me construct the teacher I wanted to be. My self-study research allowed me to recall and revisit my memory work (art-work, letters,

etc.), as this form of arts-based approaches in holistic education was what helped me to become a more multi-faceted teacher.

The use of artefacts became very significant in my self-study, as it served to revitalise and rejuvenate past lived experiences. Artefacts have taken my mind back to a point where I have been able to find significant information that was relevant to my teaching and learning, and thus my growth as a science teacher (Allender & Manke, 2004). My artefacts included old school report cards, old school photographs, paintings I had done as a student, and letters from students to me during my teaching practical in 2012, as well as one I wrote to my little sister. The old school report displayed my dexterity in academics which became my primary identity. My school painting revealed my creative side, which I had otherwise ignored, as I thought my academics was more important. My artefacts helped me to relive the experiences each one brought and evoked forgotten emotions and underlying realisations with it, as well as take the reader through the same journey.

My methodological learning also equipped me with the standard in which data collection was to take place, regarding ethics, fairness, validity, anonymity. Part of the methodology was collecting data from my participants. This proved challenging with the constant question being asked: if the work was for marks. This helped me realise how formal class time was to my students; my participants would do the work if they knew they would be graded on it. I was constantly begging for work, which became a struggle to collect adequate data. I have learnt that persistence pays off, and after several attempts of persuading my students, giving them extra time to complete and calling them in during break to do some piece for me, they finally conceded. It was an immense help to have a few students that I could count on as they helped in motivating the other students to assist with hand-ins.

I have learnt that this self-study was an on-going methodology process. I was constantly learning about and from myself. Making sense of my past lived experiences and reflecting on them was a process that not only offered valuable insight but a truth that was often hard to hear.

5.5 Conceptual and theoretical learning

Several aspects contributed to my learning and practice as a teacher and researcher. These key concepts aided in shaping the teacher I became, as well as provided insight into the researcher I was seeking to become. My self-study research was rooted in these reflective practices, as it provided aspects of change and areas that emulated where I could foster holistic education. These key concepts were instrumental in manoeuvring my self-study research at unfolding my identity, and the dimensions of my teaching and learning Science. These key concepts are discussed further below.

5.6 The socio-cultural perspective

Taking a socio-cultural perspective on learning and teaching helped me to understand that students are shaped and informed through the socio-cultural world. This meant that all learned behaviour, morals, traditions have social and cultural dimensions. Students are not born with or without a tool set that equips them for learning in the classroom; these skills and behaviours are learned from early childhood. Families, friends and religious sects all have an input and impact on the development of a student. I realised that students did not learn in isolation, but through a vast network of key role players involved (Gerhard & Mayer-Smith, 2008). This was evident in my childhood (see Chapter Three): I was a product of values, behaviours, likes and dislikes that were in some way shaped by family and friends. My mother, being a teacher herself, took the reins in ensuring our school day was as structured and routine as possible. School ended at half past two, upon which she fetched us, drove us home, made us a snack, and then went about helping with homework. This routine behaviour is something I have found myself exhibiting, even attempted mimicking in my classes. The context and dynamics of the institution – the schooling system, for me - have always been greatly influenced by culture and society, and this idea can further be unwound into developing ways to foster holistic education in the classroom (Lee, 2014).

5.7 Science education and the socio-cultural perspective

Science education was not without social issues, and I had therefore used the necessary science education techniques to unravel socio-cultural issues to help create a diverse understanding for students, thus breaching into holistic education (Mudaly, 2011). In keeping with the socio-cultural issues around a student's life, I could have utilised Science education in bringing about

information, understanding and solutions to these social issues (Mudaly, 2011). In Chapter Three, I detailed a memory of a Science project I undertook with some of my peers during my high school years in Grade 10. The project, 'Adopt-A-Spot', saw my group and I clear, rehabilitate and maintain a plot of land that was in dire need of an environmental rescue. My team and I located a spot in a communal residential area that posed a pollution, dumping and pest problem. Together with investigative techniques, researching protocols, we questioned the residents, found out what they would prefer and started the process. We followed the steps of establishing the area, clearing it, and turning it into a vegetable garden for the residents to continue after our project was over. The area was maintained for a while, until the municipality cleared it up to make room for a project of their own. We followed scientific protocol in aiding residents of this block of lower income apartments find a solution to an environmental hazard.

5.8 Holistic education

Forbes (1996) defined holistic education as involving teaching and learning that allows for personal, social and cultural identity discovery, whereby an individual could unravel the fibre of their being, i.e., what made them who they were. I believe my science education was doctored to be and presented itself as rigid, uniform and structured. It is my belief that holistic education integrated into mainstream education has yielded life lessons aimed at not only developing the academic prowess of the student, but the emotional and spiritual aspects as well. This yielded a balance of 'mind, body, soul' and helped grow students that were better equipped with social skills to handle real-life problems. I planned lessons around fostering holistic education in my class, but this approach was supported by many adaptations outside my classroom. I sought to get to know my students well, learnt their names to show that I was genuine about building a good relationship with each of them and recognized them in my classroom. I sought to be a teacher that would be available no matter the time of day and thus had an open-door policy. I was always in my class, even during breaks and made mention to my students that my doors were always open to them for help. This, for me, was a massive support system to what I was attempting to do in my classroom. A hope to establish long-lasting, substantial learning was what drove my holistic education approach (Schiller, 2006). In my Science classroom, I wanted holistic education to take a step away from the formal level of linguistic and logical applications in curriculum, and towards a more creative, meaningful approach to life (Schiller, 2006).

5.9 Creating a safe space

In order to begin fostering holistic education in my classroom, I attempted to create a holistic environment by regarding the content, the set-up of my classroom itself, the homework and the activities, that I, as their Science teacher and together with my Science students, had to do to make the classroom a place where they were encouraged to be creative, imaginative and where the lessons were well-received. This was an environment where creative learning had taken place. I learnt that my students felt safe in this kind off an environment, safe to be themselves. I took a creative approach and made my classroom more colourful by adding posters, some of them with inspirational quotes. I used the glass cabinet outside my classroom to place posters of women in STEM to help inspire the few girls I had in my senior Physics classes. I rearranged my desk to face the board, just like my students, as I believed they would see me as part of the class in how we learnt, rather than a figure at the front dictating to them. To expand this concept would be to create a school where there is an open, honest environment where students were comfortable to express themselves; this environment could be accomplished by identifying the holistic needs of students and teachers alike, and working towards a common goal of growing our education system.

5.10 From STEM to STEAM

Including arts-based approaches into STEM subjects was what my study had focused on as a manner of introducing and thereby fostering, holistic education in my Science classroom. Arts-based approaches called an overflow of creativity and imagination, something that was lacking in my classroom, in what I believed as a child and student was a fact-based subject (Science). In Science, I also expected students to think about their work, describe and explain it, which is the foundation for reflective practices. If I could teach my students to be reflective, I could teach them to think about problems and solutions and how to better them.

This helped enhance my own reflective practices as it granted me an opportunity to hone those skills and dig deep into my identity. It helped me appreciate and accept the identity I constructed, to take ownership and responsibility to perpetuate a better method of doing things in my classroom. I introduced art in my lesson during homework time. I recalled an activity I gave to my Grade 9 Science class to make a book mark that they could attach to their notebooks. The book mark had to have the *ph* (power of hydrogen) scale, which measures acidity and alkalinity of substances on a scale of numbers from 1 to 14, on one side, and the other could be

whatever they wished to draw or stick or paint. I also remembered during a Biology lesson on photosynthesis (chemical process whereby plants make their own food) with my Grade 9 class, that I asked them to go find a leaf, stick it in the books and attempt to redraw it with labels. These helped in introducing arts-based approached in otherwise mainstream STEM subjects in my classroom.

5.11 Moving forward

Taking everything into consideration, I have already implemented some enjoyable and valuable changes in both my classroom and teaching styles. The changes discussed next were illustrated by pictures taken in and of my classroom.

Early in 2019 during term 1, I noticed that my senior students (Grade 11) that were enrolled in my physics classes always tended to get bored, irritable and distracted half-way through the lesson. Therefore, I created a "brain-break corner". This initiative was by accident. Before I left in Term One to go on maternity leave, I had puzzles that I had built on my table and counter. When I left, my puzzles were moved to the store room. During transit, they broke, leaving them in pieces. Upon my return, I moved them back with the hope of re-building. During one of my physics lessons, one of the students was feeling quite overwhelmed and was on the verge of shutting down. I simply asked him to take his mind off things and take a break by doing a few pieces for me. What started as a way to dispel distraction ended as my "brain-break corner", where students take a few minutes to unwind, focus on something new to give their brain a break, and eventually gather their thoughts so we could continue with the lesson.

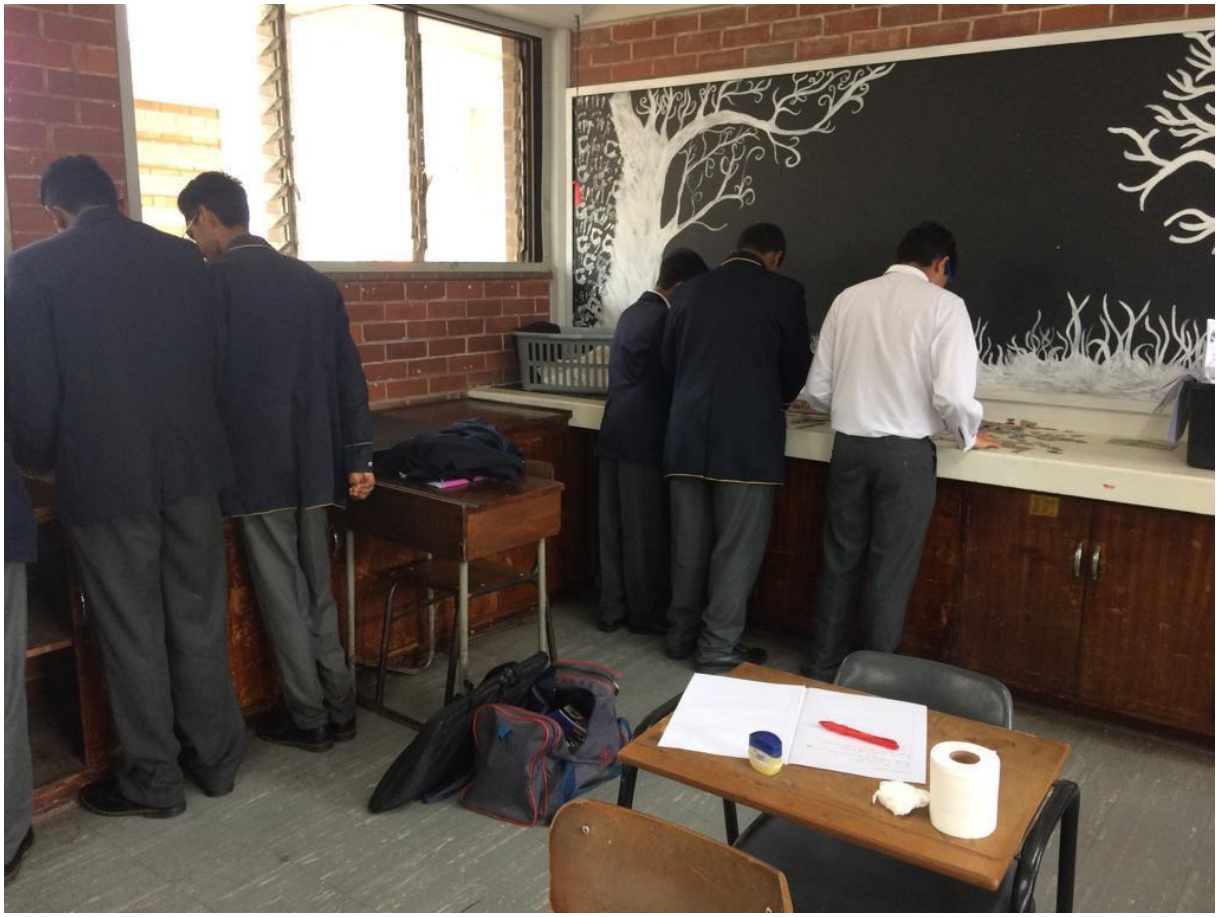


Figure 5.3: My classroom brain-break corner

Figure 5.4: Puzzle 1 in the process of being completed

Figure 5.5: Puzzle 2 three pieces away from completion

Figure 5.6: Puzzle 3 after completion

Upon revisiting my ideas on STEM to STEAM during mid-2019, I came across a site (https://www.stemminds.com/international-womens-day-roundup-empowering-the-next-generation-of-women-in-stem/) that had free posters on women in STEM. What was interesting for me was that not all the women were typical STEM practitioners: they were unique, diverse and masters in so many different areas in their field of expertise. I have a glass cubicle outside, so I stuck the posters there and even attempted at putting some equipment and displays to catch a student's eye and get the students talking. Even some of the lab residents received an upgrade, something to add colour and personality to Science.

Figure 5.7: Women in STEM posters in glass cubicle outside my classroom

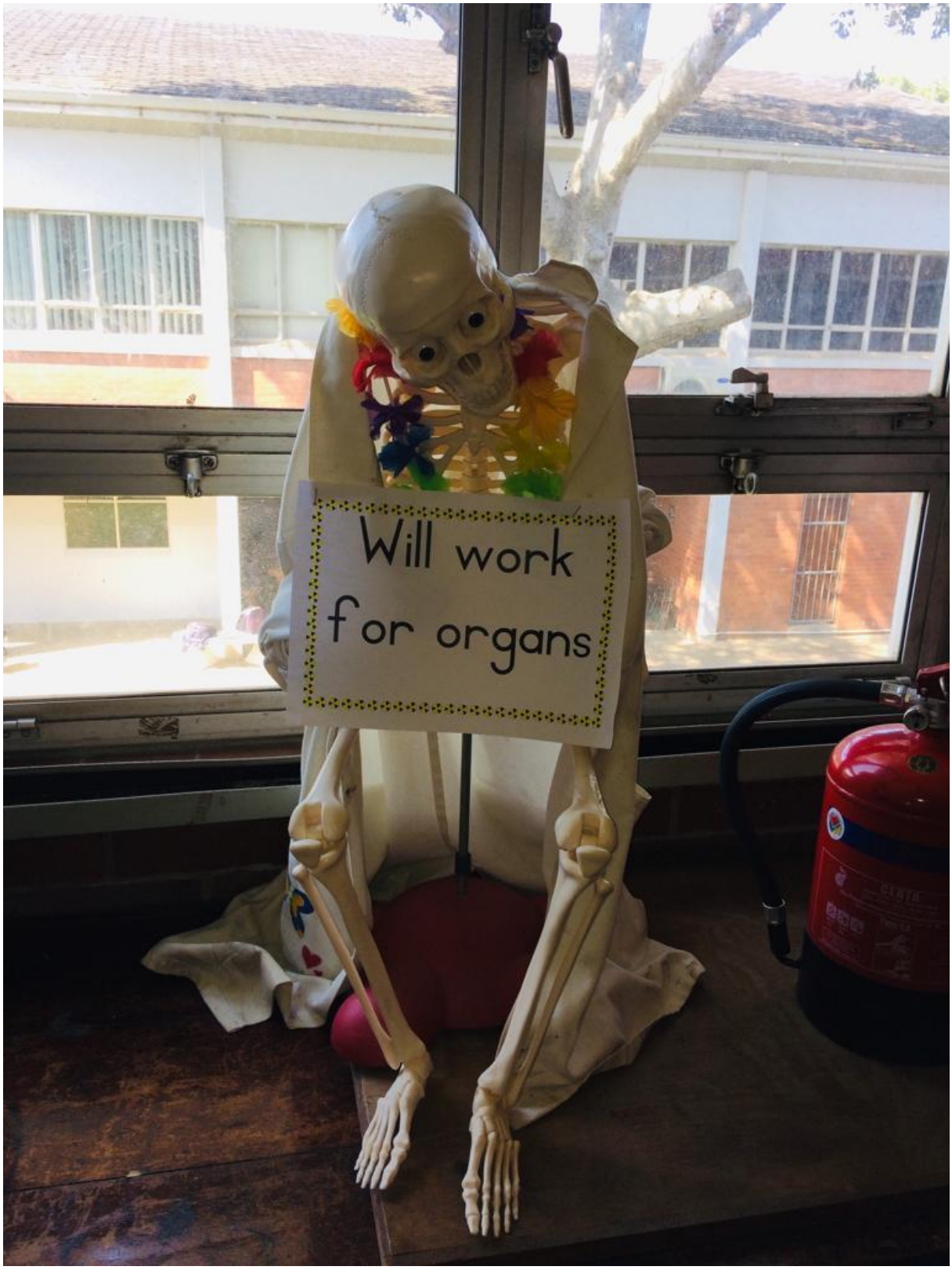


Figure 5.8: My fashionable skeleton seeking work

5.12 The value of fostering holistic education

Saw (2013) highlighted 'ultimacy' as one category that portrayed the philosophy of holistic education. Ultimacy referring to the desire a person may have to strive to be the best they can be (Saw, 2013, p.70):

> Holistic education is a philosophy of education based on the premise that each person finds identity, meaning and purpose if life through connections to the community, to the natural world and to humanitarian values such as compassion and peace.

I see holistic education and the value of fostering it in my Science classroom as an opportunity for change and continual growth for my students and myself. As Forbes (1996) mentioned, holistic education entails teaching and learning that involves discovery and awareness of levels of personal, social and cultural paradigms, as well as unpacking fibres of the self. To complete my dissertation, I synthesized all my findings and constructed an art piece to depict what the value of fostering holistic education in my Science classroom was. I chose to utilise drawing as a method for my arts-based approach to this section, as drawings can help extend a clear-cut message, as well as aid in understanding (Knight et al., 2015). Following my drawing, I explained the drawing and the message I portrayed in it, as well as the lessons learnt from the emergent themes and patterns.

Fig 5.9: How I visualise the value of fostering holistic education in my Science classroom

5.13 About my drawing

The themes and patterns that spoke strongly, upon a synthesised review of my work, were that fostering holistic education in my Science class yielded wholesome growth and accomplishment; valuable and fruitful relationships between myself and my students and an unlocking of student's genuine identities and potential. For myself, the same fruit was yielded, which gave me a keen insight into and deeper understanding of practices and approaches for my future students. This was lifelong learning. My drawing spoke of growth. For me, fostering holistic education in my Science classroom encouraged the growth and nourishment of my students. This was exponential, not growth that was contained to the subject, to the year; it was growth that exceeded the confines of classroom. The fruit yielded in the tree in 2020 would be used to grow the tree (stronger, greener, more fruit-bearing) in 2021. The growth cycle would be perpetuated for years to come, each successive growth yielding an improved and abundant harvest. The first tree started out small, with assistance (the peg and wire) to keep it straight

and towards the light. The colouring of the grounding is what the trees were rooted in, its foundations, which changed as the trees changed. The initial tree grounding was light, dry and looks like sand that would be easily swept away. However, the grounding of the last tree was dark, and healthier, indicating a richer soil which in turn meant that this tree was soaked in nutrients to help it thrive.

The lesson learnt about my teaching was that before I started my journey of self-study, it lacked an element of creativity. I found it to be missing inspiration; my lessons did little to excite and engage my students, they simply perpetuated the content that was expected to be learnt in order to pass my tests and exams. They did little to teach skills outside of Science. My teaching and lessons have since begun the evolutionary phase and thus extended into the holistic sphere of education, one that has sought to enrich and nourish teaching and learning for future educational institutions. I believe my students' learning was shrivelled to produce very little fruit for sustenance. Holistic educational techniques fertilize the mind, yielding healthier fruit for the next season. Learning became productive.

Events that indicated evidence of change for me came when I saw students that were otherwise reserved, too shy to speak up in class, start to offer suggestions, ask questions, be directive and open up to me. This was success for me. When my Grade 11 Physical Science 'A' pupil suddenly dropped to a 'D' because of family problems, then worked back up to 'B' after I tried some holistic approaches, I noted this down as a success story for me. He particularly enjoyed my 'brain-break corner' and was actually the inspiration behind that idea (see Chapter 5; Moving Forward).

My change was seen in my practices. My practices became less about me and ticking off the completion grids on my subject teaching plan, and more about the growth of my students in those lessons. For example, in the past, a disrespectful student meant a bad student. I have since become aware and more accommodating in that the students who act up usually have underlying issues that have filtered their way into my Science lesson. I have since dealt with these situations better by calling such students back after class and talking, opening up to them. If they saw me as approachable and vulnerable, it did not mean I was meek and weak. They have found ways relate to me and hence broken communication barriers, which has made my class more learner-friendly and more holistically developed.

5.14 Conclusion

The purpose of this chapter was to help bring this study to a close, to reflect on each step undertaken in this self-study. This research aimed at ways to foster holistic education in a Science classroom, with the focus on self-study. Holistic education in this study encompassed bringing a multi-faceted dimension into the classroom that incorporated arts, creativity and imagination into an otherwise rigid and fact-based subject like Science. Students often have a preconceived expectation as to how the Science class dynamics should play out. It must be formal, uninterrupted, rooted in rules. This mentality already set the tone for how the Science lesson was to run. Incorporating holistic techniques by introducing arts-based approaches derailed this mentality and added a creative edge, which was crucial to developing all aspects of the student's mind.

As I concluded this dissertation, I revisited my research questions to see if the research fully captured my main learning. Question One asked how my past experiences contributed to my interest in holistic education. My past lived experiences have played an important role in creating the identity I have assumed and assimilated as my personality. Allender and Manke (2004) established that artefacts are physical indicators that are used to pull us into the past as a learning and reflective technique to help identify aspects of ourselves in our current teaching and learning. I used artefact retrieval to help launch the analysis into my past, and identify the type of teacher I was. This yielded insights into why I was a particular way in my classrooms and why I taught my Science lessons in a particular manner.

Question Two asked how I fostered holistic education in my Science classroom. Fostering holistic education in my Science classroom entailed utilising an arts-based approach in my lessons. I realised that my Science subject lacked aspects of arts-based techniques in delivery and intake. I felt that my students had already categorised Science as a subject that was only about rules and theories, which needed to be churned out. I therefore attempted to introduce the arts into an otherwise formal STEM subject, like Science, moving from STEM to STEAM. I found that arts-based techniques allowed for an exponential, creative wave of thinking outside the box, thinking like there was no box to begin with. I found that my students not only enjoyed those specially adapted lessons, but were able to gain confidence by speaking up when they felt overwhelmed. They had fun in my class, and they grew in how they thought about Science.

Question Three asked what the value of fostering holistic education in a Science classroom was. As mentioned (in The Value of Fostering Holistic Education), I found that this yielded a fruitful experience for myself as teacher-researcher and my students. I was able to grow in my teaching practices, learning why I did certain things and how I could have improved to make them more fulfilling for my students. This also provided lifelong lessons for me, which I was able to project into future classes. Fostering holistic education in my Science classroom helped my students unlock inquiry, natural curiosity, and fearlessness in my classroom: this was the measure of their success in my class.

Self-study methodology played a central role in developing this study. It focused on studying myself, as researcher, teacher and participant. Self-study helped me travel back to my past, unravel and make sense of it, and to embrace it fully, the good and the bad. Self-study methodology also helped me reflect on and make connections between my past lived experiences and the teacher I am now, enabling me to see the growth of the teacher I have become.

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7. APPENDICES

APPENDIX A: ETHICAL CLEARANCE LETTER (I)

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

23 December 2015

Ms Trisha Govender 206506339
School of Education
Edgewood Campus

Dear Ms Govender

Protocol reference number: HSS/1855/015M
Project title: Fostering Holistic Education in a life Sciences Classroom: A teacher's self-study

Expedited Approval

In response to your application dated 15 December 2015, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]

.....
Dr Shenuka Singh (Chair)

/px

cc Supervisor: Dr Kathleen Pithouse-Morgan
cc Academic Leader Research: Professor P Morojele
cc School Administrator: Ms B Bhengu, Ms T Khumalo & Ms PW Ndimande

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** ximbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za

APPENDIX B: ETHICAL CLEARANCE LETTER (II) (Revised Title)

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

15 February 2018

Ms Trisha Govindasami 206506339
School of Education
Edgewood Campus

Dear Ms Govindasami

Protocol reference number: HSS/1855/015M
New Project Title: Fostering Holistic Education in a Science Classroom: A teacher's self-study

Approval notification – Amendment Application

This letter serves to notify you that your application for an amendment dated 15 February 2018 has now been granted **Full Approval** as follows:

- **Change in Title**

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted].....
Dr Shamila Naidoo (Deputy Chair)
Humanities & Social Sciences Research Ethics Committee

/pm

cc Supervisor: Dr Kathleen Pithouse-Morgan
cc Academic Leader Research: Professor P Morojele
cc School Administrator: Ms T Khumalo

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
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Website: www.ukzn.ac.za

APPENDIX C: TEMPLATE OF A CONSENT FORM

Informed consent letter for participation in self-study research

198 Rinaldo Road
Glen Hills
Durban North
4051

3 March 2018

My name is Mrs Trisha Govindasami and I am currently studying towards a master's degree at the University of KwaZulu-Natal. As part of the requirements of the degree, I am required to complete a research project. The research objectives and gain from my study is to ultimately learn to foster holistic education in science classrooms. To collect information for my research study, I would like to work with your child/ward in Grade 9. During lessons where data will be collected, I will take down notes and use an audio recorder to record our class discussions.

Risks of Participation in the study

There is no known physical, economic, social or psychological risks associated with participation in the discussion.

Benefits of Participation in the study

There are no guaranteed benefits for you; however, you will have the opportunity to reflect on your own involvement in providing information required by this study.

Confidentiality

The information gathered from this will be kept as confidential as possible. The participants' real name or any identifiable information will not be used in the reports and all files, but information will be used for academic research reports.

Voluntary participation

Your participation is entirely voluntary and you are free to withdraw from the process any time. At any time, you may choose not to answer any questions, if you feel uncomfortable.

Consent

You have been given a copy of this consent form to keep. Your participation in the study is voluntary. You are free to decline to participate in this research study, or you may withdraw your participation at any point without penalty.

My supervisor is Professor Kathleen Pithouse-Morgan who is located in Education Studies on Edgewood campus of the University of KwaZulu-Natal. Email: Pithousemorgan@ukzn.ac.za

Thank you for your contribution to this research.
Kind Regards
Mrs Trisha Govindasami

DECLARATION

I …… (Full names of participant)
Hereby confirm that I understand the contents of this document and the nature of research project, and I consent to participating in the research project: Fostering Holistic Education in a Science Classroom: A Teacher's self-study.

APPENDIX D: EDITING CERTIFICATE

THE WRITING STUDIO

Writing and Editing Practice

Certificate 2020/12/3

2 December 2020

TO WHOM IT MAY CONCERN

This dissertation, entitled **Fostering Holistic Education in a Science Classroom: A Teacher's Self-study, by Trisha Govindasami**, has been edited and reviewed to ensure technically accurate and contextually appropriate use of language for research at this level of study.

Yours sincerely

CM ISRAEL, BA Hons (UDW) MA (UND) MA (US) PhD (UNH)
LANGUAGE EDITOR AND WRITING CONSULTANT
Connieisrael90@gmail.com Mobile 082 4988166

APPENDIX E: TURNITIN REPORT

preferences

Originality Report

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CHAPTER ONE: AT THE HEART AND SOUL OF HOLISTIC EDUCATION 1.1 Once upon a time…in a Science classroom not so far away "I never teach my pupils. I only attempt to provide the conditions in which they can learn." - Sir Albert Einstein Sir Albert Einstein, born to a Jewish electrical engineer in Germany, was a world- renowned scientist, scholar, and teacher. My understanding of his message was that in providing a growing and conducive learning environment, we teachers must create a space where students take responsibility for their learning with us to facilitate and help perpetuate that journey of self-discovery. 1.2 Trying out my superhero cape I have always had a passion for Science. Since my high school days, I have been

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