

INVESTIGATING THE PREDICTIVE VALIDITY OF CAP TEST

An Investigation Into the Predictive Validity of the CAP Test

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INVESTIGATING THE PREDICTIVE VALIDITY OF CAP TEST

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An Investigation Into the Predictive Validity of the CAP Test

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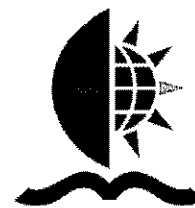
ABSTRACT

The Vocational Training landscape in South Africa changed in 2000 when the 153 Technical Colleges merged to form 50 macro Further Education and Training (FET) Colleges with new vocational programmes. In an endeavour to assist prospective students in making an appropriate choice of programme, placement tests prior to registration were implemented. The Competency and Placement (CAP) test was developed to identify gaps in the students' knowledge of the grade 9 curriculum in order to identify high risk students prior to registration. This study aims to discover whether results of the CAP test of students at Boland Further Education and Training (FET) College correlate with their final year-end results in numeracy and literacy, and to what extent the test could be used to predict students' future achievement.

Data from 710 students were used to determine the correlations between their CAP scores and their year-end examination results. A Pearson product-moment coefficient (r) was calculated to indicate the extent of correlation for different groups. The coefficients of determination (r^2), a coefficient used in the prediction of future outcomes, were also calculated. It was found that there were correlations of different strengths for different groups, but the coefficients of determination did not indicate that the CAP test could be used to predict the outcomes of the final year-end examinations. Therefore it can be concluded that the CAP test is not a valid instrument to predict academic success and should be used only to identify grade 9 mathematics and English skills gaps, according to the purpose of its design.

Keywords: placement test, correlation, prediction, National Curriculum (Vocational), NCV, Mathematics, English, Further Education and Training Colleges, FET.

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09 December 2009

Mrs A Taljaard
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Dear Mrs Taljaard

PROTOCOL: An investigation into the Reliability and Validity of a placement instrument for Colleges

ETHICAL APPROVAL NUMBER: HSS/0886/2009: Faculty of Education

In response to your application dated 20 November 2009, Student Number: 206526005 the Humanities & Social Sciences Ethics Committee has considered the abovementioned application and the protocol has been given **FULL APPROVAL**.

PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

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

Yours faithfully

A handwritten signature in black ink, appearing to read 'Steve Collings'.

**Professor Steve Collings (Chair)
HUMANITIES & SOCIAL SCIENCES ETHICS COMMITTEE**

SC/sn

cc: Sandra Land
cc: Ms Rishandhani Govender

ACKNOWLEDGEMENTS

Without much sacrifice and assistance from important people, it would not have been possible to complete this work. The following people played a vital role throughout the research and writing of this manuscript. I am humbled by your support.

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Natasha Bothma & Dudley Dodd: Thank you for wonderful team work.

This book would not have been, but for the grace of God. Soli Deo Gloria.

I dedicate this work to my Oumie.

DECLARATION OF ORIGINALITY

I, ANNELINE TALJAARD, hereby declare that:

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ABBREVIATIONS

AARP	Alternative Admissions Research Project
CAP	Competence and Placement
DoE	Department of Education
FET	Further Education and Training (South Africa)
HESA	Higher Education South Africa
NBT	National Benchmark Test
NC(V)	National Certificate (Vocational)
NQF	National Qualifications Framework
NSFAS	National Student Financial Aid Scheme
OBE	Outcomes Based Education
RPL	Recognition of Prior Learning
RSA	Republic of South Africa
SAQA	South African Qualifications Authority
SETA	Sector Education and Training Authority

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CHAPTER 1

PURPOSE OF AND BACKGROUND TO THE RESEARCH

BACKGROUND TO THE STUDY

Vocational training in South Africa reflected the political ideology of its leaders. Colleges offering technical and vocational education reflected apartheid and offered qualifications to separate racial groups. Although most colleges were exclusively for whites, the Ohlange College in Durban was established in 1907 for black students and more black training colleges were established in the 80's (Wedekind, 2008). Since the merging of 153 Technical colleges into 50 Further Education and Training (FET) Colleges in 2000, the number of black students increased to such an extent that the majority (96%) of all students at FET Colleges in 2010 were black and the rest represent the White, Coloured and Indian populations. In the apartheid years, the use of placement or selection tests was common practice at some of the previously "white" colleges, for example, the use of the Trade Aptitude Test to identify stronger aptitudes in different technical fields (Mindmuzik, 2011). Due to many factors explained later, tests became unpopular and were not replaced with any other tools to assist prospective students in making a vocational choice. Fortunately, the Department of Education identified this need:

Learner counselling and support services will be established to help new entrants to FET to make meaningful choices about their direction of study and to ensure that all learners, including previously excluded or disadvantaged groups, are given the opportunity to succeed. Career guidance and support services will provide information on learning programmes, education and training providers, qualifications and job opportunities. (Department of Education, 2008b, p.4)

The newly developed Student Support Framework indicated the implementation of a selection and placement activity as a key deliverable for phase 1 in 2008 – 2009, and stated that "a clear selection and programme placement policy that focuses on redress must be in place. Such a policy must assist in the appropriate choice of NC(V) programme" (Department of Education, 2008, p. 25), and "Colleges should use a

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placement and selection tool when admitting students.” (Department of Education, 2008b, p. 14). Subsequently, for the past five years, colleges progressively increased the administering of placement testing prior to registration of new students.

This chapter will provide background for the research to discover whether one such placement instrument, the Competency and Placement Test (CAP) is a valid instrument to predict the possible academic achievement of students at the end of the first year.

MOTIVATION FOR THE RESEARCH

As will be discussed later in this chapter, there is a need for an instrument to assist prospective students when making a decision about which programme to register for. The intention of the Competency and Placement test is clearly stated in the manual (CAP, 2007):

Act as a gauge for a student’s knowledge of grade 9 English and Mathematics: “The purpose of this test will be to determine if the prospective FET College student has the basic fundamental knowledge of the English language and numeracy skills to cope with the learning material of NC(V) level 2” (CAP, 2007, p.1), and “ to assist the College personnel in placing prospective students that have the fundamental skills in appropriate vocational fields. Thus, the focus is to identify the level of additional academic support some students may require

To identify a student’s vocational interest: The Placement Test will assist the prospective student to choose a vocational field that is aligned with his/her interest by providing information on the 14 different vocational fields available in NC(V). The Placement Test will also guide the FET College personnel to place and advise students in appropriate vocational fields”. (CAP, 2007, p. 1)

If the CAP test could also indicate whether a student is likely to complete the year successfully, it would be an added advantage for the college to further identify possible high risk students.

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STATEMENT OF PURPOSE

A very important function of the newly developed student support divisions at FET Colleges was to guide and support students to make an informed decision on their career direction. The Department of Education identified this service in an endeavour to improve the poor attrition of students. (Department of Education, 2008). A key delivery is that prospective high risk students should be identified as early as possible in the year, so that supporting strategies could be put in place as early as possible (Department of Education, 2008). Hence, an instrument that would empower students in their career choice process, and simultaneously assist college personnel to identify the students who will probably need support, would be advantageous to both college and students.

For the scope of this study, it was decided to focus on the predictive validity of the Competency and Placement test. This test is used to identify prospective students at risk to fail, by means of investigating if a correlation exists between CAP test scores and final year-end results. As correlation is the “statistical concept used to describe the relationship between two variables” (Ghiselli, Campbell & Zedeck, 1981, p. 76), the objective of this research is to determine, by means of a Pearson product-moment correlation coefficient, whether a student’s CAP test result is a valid indicator of his/her achievement in the final year-end examinations in the corresponding subjects.

KEY RESEARCH QUESTIONS

As explained above, FET Colleges needed an instrument that would indicate the capacity of a student to meet the demands of a specific programme. The manual of the CAP test states: “The purpose of this test will be to determine if the prospective FET College student has the basic fundamental knowledge of the English language and numeracy skills to cope with the learning material of NC(V) level 2” (CAP, 2007, p. 3). Because the CAP subtests are based strictly on the Grade 9 curriculum, it would be possible to identify the extent of a student’s lack of skills and knowledge of the basic foundation (grade 9) for the NC(V)programmes as set by the Department of Education.

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The question that arises, though, is whether a student's CAP results, showing levels of skill and knowledge, can be used to predict year-end examination success.

The other side of the coin, therefore, is whether the CAP subtests can in actual fact identify a student at risk to fail the first NC(V) year on the basis of his / her level of grade 9 background knowledge. As the CAP Test is still a relatively new instrument, clarity regarding its predictive validity is needed. With data available from students who have completed the test, and been through FET colleges, it is now appropriate to critically evaluate the CAP test with the purpose of identifying its potential as a valid screening instrument for high risk students. The decision was made to investigate the predictive effectiveness of the English and Mathematics test by determining the extent of the relationship between the CAP subtest results and the end-of-the-year results. Hence, the focus is on investigating the following question:

Is the CAP test a valid predictor of FET College students' academic success?

To find an answer, this research will focus on two sub questions:

- What is the extent of the correlation between the students' CAP results and the final year-end results?
- What inferences can be made from the pattern of correlation between these results?

Findings from this research could be useful in improving and further developing a standardised, valid and reliable placement instrument for the FET sector in South Africa.

EARLY IDENTIFICATION OF HIGH RISK STUDENTS AT FET COLLEGES.

In 2007, 368 217 young people wrote the final National Senior Certificate examination at schools (Department of Education, 2009a). About 41600 or 11.3% passed with merit and earned access to tertiary institutions. One would expect to find the remainder of the cohort in institutions for Further Education, but in fact, the opposite is true.

Unemployment and Skills Shortage

The majority of this group, about 327 000 students, are neither working nor in training. MacGregor (2009) explains that: “There were 2.8 million young people not in employment, education or training in South Africa in 2007 – two out of five, 18 to 24-year-olds – and the number could have soared to 3.2 million now.” Cloete, Sheppard, Nel, Stumpf, Papier, Needham, & Leibrandt (2009, p. 13) warned that “Having almost 3 million youth between 18–24 unemployed and not in education or training, points not only to a grave wastage of talent, but to the possibility of *serious social disruption*.” (Italics inserted).

Ironically, in spite of the fact that more than 300 000 school leavers completing high school remain unemployed every year, the Department of Labour experiences a huge deficiency in skilled labour, and it seems as if they opt to make use of foreign skilled labour to meet those needs. The Department of Labour (2003, p. 2) stated that in order to fill the need for skilled workers, they would: “Facilitate(ing) the recruitment of skilled foreign workers in areas of critical skills shortages, while ensuring the concurrent development of South Africans in those fields.” Cloete et al. (2009) also highlight the importance of providing vocational guidance to support the unemployed school leavers to help them select a career in line with their interest, according to the critical and scarce skills shortages in South Africa.

A new College qualification

On a national level, the Department of Labour (2003) identified huge skills shortages. The discrepancy between the enormous number of unemployed young people and the skills shortage in South Africa (Skills Portal, 2008; Fin24.com, 2007; Daily Dispatch, 2007) resulted in the Department of Education launching a new vocational qualification, the National Certificate (Vocational). This National Certificate has as its purpose to provide students with a training opportunity to obtain different vocational skills on NQF level 2-4. Gower (2009, citing Cloete *et.al.*, 2009,) explained that: “In 2007, 508 600 youths had not reached grade 10; and almost a million left school after completing grade 10.” Because the minimum entry requirement to register for the NC(V) is the

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possession of a grade 9 certificate, this is a much needed solution to the unemployment and skills problem. Cloete *et al.* (2009, p.13), further supported the implementation of the NC(V) as a post-grade 9 qualification: “This is not only an enormous waste of educational resources, providing 10 years of education and then not completing the final two years, but it is also the group that seems the most vulnerable to unemployment.” This is an interesting shift in emphasis if one considers the fact that grade 9 was decided upon as the official school leaving age a few years ago, and government decided that their responsibility in education would end at grade 9.

When these new qualifications were introduced in 2007, it gave young people older than 16 years the opportunity to study towards a specific, vocationally orientated qualification. Unfortunately this also means that young people are now forced to make a vocational choice at the tender age of 15 or 16 years.

National throughput of Students studying towards the NC(V)

The new NC(V) is a three-year qualification that is equivalent to a grade 12 Senior Certificate level. Poor throughput and certification of students who have entered colleges at NC(V) level 2 is a major issue, in addition to the problem of unemployed, uneducated young people. Statistics of the enrolment numbers of students (see fig.1) at all the FET colleges nationally reflect that about 80% of the level 2 students do not reach level 4 within the allotted two years. Figure 1 below reflects the number of full time students who were registered between 2007 and 2011, released by the Department of Education. The growth in Level 2 registrations is mainly the result of the marketing initiative by colleges, but there are a number of repeaters as well.

Of the 25 073 NC(V) students who registered for level 2 in 2007, less than 20% (4991) registered for level 4 in 2009 which indicates a non-certification¹ of about 80% of the students for whom English is a second language (L2 students). The same applies to the 51173 students who registered for level 2 in 2008 – only about 20% (9489) of the

¹ Certification of students relates to the number of subjects passed in a year. Certification for NC(V) means 7 subjects passed and Progression means 5 or more subjects passed to move on to the next level.

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original L2 students registered for level 4 in 2010. This indicates that only about 1 out of every 5 students that registered for level 2 reaches level 4 within the prescribed time

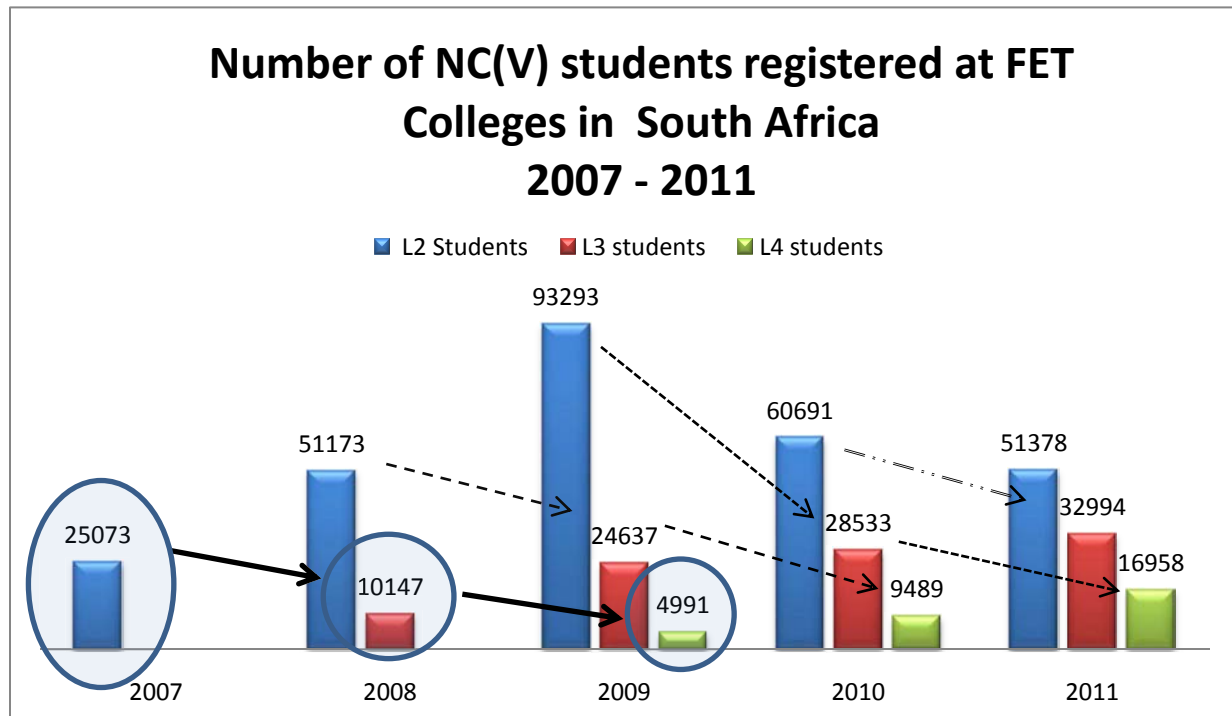


Figure 1: Number of NC(V) students registered at FET Colleges in South Africa, 2007 – 2011. (Source: Department of Education National statistics: 2007, 2008a, 2009a, p. 19, 2011a & 2011b)

frame. Four out of five students either failed the exams or dropped out during the three year period. As table 1 only reflects the number of students who registered in January every year, it is not possible to see, from this information, how many students are repeaters, nor how many did not write the final examination.

Figure 2 below indicates an analysis of the throughput of students who registered for NC(V) level 2 programmes at FET colleges in South Africa in 2009. For the three subjects analysed, namely English First Additional Language, Mathematics and Mathematical Literacy, it is evident that about a third of students who registered in January were absent at the end-of-the-year final examination. When the difference between the number of students registered in January on a national level, and the number of examination papers written (as reflected in the national examination results for 2009,

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Department of Education, 2009), is analysed, it indicates a loss of about 35% of students registered for English Language during the year, and reveals that about 30% of the Mathematical and Mathematical Literacy students did not even attempt the final examinations.

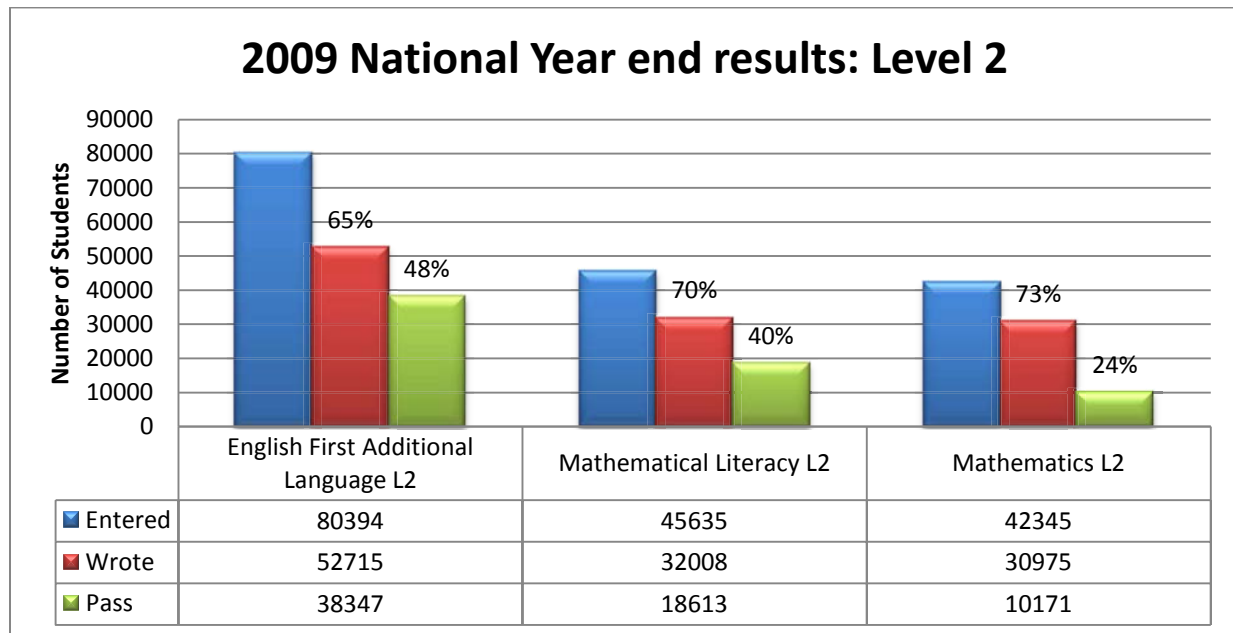


Figure 2 : 2009 National Year end Results: Level 2. (Source: Department of Education, 2010)

The passing rates indicate a similar trend. A little less than 1 out of 2 students of this cohort passed the English examination, while about 2 out of 5 students passed the Mathematical literacy examination, and only about 1 out of 4 students who registered for Mathematics in January 2009, passed the final examination in November 2009.

If one could argue that the English first additional language examination numbers reflect students who left colleges during the year, it implies that 35% or about 28 000 students failed in their bid to gain skills. Furthermore, if the students who failed left the system and did not return to repeat the academic programme the following year, it implies that more than 50% or about 42 000 students possibly returned to the unemployed status.

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The poor pass rate was also mentioned by Papier (2009) when she found that 80% of the Level 2 students in 2007 were not certificated² because they had not passed all 7 subjects. This means that about 20 000 young people experienced failure which could have been prevented to a certain extent, if FET colleges could provide proper vocational guidance and support.

Causal factors for leaving college.

Papier (2009, p.14), identified three categories of factors that “contributed to poor academic performance and attrition.” These were programme- related factors, learner-related factors and college related factors. Reasons found a year earlier by Maharaj (2008, p. 65) can also be categorized under these headings:

- **College related factors:** Under-qualified lecturing staff and negative attitudes among lecturers
- **Learner related factors:** Finances, health, attitude, problems at home, death, and a job offer
- **Programme related factors:** Difficult subjects, poor results, teaching methods, statistical methods used to calculate results and subject terminology.

Contributing factors identified by other researchers also fall into the categories suggested by Papier. For example, under ‘Learner related factors’ Kush & Cochran (1993) investigated the effect that broken families have on student retention, and Meintjes, Hall, Marera and Boulle, (2009) investigated the challenges of child-headed households relating to retention of students. Grant and Hallman (2006) found a 60% drop out from school in the age group 14-24 years related to the incidence of youth pregnancies.

Vocational guidance prior to registration

Because of the high unemployment rate or absence of significant supportive adults, students have little knowledge of the world of work and hence, limited exposure to jobs.

² Certification indicates a total pass of all 7 subjects per year.

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As a consequence, they may decide on a study programme or vocational qualification without knowing what the career really entails.

This demonstrates the lack of proper support prior to registration, and the need for an instrument to support students and colleges in guiding the students in the right direction, is now emerging.

RATIONALE FOR DEVELOPMENT OF THE CAP TEST

A year before the publication of the Student Support Framework (2008) and only a few weeks into the academic year after the new NC(V) intake in 2007, I was, in my role as manager of Student Support services at a rural FET college, bombarded with non-performing students referred to me by desperate lecturers. By interviewing the students, it was discovered that:

- Some students were emotionally immature and not yet ready to cope with the freedom of the college time table.
- Some students refrained from attending classes because they felt inadequate to cope with the learning material. Students didn't understand the work or they felt they didn't have the necessary knowledge and academic skills to cope with the work.
- When registering for a specific programme, some students didn't realise exactly what the field of work entailed, and, when they did discover what the programme involved, decided that they didn't like what they were doing. During my professional career as career guidance counsellor I had many interactions with young people who had misconceptions about a vocation. Arguments such as "I want to study Hospitality because I want to work in a hospital" was not uncommon, and when asked why a student wanted to become a chartered accountant, students often explained that the reason for their choice lay in the fact that the chartered accountants that they knew, owned expensive motor cars. Sadly, usually these explanations come from students who had dismally failed Mathematics, English or accounting. It was obvious that the majority of

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students came to register for programmes without having a full understanding of what exactly they would do after completing the qualification. The lack of knowledge of the world of work could not be addressed in the short interaction that lecturers have with them during the registration period.

- Some students enrolled for a specific programme out of obedience to a parent, or following advice from lecturers. Some lecturers themselves were ill-equipped to guide prospective students. A senior lecturer was once overheard - advising a young lady to register for a management assistant programme simply because, according to him, she 'looked like a secretary'.

It was in the early weeks of 2007 that the need for a screening and placement instrument became evident. The instrument should address the two challenges highlighted in figure 2 and 3 above: Firstly, that students tended to exit the college before the end of the academic year, and secondly that they would attempt to write the examination but fail the year (possibly because their academic foundation was not adequate). Avoiding this was precisely what the Department wanted the following year, namely to help the students to make an informed career or study programme choice, and to assist the colleges in the early identification of students who were at risk of failing the year-end examinations. Hence, a tool was needed to become part of a guidance process to identify and eliminate most of the possible hurdles as early as possible, so that students would be able to complete the qualification (Kim & Suen, 2003).

This tool should have four characteristics: It should be a screening instrument, not a registered standardised psychometric instrument, mainly because of the large number of students and the small number of registered testing professionals. Secondly, the instrument should not take as long as psychometric evaluations to administer, and thirdly, it should be able to identify high risk students with the focus on remediation rather than selection. Lastly, of course, the purpose of this instrument should be, in the words of Bohlmann (2005, p. 363): "not to function as a gate-keeping device, but to be able to advise potential students..."

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Description of the CAP test.

The CAP Test consists of three subtests: The English Competency test, the Mathematics Competency test and the Career Interest Questionnaire. The English and Mathematics Competency Tests measure which NQF Level 1 outcomes a prospective student has mastered, as the Department of Education (2006) determined NQF Level 1 (or school grade 9) as the entry criteria for NC(V) Level 2. The Career Interest questionnaire indicates a student's interest in one or more of the 14 vocational programmes offered by the FET Colleges.

The test can be administered as a pen-and-paper test or a computer-based test. It takes about two hours to complete, and consists of multiple choice questions. These responses have to be captured by the test administrator, onto the computerised data base, in order to be marked. In administering the computer-based test, the results are immediately available after the completion of the test.

The NC(V) Programme Interest Questionnaire³

The current situation in the FET sector is that students may enter the FET colleges after passing grade 9. In South Africa, the average student turns 15 years old in grade 9. Because students can, at that point, exchange the main stream high school grades for the vocational qualifications at FET colleges, it becomes progressively more difficult for them to reverse a wrong decision later by returning to main stream education. After taking the option of vocational training, it is very difficult for them to take another direction if they feel that the direction chosen was not an appropriate choice. Unfortunately, at this tender age, young people are not likely to be emotionally equipped, nor have they the necessary exposure to the world of work to make proper and informed career choices. A young person, finding her- / himself in this situation, needs all the support that s/he can get in order to make this significant decision.

³ The Interest Questionnaire was outside the focus of this study, but this description is included as it was part of the development of the CAP test.

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The test developers understood that an informed choice can be made once a person has, and understands information about different careers. Therefore the career questionnaire provides, as a point of departure, as much information as possible, before asking a student if he would be interested in a specific career. The Career Interest test items enhance the understanding of career information by including coloured photographs of people engaged in such jobs. Care was given to cultural diversity and to the language levels of the questions.

Format of the questions.

The Mathematics test and the English test have multiple choice-questions. Amongst standardised tests globally, the practicality and time efficiency of multiple choice questions make this pen-and-paper format the most popular way to test individuals. (Wagner-Welsh, 2008). It is just too mammoth a task to test a huge number of students, and to mark and interpret their results in the short registration period, if the placement instrument requires answers in students' own words, although that would give a more reliable indication of the candidates' expressive language skills. Where students select one out of four possible answers, there is always a 25% possibility that the response to a question is correct because the candidate has guessed it rather than selected the correct option based on knowledge. However, the multiple choice format was chosen because the many advantages outweighed the disadvantages.

SUMMARY

This chapter explained the need for an instrument that would help students to identify their career of choice, as well as early identification of students at risk of failing the first NC(V) year. Research into the validity of CAP test as an early high-risk screening instrument is guided by one main research question:

- Is the CAP test a valid predictor of FET College students' academic success?

Two sub questions will be investigated, namely

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- What is the extent of the correlation between the students' CAP results and the final year-end results?
- What inferences can be made from the pattern of correlation between these results?

In the next chapter, five basic assumptions that serve as a foundation for aptitude testing as well as some fundamental research paradigms will be discussed, followed by a closer investigation into placement testing as a popular international phenomenon. Lastly, literature on the validity of placement instruments will be briefly explored.

CHAPTER 2

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

This section explores what has been written on the topic of placement assessment, by focusing on three issues. First, the conceptual framework of this research will be discussed. Secondly, placement testing is investigated as a common topic that is internationally discussed in psychological and humanities literature. Although the use of placement instruments is a common phenomenon internationally, it is a new occurrence in the FET sector in South Africa, and the limited available literature on local research in the field, will be explored. The chapter ends with a brief discussion on the validity of placement instruments.

CONCEPTUAL FRAMEWORK

Much has been said about quantitative, qualitative and mixed method approaches to research in education, and the consequential “paradigm war“ (Niglas, 1999), that peaked in the 1980’s. Thomas Kuhn (1962, cited in Johnson & Onwuegbuzie, 2004) defines paradigm as “...a general concept...” which “...included a group of researchers having a common education and an agreement on ‘exemplars’ of high quality research or thinking”. In transcribing century-old ideas, Mkele (1953) identified a framework for understanding aptitude testing as a prediction of achievement. This articulates the assumptions that form a basis for understanding and interpreting all testing relating to learning since the Chinese began with the earliest recorded ‘competency testing’. In 2200 B.C. Chinese scripts recorded “formal oral tests of knowledge; after three such examinations, officials were either promoted or fired” (DuBois, 1970, cited in Sax & Newton, 1997, p. 3). Figure 3 below shows Mkele’s basic assumptions.

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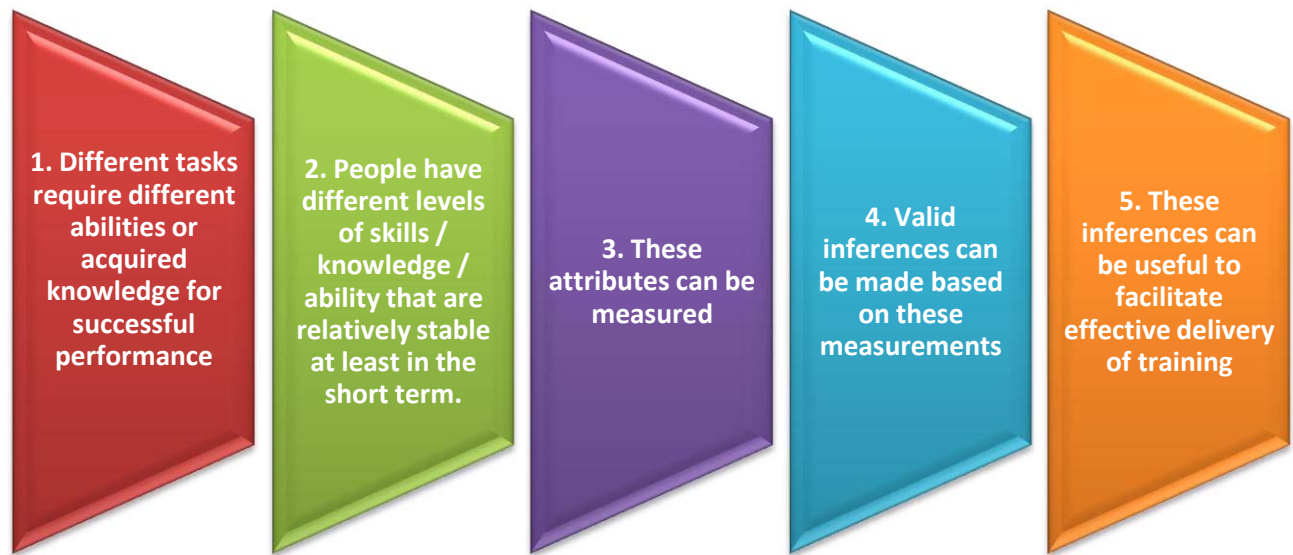


Figure 3: Mkele's Basic Foundation Assumptions. (Adapted from Mkele, 1953, p. 2)

The same assumptions apply to different jobs or educational levels that require different skills or knowledge, today. The CAP manual states that "A prerequisite of the National Certificate (Vocational) (NC(V)) Level 2 is that prospective students must have passed Grade 9 or achieved an equivalent qualification on NQF Level 1" (CAP, 2007, p. 2). Based on Mkele's framework, it can be concluded that in order to embark on the NC(V) level 2 programmes, a student needs a certain level of knowledge and skills, which

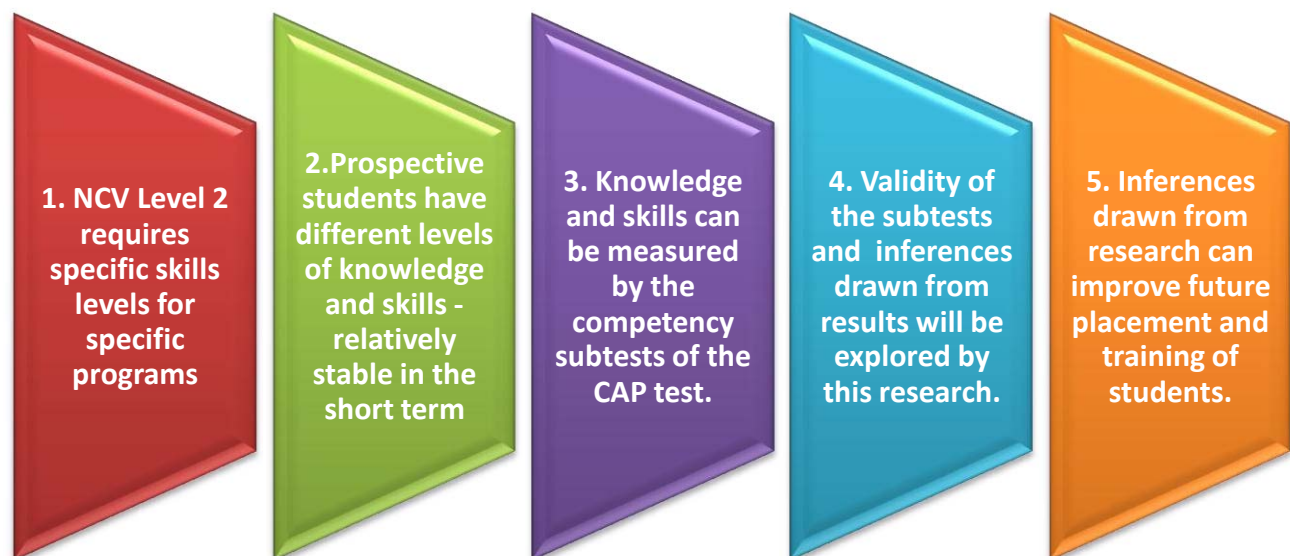


Figure 4: Five Assumptions for this research. (Adapted from Mkele, 1953, p. 2)

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could be demonstrated by successfully completing a grade 9 examination. Mkele's third assumption speaks to the issue of measurement of competencies. Jagers and Hodara (2011) also address this issue in an "opposing forces framework" (Jagers & Hodara, 2011, p. 3) for understanding developmental assessment and placement. Developmental assessment and placement imply assessment for referring prospective students to a bridging or foundation programme prior to registration for the full time formal qualifications, and as such has a similar purpose to that of placement testing at FET Colleges. Of the three continuums that form the basis of the opposing forces framework, the second one is very relevant to Mkele's third assumption:



(Jagers & Hodara, 2011, p. 6-7)

The second continuum of opposing forces addressed the issue of *Effective* versus *Efficient* assessment. A massive administrative exercise of testing a large number of students during a very short period at the beginning of a registration cycle can be a very effective exercise, because most of the students will be assessed. The weakness of this exercise is that standardised testing does not allow for the individual differences and identification of each student's strengths and weaknesses. Effective assessment where the needs of individuals will be properly identified is a time-consuming process which is costly in terms of manpower as well as resources.

For the purpose of this thesis, the second differentiation between the effectiveness and the efficiency of the CAP test is relevant as it gives a qualitative and reliability meaning to the assumptions of Mkele. As indicated in figure 4 above, Mkele's assumptions form a conceptual framework for this research. The Pearson product-moment correlation between students' scores on the CAP test and their scores in year-end results indicate the extent to which these scores are linked. It can be inferred that the

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higher the correlation between the CAP score and year-end results, the more closely they are linked and the more certain a conclusion of prediction can be made.

Furthermore as Mkele explains, inferences can be drawn from the assessment results. These inferences can be criterion-referenced, norm-referenced, or based on Messick's progression matrix⁴ (which will be described later in this chapter in the section on validity). For the purposes of this research report, can the information based on the inferences be used not only in the placement process, but also to improve the training of the students.

PLACEMENT TESTING IN SOUTH AFRICA

Placement testing research in Higher Education

In this country, studies on placement testing have mainly been carried out at universities. The need to predict academic achievement in South Africa was echoed in studies by Zaaiman (1998, p. 9) and Jacobs (2010) who both found that grade 12 school results are "...not to be viewed as a flawless predictor of university achievement" (Jacobs, 2010, p. 214). In an endeavour to improve throughput and academic success by exercising enrolment management and following international trends, academic institutions in South Africa started to research the implementation of placement testing as a predictor of academic performance (Zaaiman, 1998; Koch, Foxcroft & Watson, 2001; Wagner-Welsh, 2008; Bohlmann, 2009; Jacobs, 2010, and Lemmens, 2010). Well known studies by the College of Science at the University of Witwatersrand (1990 & 1997), the Teach-Test-Teach programme of the University of Natal (1993) and the Alternative Admissions Research Project of the University of Cape Town (1997) (Zaaiman, 1998) did groundbreaking work in moving the focus from using senior certificate results to pre-registration testing of disadvantaged students.

⁴ Messick focuses on the validity of inferences made in the interpretation of scores, and suggests that validity is viewed as a progressive matrix.

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Apart from focusing on the prediction of academic success with the aim of improving the success rate of first year students at universities, researchers in the field also explored topics such as academic predictors at schools (Scherman, Archer & Howie, 2006, and Marais, 2007), placement test for Recognition of Prior Learning (Blunt, 2000) and research on the shift from selection to placement testing at the University of Port Elizabeth (Koch *et al.*, 2001). Most of the above research projects focused on placement in Higher Education at universities and Universities of Technology. As the majority of school leavers do not qualify for programmes at Higher Education Institutions, the issue of placement testing at FET Colleges is highly relevant.

Placement testing research in Further Education.

There is almost no empirical research that has been done on placement testing in the Further Education and Training Colleges, except for a very recent study by Adams (2011) which was an impact study of the CAP test. That there is so little research available on placement testing in the FET sector is primarily due to the fact that placement testing was only introduced to FET Colleges in November, 2008. Unfortunately the research study by Adams (2011) has some flaws which compromise the findings. For example, although the dissertation apparently sets out to examine the impact of the CAP test, the initially stated objectives were to "...obtain evidence of the apparent poor performance of learners within the NC(V) programme" and "to ascertain whether the CAP intervention was implemented effectively so as to improve the current learner performance" (Adams, 2011, p.19). Instead of carrying out these aims, Adams primarily focuses on the shortcomings of the CAP test. This is unfortunate, as there is very little academic research available on the FET sector and a better directed study would have made a stronger contribution to the field. The implementation of placement testing at FET Colleges is still at a very early stage and much empirical research and forthcoming development is needed.

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Vocational mobility and Job restriction.

Vocational guidance was hampered by racial and gender discrimination. Career development opportunities and promotional positions were in the main implicitly earmarked for white men. For a very long time women could not break through the glass ceiling in their work environments, and even when they were promoted, they did not earn salaries equal to their male counterparts (Winter, 1999).

The Employment Equity Act No. 55 of 1998 ensures access for all population groups to all the different career fields at all levels, in contrast with the tradition of “job exclusivity” that was established by historical factors and legislation. For example, acts such as the The Group Areas Act, Act No 41 of 1950, Extension of University Education Act, Act No 45 of 1959 and Bantu/Native Building Workers Act, Act No 27 of 1951 made provision for selective training and employment based on population and ethnic classification. Hence the way in which people were forced to spend their days and lives, depended on decisions made by other people. These decisions were based on colour, race, gender or belief, and serve as a sad foundation for vocational guidance today. Access policies in tertiary institutions now favour previously disadvantaged groups, and there is emphasis on the employment of the previously disadvantaged. However, the basic supporting actions in the process of making a career choice have not yet received much attention, and with little state provision of psychological services to schools, it is obvious that professional career guidance is still restricted to higher income groups that can afford the services of registered career guidance counsellors.

To address this shortcoming and support prospective students in selecting a career, the Department of Education emphasised ‘Pre-entry support’ in the Student Support Framework, published in 2008.

PLACEMENT INSTRUMENTS

The use of a placement instrument to support students before they enter tertiary institutions is common international practice. These placement instruments predominantly focus on academic support. However, until 2007 it was not common practice amongst FET Colleges in South Africa to use placement tests to guide students in making a career choice, although a few questionnaires, such as the MENTOR and ELSA were used at one or two colleges. Universities had by then already embarked on validity and reliability research on the use of placement instruments, such as the Teach-Test-Teach (TTT) programme of the University of Natal and the Alternative Admissions Research Programme (AARP) of the University of Cape Town (Zaaiman, 1998). In response to this lack, the Competency and Placement (CAP) instrument was developed in 2007 with the purpose of identifying skills gaps so that colleges would be able to render focused academic support to students, and to help students to make an informed career choice.

Placement tests versus Psychometric tests

The question arises as to what the difference between a psychometric test and for example a school Mathematics test used for placement purposes is. Psychometric instruments reveal relative stable valuable information about the individual that can assist in training choices opposed to levels or the extent of knowledge gained. The use of psychometric instruments in vocational guidance is common practice all over the world but cultural bias and its implications for validity is constantly a hotly debated issue. In South Africa there has been little change in the development and use of psychometric instruments in vocational guidance services since the end of apartheid, and issues regarding the validity of the tests for different population groups, remain a profound concern. Ten years after the end of apartheid, Foxcroft, Paterson, Le Roux and Herbst (2004) found that psychologists still experienced a need for tests that are valid and fair in a cross-cultural context. There are very few tests available in African languages: "We use tests for training of psychometrists. A wide variety of tests are used. The problem is that very few tests are available for use with the Sotho-speaking population" (Foxcroft *et al.*,

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2004, p. 56). They found that there is often a difference between the language of the practitioner and the client. If the client doesn't understand the practitioner or the test questions, the validity is compromised and the results are unlikely to reflect the true ability of the client. According to Foxcroft *et al.* (2004), this seriously compromises the practice of fair assessment. The graph below indicates the difference between the client's home language and the test communication language. The question that immediately comes to mind is that if this is the case 10 years post-apartheid, how much more did language restrict vocational guidance prior to 1994?

The figure clearly demonstrates that almost no testing is done for speakers of indigenous South African languages although they are the majority of the population. For the Xhosa and the Zulu group there is some testing and the graph indicates that for them testing takes place in a language other than their vernacular.

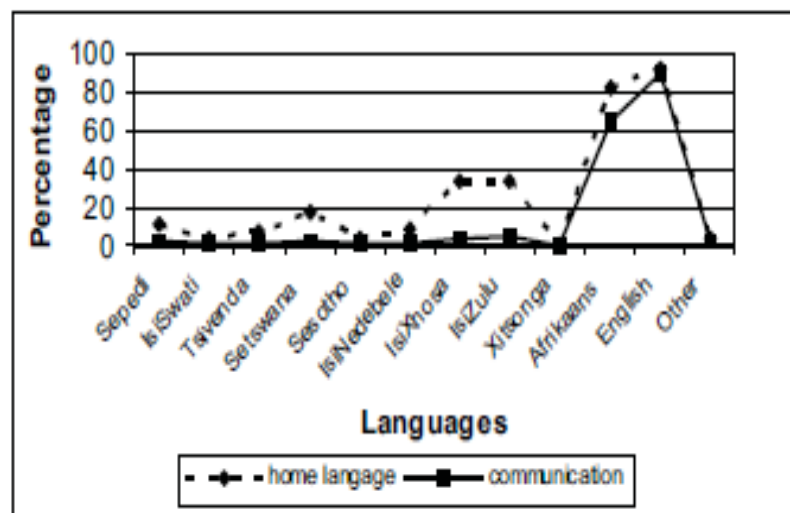


Figure 13: Language of communication and home language of client. (Foxcroft *et al.*, 2004, p. 14)

Apart from language, there are other reasons that make the use of psychometric instruments very difficult. We scrutinised different psychometric tests that appeared on the Health Professions Council of South Africa (HPCSA) list of registered tests, but found that there were no tests that could be used for placement testing purposes, due to the following reasons:

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- Most of the psychometric tests are standardised for middle class western culture respondents, and thus not suitable for students who come from backgrounds that are different from this. For example, many of the prospective students from the rural parts of KwaZulu-Natal have grown up without a television set or a computer in their homes, and without much exposure to newspapers or other media. If a psychometric test contains a question e.g. on Human Resources Management, the individual might have no background knowledge to bring to bear in understanding the question. If a question states “I would rather create advertisements for magazines”, how much does the potential student understand of careers in the printed media?
- Only people registered with the HPCSA as registered psychologists, psychometrists or counsellors may administer these tests. Very few of these professionals were appointed within FET Colleges at that time, thus the services had to be outsourced, with high cost implications. Although a psychometrist or registered counsellor could administer the tests, it is virtually impossible for one person to test an intake of 500 – 600 students during the very short period of registration. Computerised tests might have solved this problem, but imposes a new challenge, namely that most of the prospective students were, at the time of testing, unfamiliar with computers and simply did not have the skills required to take computerised tests.
- During the apartheid years, psychometric tests were used to identify the right employee for a specific job, but these tests became instrumental in excluding people. Perhaps partly as a result of this, and partly because of a general fear of testing, there is a negative perception amongst the public relating to the purpose and use of psychometric tests.
- Individual psychological testing is costly, which implies the exclusion of lower income groups. As the pre-1994 income spread reflected the racial differentiation,

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these services were generally used by higher income groups and were not within the reach of financially depressed members of the public. The Colleges and students cannot afford these expensive tests.

- Administration of the tests is time consuming – proper career guidance assessments can take up to 5 hours or more.

In South Africa, the Health Professions Act Nr 56 of 1974 section 37(2) addresses the issue of psychological practices such as psychological testing and assessment. The Health Professions Council of South Africa (HPCSA) guards the classification and the use of psychological instruments, and published a policy (Form 208, updated 01 June 2010) on the classification of psychometric measuring devices, instruments, methods and techniques. Form 208 further elaborates on the classification of psychological tests. Neither Act 56 (1974) nor Form 208 clearly differentiates between psychological tests and non-psychological tests, but form 208 (2010, p. 2) explains that tests that measure a psychological construct, such as cognitive functioning, interest, aptitude and attitude, must be classified as psychological tests. The Psychometric Committee of the HPCSA should advise the Board according to the following considerations:

Classify and advise on regular revision of any device, instrument, method, technique or test aimed at aiding persons or groups of persons in the *adjustment* of personality, emotional or behavioural problems or at the *promotion of positive personality change, growth and development* or for the *determination* of intellectual abilities, personality make-up, personality functioning, aptitude or interests (HPCSA, 2010, p. 2) (Italics inserted)

Form 207 (HPCSA, updated June 2009, p. 3) lists all the classified and registered psychometric instruments in South Africa. Furthermore, it highlights the responsibilities of test administrators regarding non-classified tests:

1. Some important issues need to be pointed out to the users of psychological tests, measures, and instruments: Test users may find that many tests that are currently in use are not on the list. In such an instance it means that they are either currently under classification consideration or they might not have been submitted for classification

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purposes to the Psychometrics Committee. The onus rests on test users to refer such tests to the Psychometrics Committee, even if they were developed overseas; and

2. It needs to be noted that even though a test may be classified as a psychological test, the onus rests on the test user to ensure that:

- * the test is valid for the purposes for which it is being used;
- * appropriate norms are consulted; and
- * where tests that have been developed in other countries are concerned, appropriate research studies need to be undertaken to investigate whether the test is culturally biased and special care should be taken when interpreting the results of such tests (HPCSA, updated June 2009, p. 3).

Within this study, psychometric tests are defined as tests that measure a psychological construct, such as cognitive functioning, interest, aptitude and attitude, in line with the policy of the Health Professions Council of South Africa (HPCSA). Naglieri *et al.* (2004, p.14) made an important differentiation in the context of computerised psychological testing. According to them, testing refers to the administrative function of completing of the questionnaire, with the focus on the individual test itself. Psychological assessment refers to the process which may include more than one tool such as tests and interviews as well as interpretation of different sources of information, such as educational qualification and personal history in addition to the profile developed by the test questionnaire. The focus here is on the integration and interpretation of data in the assessment process with the goal to answer the referral question/s. (Naglieri *et al.*, 2004, p.15).

Of course, the ideal in placement testing would be to make use of standardised psychometric instruments but amongst the 30 colleges who participated in the survey mentioned above, there were only three (10%) who had trained professionals (i.e. a psychologist, psychometrist or registered counsellor) on their staff to oversee the testing process. The result was that at 90 percent of the participating colleges, testing as part of advisory services was administrated by people who were not professionally qualified. Furthermore, testing with the purpose of admitting or excluding students from programmes was done by staff members who were not trained to do this.

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It is clear that there is no uniform, standardised way of testing prior to registration at FET colleges in South Africa and this highlights the inconsistency of admission criteria amongst the colleges. It is possible that a student, who is excluded from one college for a particular reason, may easily be accepted at another. One of the advantages of placement testing is that it serves as a standardized form of measurement. Nevertheless, in spite of this advantage, the legacy of South Africa's sad political history is that students who are making important life decisions have very erratic levels of support. A large portion of the student population in South Africa, especially at Further Education and Training Colleges, are either not guided in the process, or guided by unethical processes and unqualified people.

Selection, entrance, access, admission or placement tests

Tests as gate-keeping tools: As can be deduced from the extensiveness of research reports by Scherman et al. (2006); Marais (2007); Blunt (2000); Lemmens (2010) and Bohlmann (2009), a lot of money has already been spent to ensure the development of a useful, valid and reliable South African placement instrument, with the purpose of predicting academic achievement. Clearly, institutions nationally and internationally have placed a high value on the predictive nature of the placement test, in other words, the tests' ability to give an indication of the likelihood that a student will successfully complete his/her course. Many institutions use such tests, commonly known as Selection, Entrance, Access or Admission Tests, as part of their admission protocol. For example, the selection policy of the Health Sciences faculty of the Johannesburg University, states that:

If you are applying to the Health Sciences, you will not be selected solely on your school leaving results, although they are very important. A composite index is calculated, taking into consideration (1) your academic results for FIVE subjects; (2) Health Sciences Consortium Test scores; (3) the score achieved for the Biographical Questionnaire. (Wits University website, 2010)

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Tests as diagnostic tools: Some researchers find the exclusion of students from programmes, unacceptable. Koch *et al.* (2001) and Bohlman (2009) argue that placement testing should oppose gate-keeping at entry, and should focus on the developmental and enabling value that it could have for a student. For these researchers, the predictive function of a placement test should be utilised as a *supportive* academic indicator, rather than an exclusion indicator. They advocate the use of placement tests to assist a student to select a specific vocational field, and/or to identify the skills gap that must be closed in order to complete the course. The focus is to identify the level of support a student might need in order to bridge the skills gaps. Higher Education South Africa (HESA) endorses the use of the standardised National Benchmark Test (NBT) to identify the level of a prospective students' readiness to enter Higher Education but "The NBT also provides information to assist in the placement of students in appropriate curricular routes (e.g. regular, augmented, extended, bridging or foundation programmes) and with the development of curriculum for Higher Education programmes." (NBT website, 2011).

Lemmens (2010) supports the stance on a placement test as a diagnostic supportive instrument. The Academic Readiness Questionnaire developed by him is aimed at early identification of possible high risk students, and should be administered early in the academic year. The purpose is that identified students can be supported as soon as possible in order to minimize attrition, improve throughput and the successful completion of their qualifications.

Definition of placement tests

Although selection, entrance, access or admission tests focus on exclusion of some students, South African policy is that placement tests should focus on inclusion of all students. Sax and Newton (1997) differentiate between selection and placement tests on the basis of when they are administered. Selection tests are administered prior to placement, and acceptance is based on the results. According to them, placement tests are administered after selection, and are used for the purpose of differentiating placement levels or categories. This is a popular practice, for example at the International House in

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Newcastle, in Newcastle upon Tyne, UK (2006) where the placement test is used to identify the correct level at which a student should be placed.

The definition of a placement test should lie in its purpose. As it could be utilised for a dual purpose, it is suggested that a placement instrument will be defined as: *a diagnostic evaluation of a person's skills and competencies at a specific moment, with the purpose to predict possible achievement in future*. Once the prediction is determined, a decision can be made to either take supportive action, or to consider exclusion.

Therefore, although selection, entrance, access or admission tests focus on exclusion of some students, placement tests should focus on inclusion of all students, and on academically supporting the student. With the main focus on supporting the student, the CAP test was developed as a placement instrument:

The purpose of the test is not to exclude students from the FET sector, but rather to assist the College in placing prospective students that have the fundamental skills in appropriate vocational fields. Thus, the focus is to identify the level of additional academic support some students may require (CAP, 2007, p. 2).

It should be noted here that the same instrument could be used as both a selection and a placement tool. Although the Academic Readiness test of Lemmens (2010) has as its purpose to determine the readiness and support the non-ready students, it is unavoidable that it would also identify students who need so much support that the financial investment needed to educate them is not viable. In the FET sector in South Africa, there is continuous pressure from lecturing staff to use placement tests at FET colleges in South Africa as part of a selection process in order to exclude such students, although exclusion is currently not part of the admissions policy at most colleges.

VALIDITY AND RELIABILITY

For a test to be effective, it needs to be valid and reliable. Validity, according to many authors (Ghiselli, Campbell & Zedeck, 1981; Walsh & Betz, 2001; Popham, 2000)

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basically means that a test measures what it is supposed to measure. Types of validity particularly relevant to this study are:

- Content validity, which is generally understood as whether a test measures what it aims to measure,
- Construct validity, which is generally understood as the extent to which what is measured matches people's understanding of what it measures, and
- Predictive validity, which is where criteria that are available or easily acquired (for example test scores) can be confidently used to predict some future outcome (Walsh & Betz, 2001).

Validity of Placement Tests.

Although differentiation between, and classification of the different types of validity support the endeavour to come as close to true validity as possible, Kane (2001, p. 319-342) points out that "the criteria for evaluating validity evidence were still in doubt", and therefore suggests that there should rather be a broad, general definition of validity. The concept of validity has evolved extensively over the last few years (Moss, 1992, in Gere *et al.*, 2010), and according to Gere *et al.* (2010), this shift developed to include evidence of social and personal consequences and values. This stance was also supported by Cronbach (1988, as in Gere *et al.*, 2010) and Messick (1995). It was specifically Messick who supported the idea of a broad general view on validity and criticized the classification of validity as insufficient because it "fails to take into account both evidence of the value implications of score meaning as a basis for action, and the social consequences of score use." (Messick, 1995, p. 741). This is relevant as this research, focusing on placement tests as a predictive tool of future achievement of students in a college, would be senseless if the knowledge is not used in the interpretation of validity. The underlying ethical question is always: on what basis can this instrument be used to guide and place students? Does this instrument measure what it is expected to, and to what extent can the measured results be used to guide a student's future?

Facets of Validity as a Progressive Matrix

	Test Interpretation	Test Use
Evidential Basis	Construct Validity (CV)	CV + Relevance/Utility (R/U)
Consequential Basis	CV + Value Implications (VI)	CV + R/U + VI + Social Consequences

Figure 6: Facets of Validity as a Progressive Matrix (Messick, 1995, p. 748)

Messick’s suggestion evolved from the earlier understanding that a test is valid if it measures what it is supposed to measure. He argues that this is a limited viewpoint and that validity is actually a unification of contextual, substantive, structural, generalizable, external and consequential dimensions (Messick, 1995, p. 741). Messick’s Progressive Matrix suggests that construct validity is a culmination of evidence in the interpretation of the test results.

Reliability

Many authors use the analogy of a ruler versus a stretchable tape measure to explain that a test should get the same results if it is administered repetitively under the same conditions. (Walsh & Betz, 2001; McQueen & Knussen, 2006). A plastic ruler would indicate the same length if something is measured under the same circumstances, but if a tape measure that expands in wet or hot conditions is used, the readings would not remain consistent despite the unchanged length of the object. If the measuring instrument stays the same, one could say that it measures in a stable, repeatable or consistent way and is thus reliable (Walsh & Betz, 2001, p. 47).

It is therefore important, as noted by McQueen and Knussen (2006, p. 139) that to be reliable, a measuring instrument:

- Must be able to measure and detect changes in the variable
- Should not indicate change where there is no change

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- Must demonstrate consistency and stability of test results

Therefore, if a variable changes, the reliable measuring instrument should indicate the change accordingly.

Summary

In this chapter, Mkele's assumptions for testing were discussed and adapted to serve as a foundational framework, and the opposing forces framework of Jagers and Hodara has accentuated an effective versus efficient interpretation of Mkele's third assumption. An extensive literature search revealed very little research about placement testing in FET, but differences or similarities between selection, entrance, access, admission or placement tests were discussed. The reason for choosing placement tests rather than psychometric tests was investigated, and a summary of how literature expounds valid and reliable placement tests was included.

It is necessary to point out that both the research design and methods should be valid and reliable, and this will be discussed in chapter 3. Population and sampling selection will be discussed and the preparation and statistical analysis of the data will be explained.

CHAPTER 3

RESEARCH DESIGN AND METHOD

Prospective students who want to register for NC(V) level 2 must have a certain level of knowledge of English and Mathematics to cope with the academic content of the level 2 curriculum. The CAP test was developed as a diagnostic test with the objective of identifying gaps in the required prerequisite-knowledge. Furthermore, it is useful if a placement test can predict future academic achievement as reliably as possible, in order to plan for the assistance and support of students who are likely to be at risk. The underlying question is always: on what basis can an instrument such as this predict future academic success? If it can do so, can it be used to guide and place students? In other words, does this instrument measure what it is expected to, and to what extent can the measured results be used to guide a student's future?

The reason for finding answers to the aforementioned questions is that it is not only important to know if the test measures what it is supposed to measure, but also whether it can be useful; measurement alone has little value if it cannot be applied. The goal of this correlation study is to determine the extent to which the CAP placement test has predictive value in relation to the NC(V) level 2 students if at all, and to make certain inferences about the correlation patterns. The research value is that this knowledge could be used in the implementation of strategies to improve the throughput of NC(V) level 2 students.

RESEARCH PARAMETERS

There are three different subtests in the CAP test, namely an English competency test, a Mathematics competency test and a Career Interest Questionnaire. This study is concerned with the correlation between the subtests of the CAP English and Mathematics competency test and the final year-end results for the Mathematics literacy and the English subjects.

POPULATION AND SAMPLING

For the purpose of this study, population refers to the entire group of people who might complete the CAP test. The targeted population group comprises all the prospective students who want to register for an NC(V) qualification at any of the Further Education and Training Colleges in South Africa. In 2010, 60 691 students registered nationally for NC(V) level 2 (Department of Education, 2011b). These numbers do not differentiate between first registrations and students who register for a subsequent time. As this study focuses on Boland College, the population for this research is the 1050 prospective NC(V) level 2 students in January 2012 at Boland College.

The sample used in this study is made up of students at one FET College who wrote the CAP test in January 2010 and year-end exams in November 2010, and whose test scores form the basis of this research. Findings will reflect validity only in terms of this group, although it possibly reflects the truth for other colleges where students share characteristics with students at Boland College, and where there is commonality between these other colleges and Boland College.

Boland College was approached with a request to make its data available for this research in 2010, and acquiesced to this request. One of the reasons why the data generated by Boland College in January 2010 and November 2010 are used for the research is because of the personal involvement of the researcher at the college, which made data collection unproblematic, and allowed for good control over the testing procedures and processes.

Overview of the College

Boland College is a rural FET College situated in the Winelands District of the Western Cape Province. It consists of 5 campuses and 2 satellite campuses. Students speak predominantly Afrikaans and for the majority of students English is the first additional language. A lesser number of students speak isiXhosa at home and many of them come from the rural areas in the Eastern Cape, Ciskei and Transkei. There are a number of immigrant students from different countries, amongst them from Namibia,

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Botswana, Greece and China. Students are drawn mainly from the rural towns in the Boland, an area stretching across Struisbaai, Strand, Wellington, Ceres and Robertson. There are hostels at three of the five campuses, and bus transport is also provided to the campuses. The main economic activities in the area are farming such as wine, crop and fruit farming, and related industries such as food processing, export and tourism.

About 4000 full time students are registered in all the programmes of the college. A range of full time programmes are offered on the 5 campuses. There are two entry levels namely post-grade 12 and post-grade 9. Programmes for which the minimum entry requirement is grade 12 include: Management Programmes, Assistant Management Programmes, Hospitality and Catering Services, Early Childhood Development, Tourism, Engineering Studies and Agricultural Studies. National Certificate (Vocational) programmes for which the minimum entry requirement is grade 9 are also offered in the following areas: Civil Engineering and Building Construction, Engineering and Related Design, Electrical Infrastructure Construction, Finance, Economics and Accounting, Marketing, Office Administration, Hospitality, Primary Agriculture, Tourism, Information Technology and Computer Science, and Safety in Society. One specific achievement of note is that the college produced its first batch of wine in 2010, cultivated from vines that were grown by the students.

Part time learnerships and skills training programmes are also available, mainly in response to specific demands of the community and in partnership with SETAs and other small, medium and macro organizations.

Collection and cleaning of the data

Computerised printouts of responses from 1050 students who wrote the CAP test during the registration cycle of 2010 were collected. Some of the results were incomplete and therefore eliminated as spoilt results. Students who obtained a zero per cent score (in the case of the competency tests) or who made incomplete responses (in the case of the interest questionnaire), were eliminated from the original database because this indicated

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that they either did not attempt to answer the test items, or failed to enter their responses correctly on the computer.

The English data: Eventually the data of 320 students who wrote both the CAP test and the final year end examinations in English were used. This comprises 29.8% of the total number of NC(V) level 2 students at Boland College in 2010.

The Mathematics data: Four hundred and ninety students wrote the CAP Mathematics test and Mathematical literacy final year -end examinations. This comprises 45.4% of the Boland College 2010 level 2 cohort. However, the situation for the Mathematics results differs because only 20 students (0.19% of the cohort) wrote both the CAP test and the final year-end Mathematics assessments in 2010. Since 20 is too small a sample for statistical significance, the correlation between the CAP Mathematics and the final year-end Mathematics has been omitted, and only data of the 490 students who wrote both the CAP Mathematical and the final year end Mathematical literacy assessments have been taken into account in judging the predictive validity of this instrument.

BOLAND COLLEGE 2010	Students who wrote the CAP test	Number of students with unspoilt ENGLISH test results	Number of students with unspoilt MATHEMATICS test results
Total	1050	1029	1018

Table 1: Initial Research Participant Numbers

Research Instruments and Data analysis

One of the most ideal methods to find answers to the kind of research questions that characterise this study, is that of the correlation study. McQueen and Knussen (2006) explain that a correlation study is not only a research method, but also a statistical procedure. A correlation design is an accepted method to investigate validity (McQueen & Knussen, 2006) and the bivariate method is used in this research to determine the

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relationship between two variables, namely the results that prospective students achieved in the CAP test and their year-end scores. The strength of the correlation between these variables indicates the degree of predictive validity of the test.

In this study, the predictive validity of different variables is determined by calculating the Pearson Product-moment correlation between CAP scores and year -end results. The following categories were identified:

- The results of the CAP English subtest and the results of the final year-end English Language examination.
- The results of the CAP Mathematics subtest and the results of the final year end Mathematics Literacy examination.
- The above correlations were calculated for different gender, language and culture groups.
- In 2011, a Pearson product moment correlation of the results of grade 9 learners who completed both the CAP test and the PACE test was also calculated. As the CAP test and the PACE test both consists of three subtests, namely English, Numeracy and a Career Interest questionnaire, this correlation indicates validity in that it measures the extent of correlation of the CAP test with another placement test. Both the CAP and PACE English tests are multiple choice and both instruments can be administered as pen-and-paper tests, or as a computerised tool. Both English tests include components of language and comprehension, and no written or oral work is tested. The main difference between the two instruments lies in the numeracy subtest. The CAP subtest is based on grade 9 Mathematics, while the PACE subtest is a Mathematical literacy test.

Response Rate

Many students who wrote the CAP test did not complete the year and were absent during the final examinations. Of the students who wrote both the CAP English and CAP Mathematics tests in January 2010, only 320 attempted the English year-end examination,

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only 20 attempted the Mathematics year-end examination, and only 490 attempted the Mathematics Literacy year-end examination. Table 3 indicates the number of students who wrote both the CAP test in January 2010, and the final year-end examination in November 2010.

Test / Examination Written	Number of students
CAP: Mathematics	710
Final year-end examination: Mathematics	20
Final year-end examination: Mathematic Literacy	490
CAP: English	710
Final year-end examination: English First Additional Language	320

Table 2: Final Research Participant Numbers

Because of the small number of students who wrote the final Mathematics examination, it is clear that the Mathematics database was not big enough to establish a reliable statistic. However, because of the nature of the non-probability sampling model, it could be possible to include test results from other academic years or other groups in future studies, something which was not done for this study.

Sample Characteristics

A critical trait of a good sample is that it should be representative of the total population. (Fox & Bayat, 2007). As data of 710 (67%) of the 1050 students who wrote the CAP test, were used, this is a highly representative sample. According to national statistics (Department of Education, 2011a) this sample is 1% of the total population of approximately 60 000 level 2 students. The following precautions were taken to eliminate sampling errors as far as possible:

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- **Gender** – The number of male and female participants in this study was almost even. This echoes the national statistics of students at FET colleges in 2010, where it is reported that 52% of the students are female and 48% are males (Cosser et al., 2011).

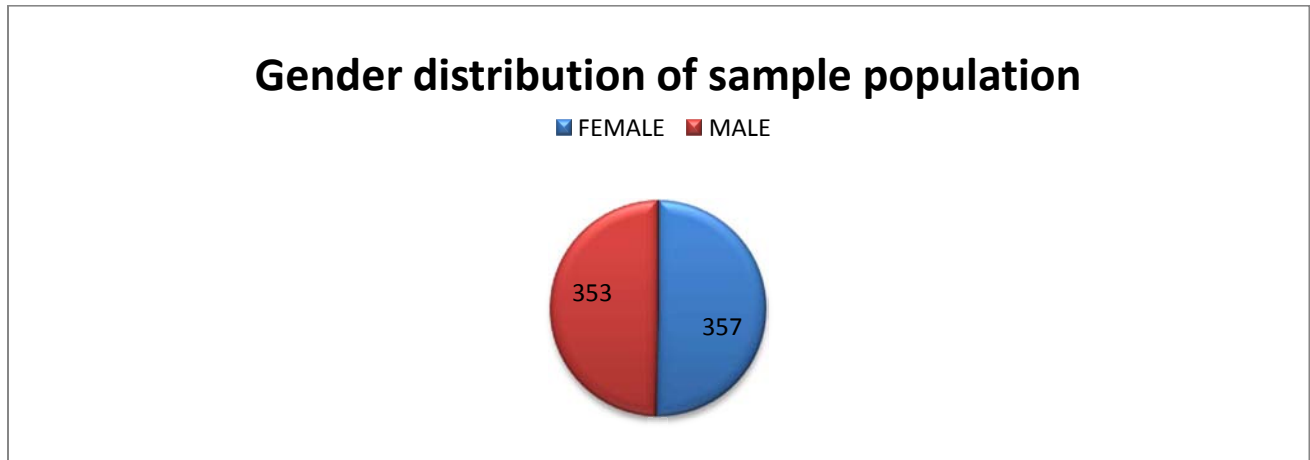


Figure 7: Gender Distribution of Sample Population.

- **Language** - The majority of the students in the sample (70%) spoke Afrikaans as a first language, while the rest spoke either English (11%) or isiXhosa (19%). Although 29% students were Black, many of them indicated their home language as either Afrikaans or English and only 1 student indicated his home language as Sesotho. The CAP test was administered in English which probably was the second language for 89% of the participants. English is the medium of instruction and the respondents on the CAP test scored an average of 50% on the English test.

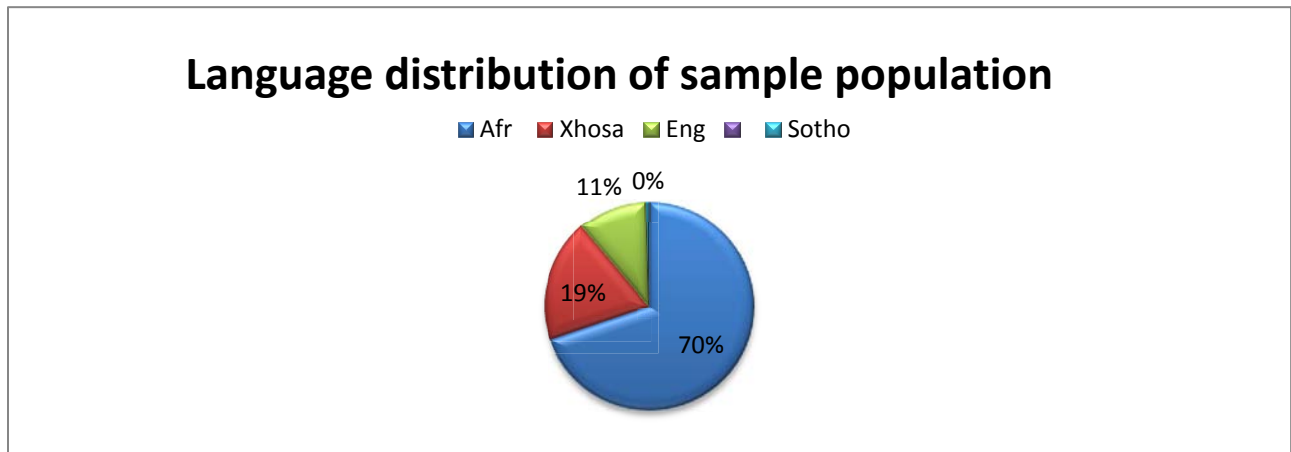


Figure 8: Language Distribution of Sample Population.

- **Population Groups** – the majority of the students were Coloured (67%) and just less than a third (29%), were Black students. There was only one Indian student and one Asian student, and 4% of the students were White. The national statistics for students at FET colleges indicate 96% black students (Cosser et al., 2010). It is not clear whether this percentage includes Indian, Coloured and Asian students. If so, the racial distribution of the sample groups similarly reflects the national distribution.

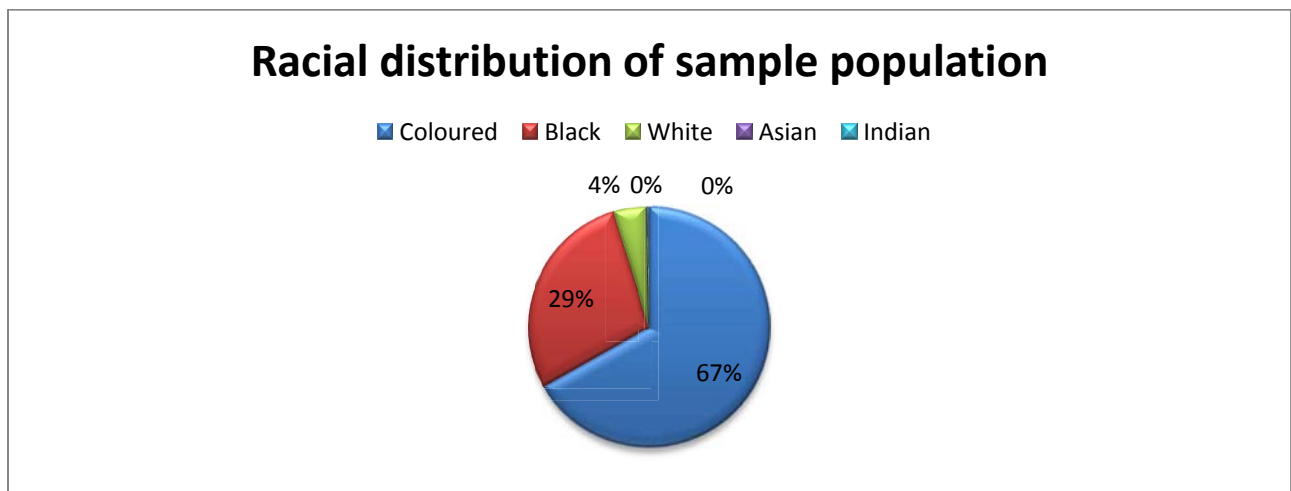


Figure 9: Racial Distribution of Sample Population

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Age – When comparing all the students in South Africa at FET Colleges and Boland College, there are differences between colleges in relation to the percentages of students younger than 20 years. Boland College has 46%, almost half of the cohort in this age group, while on a national level there are only 20%. Only 11% of the Boland College students are over the age of 24 compared with the 24% (almost 1 out of every 4 students) nationally that falls in this older age group.

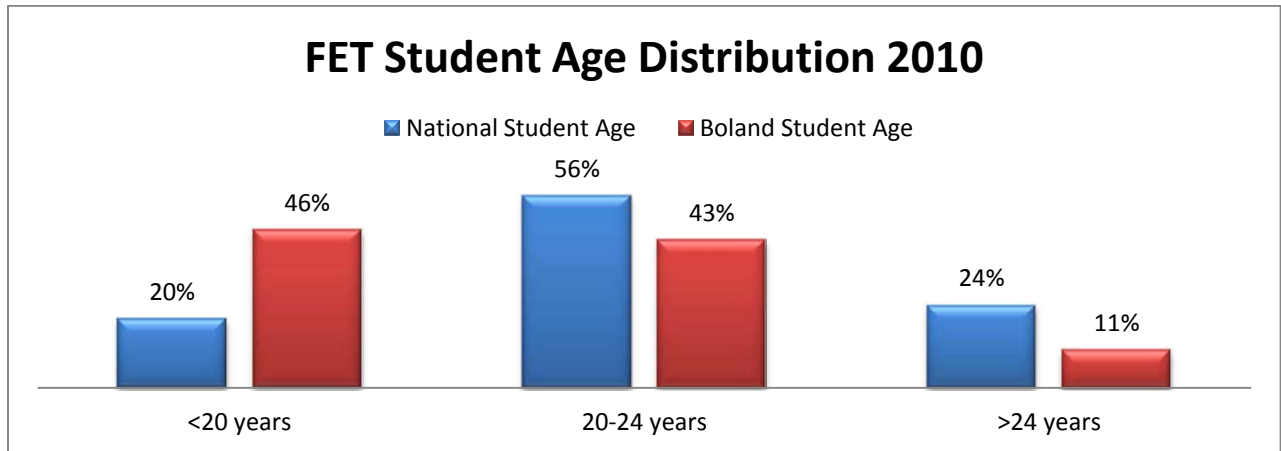


Figure 10: FET Student Age Distribution 2010.

- **Educational background** – All the students who wrote the test had passed at least grade 9. Some of them were still busy with grade 9 when they wrote the CAP test in September 2009. Others completed grade 12, but opted to take Mathematical literacy in grade 10 - 12. The implication is that they had not studied pure Mathematics for the three years prior to taking the CAP test, which may also have influenced the test results negatively.

- **Socio-economic background** – candidates were included from rural farming areas, from semi-urban industrial areas and from urban environments. Because there is no financial cost for candidates to complete placement testing, no discrimination took place on the ground of economic affordability and all students were included.

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PREPARATION OF DATABASES

Two sets of data were used. The first set contained the CAP test results and the second set contained the final year-end marks of the students. These two sets of information had to be merged into one sheet, containing all the relevant data. Zero scores were removed as the reasons for zero values were unknown, but could possibly be because some students really could not answer any question correctly, or because some students did not complete the test by accident or on purpose, or because of computer programming errors, or other unknown reasons, such as absenteeism.

Annually, colleges register new students in January. Boland College started with the CAP testing in September 2009, and the last students completed the test at the end of January 2010. After completing the test, students registered at the college for the NC(V) programme of their choice.

STATISTICAL ANALYSIS

This research compares the scores that a student obtained for CAP Mathematics and English tests in the beginning of the year, with his or her final results at the end of the year. The data were statistically analysed to ascertain the extent of correlation between these two sets of scores, and to reveal patterns of correlation. From the results it can be determined whether the CAP test can be used as an instrument to predict future academic achievement.

The Pearson Product-moment correlation coefficient.

Microsoft Excel serves as a convenient database, as Excel has many advantages. One of the functions of Excel is that it contains programmed formulas for certain statistical calculations, such as the Pearson Product-moment correlation coefficient. All the statistical calculations in this study were done in Excel.

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The equation that Excel used to calculate the Pearson coefficient is:

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{[\sum(x-\bar{x})^2 \sum(y-\bar{y})^2]}}$$

where r indicates the correlation coefficient, and \bar{x} and \bar{y} are the sample means `AVERAGE(array1)` and `AVERAGE(array2)`.

The coefficient of determination

To determine if the CAP tests have predictive value, the coefficient of determination was calculated. This coefficient, r^2 , is the square of the Pearson Product-moment correlation coefficient between outcomes and predicted values

Anscombe's quartet.

Apart from the magnitude of a correlation coefficient, which indicates the strength of the relationship between two variables, is it also important to observe the pattern of distribution of results, as indicated in Anscombe's quartet. Anscombe (1970) demonstrated the danger of only taking statistical calculations into consideration when interpreting data, and not the visual pattern as well, by noting that in the four very different scatterplots, the correlation coefficient r and other statistical data were almost identical (van Rensburg, 2011).

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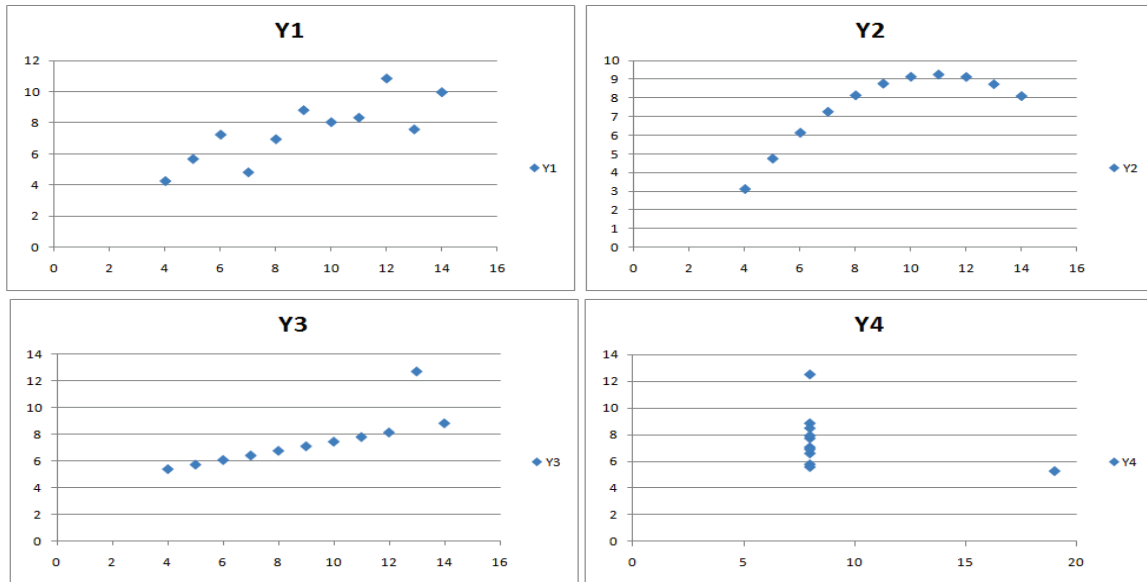


Figure 11: Anscombe's Quartet (1970, in Van Rensburg, 2011)

The importance of scatterplot patterns is significant for this study, and the scatterplot distribution patterns are taken into consideration in the interpretation of the correlation analysis.

SUMMARY

This chapter described the research method, procedure and data processing. In the next chapter the research findings will be discussed, as guided by the research questions.

CHAPTER 4

FINDINGS AND DISCUSSION OF FINDINGS

The purpose of the research was to find answers to the research question: Is the CAP test a valid predictor of FET College students' academic success? It is important to understand the placement test's predictive nature as this instrument is used as an early identification of students at risk to fail the first year at college. In this chapter, only one focus area will be explored in order to discover an answer to this research question, namely: *What is the extent of the correlation between the students' CAP results and the final year-end results?* The second focus area will be discussed in chapter 5: What inferences can be made from the pattern of correlation between these results?

These questions are answered through a statistical analysis of the students' scores on the CAP results and their final year-end results, and a discussion of patterns revealed in this analysis. It is important to take cognizance of the following aspects before the findings are explored:

In the interpretation of the Mathematics results, the proverbial comparison of apples with apples was not possible. The CAP Mathematics scores could not be compared to the final year-end Mathematics scores, because the number of students in the 2010 cohort who wrote both Mathematics assessments ($n=20$), was not big enough for statistical significance. Hence, the discussion of the results refers to the students who wrote CAP Mathematics and the final year-end assessment for Mathematical Literacy ($n=485$). This is, proverbially, comparing apples with pears as Mathematics and Mathematic Literacy are two different subjects. Nonetheless, as explained in chapter 2, the CAP test is based on the outcomes of grade 9 Mathematics because grade 9 is the minimum entry requirement set by the department to enter NC(V) Level 2. Grade 9 Mathematics serves as the foundation for both subjects, although Mathematical Literacy relates more to everyday contexts than pure Mathematics does.

THE CORRELATION BETWEEN THE STUDENTS' CAP RESULTS AND THEIR FINAL YEAR-END RESULTS

Correlation studies are frequently concerned with validity. It is imperative to note that many variables could influence the correlation of a placement test and final year-end results, such as health, socio-economic, personal and other factors. Identification of those factors, although briefly discussed in chapter 2, falls outside the scope of this document.

Validity of the English and Mathematical competency tests

FET colleges need to identify students who are unlikely to be academically successful, as early as possible. Apart from knowing what academic gaps a student has, the importance of measures of predictive validity in this research is that the college may have an early indication of the likelihood that a student will be academically successful.

Predictive Validity: To determine if the CAP test has predictive validity for students' success in their first year at an FET college, Pearson Product-moment correlation coefficients were calculated for the relationships between the CAP English test and the NC(V) English year-end results, and the CAP Mathematics test and the Mathematical Literacy final year-end results. An important aspect in determining the extent of correlation is the role that sample size plays in interpreting the correlation coefficient. In relation to this, critical values of r are taken into account. Furthermore, the coefficient of determination (r^2) which is a coefficient used in the prediction of future outcomes, is calculated.

The critical value of r indicates the minimum correlation coefficient value that is needed to state with confidence that there will be a relationship between the two variables in at least 95% of the cases with a sample of that specific size. It is understandable that the critical value is influenced by the number of cases. The bigger the n , the lower the critical value of r is needed for statistical significance. Table 3 indicates the values of the Pearson Product-moment correlation coefficients (r):

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English	N = 315	Critical value of r: 0.113 at $p=0.05$	$r = 0.505$	$r^2 = 0.25$
Mathematical Literacy	N = 484	Critical value of r: 0.088 at $p=0.05$	$r = 0.462$	$r^2 = 0.21$

Table 3: Pearson Product-moment Correlation Coefficients (r)

The value of r is significant at the $p = .05$ level for both these correlations, since the crucial value of r for a sample of 315 is 0.113 and for a sample of 485, it is 0.088. However, for the CAP English scores and final year-end English results, there was a slightly stronger positive correlation ($r = 0.505$) than there was between CAP Mathematics scores and year-end Mathematical Literacy results ($r = .462$). The coefficient of determination (r^2) is in the region of .25 for English which means that only 25% of the factors contributing to each score correlate. This is far too low for the CAP test to be counted upon as having predictive validity. Referring to Anscombe's quartet, the scatter diagram of the CAP English/final year-end English results (figure 12) displays a linear relationship and the size and the shape of the distribution shows a statistically significant, but only moderately strong correlation.

The coefficient of determination (r^2) is only in the region of .21 for Mathematics, which means that 21% of the factors contributing to each score, correlate. The predictive value of the CAP test is even less here than it is for English. The scatter diagram of the CAP Mathematics/final year-end Mathematical Literacy results (figure 13) also indicated a positive linear relationship but the shape and size and the scattering of the results suggest a weaker correlation than the English test.

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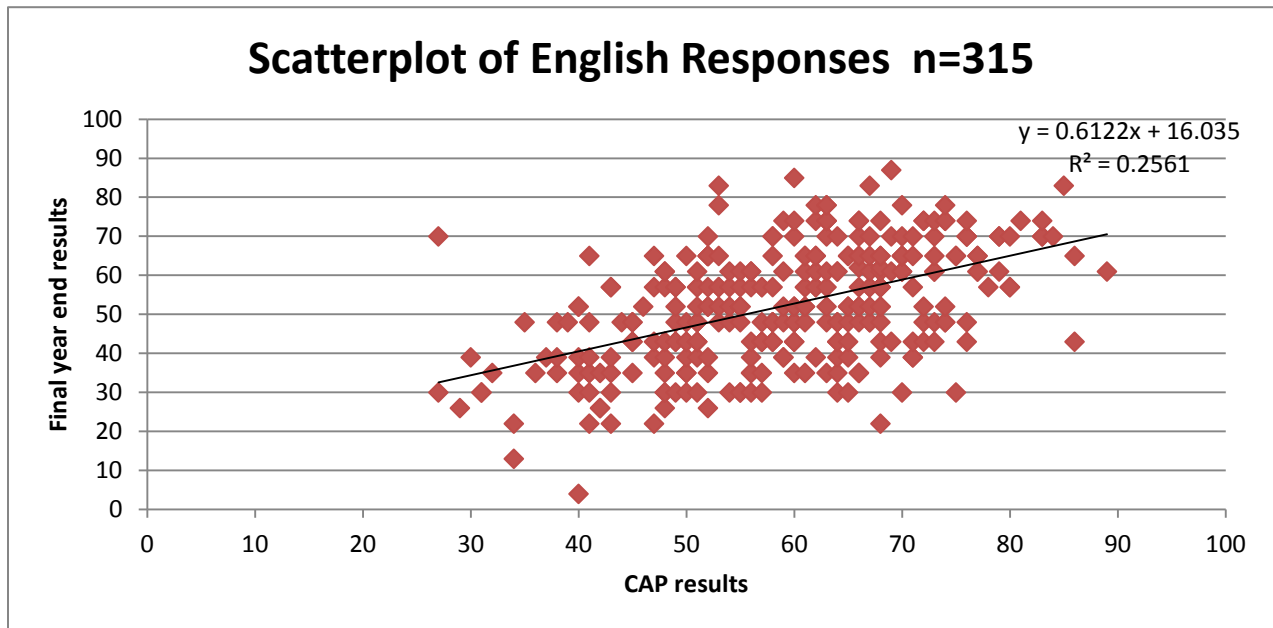


Figure 12: Scatterplot of English Responses.

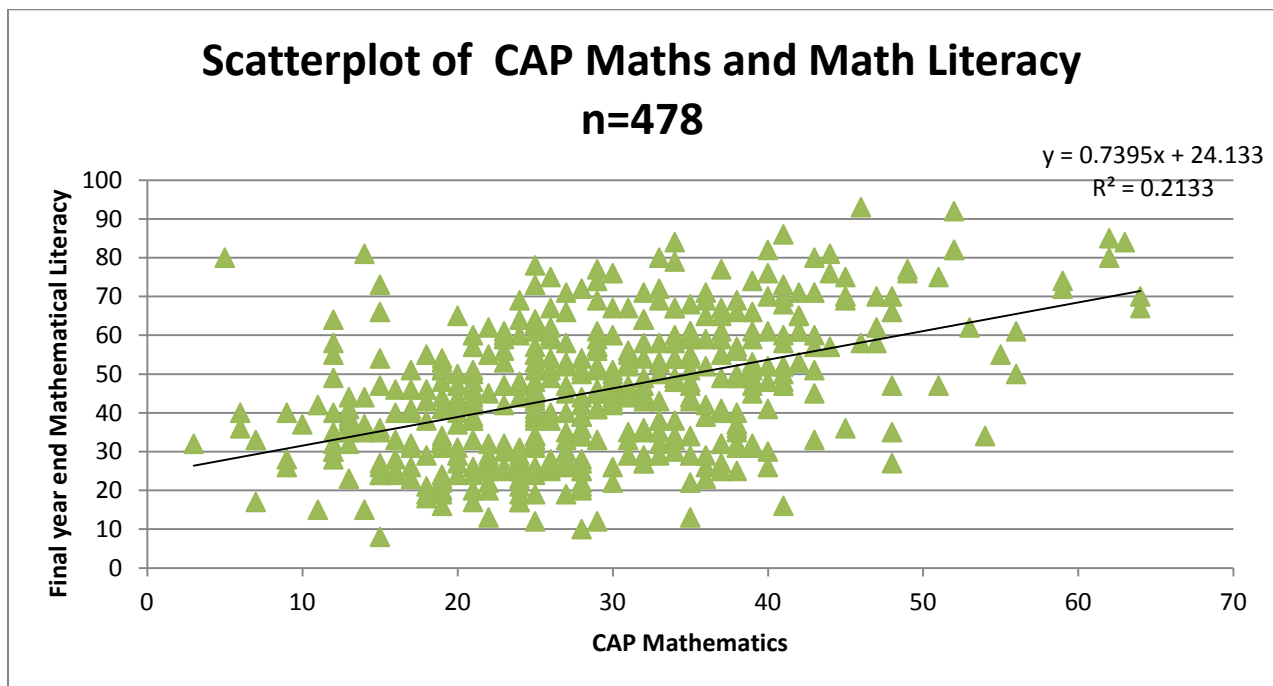


Figure 13: Scatterplot of CAP Mathematics and Mathematical Literacy

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Language groups:

Pearson Product-moment correlation coefficients for the relationships between scores of students representing different home language and population groups of the English and Mathematics subtests, were calculated. Although some Black student indicated that English or Afrikaans was their first language, it is assumed that there is a strong link between home language (e.g. isiXhosa) and population groups (e.g. the Xhosa people) as indicated in the college registers. Therefore, it could be argued that the results of r should be more or less of similar strength for both the population and the language analysis.

LANGUAGE	$n=$	Critical value of r	ENG tests $r =$	r^2	$n=$	Critical value of r	.Maths tests $r =$	r^2
XHOSA & SOTHO	91	.205	0.317	0.100 = 10%	87	.205	0.195	0.038 = 3.8%
ENG	61	.250	0.534	0.285 = 28%	52	.273	0.578	0.334 = 33.4%
AFR	163	.159	0.495	0.245 = 24.5%	345	.113	0.483	0.233 = 23.3%

Table 4: Language Groups

English correlation: For students who indicated English ($n=61$) as their first language on the college registers, a positive correlation was found between the CAP English test and year-end results at the $p = .05$ level ($r = .534$). A positive correlation ($r =$

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.495) was also found for Afrikaans first language speakers ($n=163$) between the CAP English test and year-end results at the $p = .05$ level.

For students indicating Xhosa and Sotho ($n=91$) as their first language on the college registers, a positive correlation ($r = 0.317$) was found between the CAP English test and year end results at the $p = .05$ level.

In the understanding of 'strength of the correlations', it should be remembered that the differences in strength of the correlations are shown in how much greater r is than the critical value. For r , narrow gaps show correlations that are only just significant (just over the bar) and wider gaps (well over the bar) show stronger correlations as r gets closer to 1. Therefore, it is clear from the table above that although there are positive correlations for all population groups, the correlations for the Afrikaans-speaking (indicated by the difference between 0.250 and 0.534) and English speaking (difference between 0.159 and 0.495) groups are much stronger than the correlations for the Xhosa and Sotho speaking groups (difference between 0.205 and 0.317)

Although there are significant differences between these language groups, the coefficient of determination is not high enough for the predictive value of the CAP test for any of the language groups.

Mathematics correlation: Since ($r = .578$) at the $p = .05$ level, a positive correlation was found between the CAP Mathematics test and year-end results for Mathematical Literacy for the English first language speakers ($n= 52$).

For the Afrikaans speaking group ($n= 345$), there is a positive correlation ($r = .483$) at $p = .05$ level between the CAP Mathematics test and Mathematical Literacy results for the 2010 students at Boland college. In spite of the statistical significance of the correlation coefficients for both of these language groups, the coefficient of determination shows that in terms of the prediction of future outcomes, the CAP test cannot be relied upon (33% for English and 23% for Afrikaans).

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Furthermore, for the isiXhosa en Sesotho speaking students ($n= 87$), no significant correlation was found between the CAP English test and year-end results at the $p = .05$ level ($r = 0.195$). The coefficient is above 0, but below .205, which means that although the correlation is greater than 0, the result is quite possibly due to chance for more than 95% of the respondents and therefore there is no real correlation.

There are many possible reasons for this extremely low correlation. One of the reasons may be the fact that the CAP test is a pure mathematics test, based on the acquired knowledge of grade 9 Mathematics. Because the students had Mathematics at school in their first additional language and not their home language, it could be that they struggled with understanding and remembering the terminology. The difference between relying on memory (placement test) versus the opportunity to be in classes for a year (final year examination) could also be a contributing factor.

Population groups:

Population	$n=$	Critical value of r	English tests $r =$	r^2	N	Critical value of r	Maths tests $r =$	r^2
White	16	0.468	0.642	0.412 = 41%	22	0.404	0.461	0.212 = 21%
Coloured	161	0.159	0.513	0.263 = 26%	327	0.113	0.507	0.257 = 26%
Black	138	0.159	0.356	0.126 = 13%	135	0.174	0.258	0.066 = 6%

Table 5: Population Groups.

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English correlation: For students who indicated that they are White ($n=16$) on the college registers, a moderate positive correlation was found between the CAP English test and year-end results at the $p = .05$ level ($r = 0.642$). A slightly weaker but still positive correlation was found for students who indicated that they are Coloured, Asian and Indian ($n=161$), between the CAP English test and year-end results at the $p = .05$ level ($r = 0.513$).

For students who indicated that they are Black ($n=138$), a weak but still significant positive correlation ($r = 0.356$) was found between the CAP English test and year-end results at the $p = .05$ level. Although these levels are above the critical value of r for all these samples, the coefficient of determination shows that in terms of the prediction of future outcomes, the CAP text cannot be relied upon for any of them.

Mathematics correlation: Since $r = .461$ at the $p = .05$ level, a moderate positive correlation was found between the CAP Mathematics test and year-end results for Mathematical Literacy for the White population group ($n= 22$). The significance here is only just over the bar or cut off point, with the critical value being $= 0.404$ compared with the value of $r = 0.461$. In terms of the prediction of future outcomes, the coefficient of determination is only be 21% which is obviously far too low for a trustworthy predictive test.

For the Coloured population group ($n= 327$), there is a moderate positive correlation ($r = .507$) at $p = .05$ level between the CAP Mathematics test and Mathematics Literacy year-end results. This significance for the coloured population is slightly stronger than the significance for the white population, indicated by the difference between 0.461 and 0.507. However, the coefficient of determination is only 26% and although it is a higher indicator than that for the White population group, it is still not high enough for the predictive value of the CAP test to be counted upon. For students who indicated that they are Black ($n= 135$) the coefficient of ($r= .258$) is above the critical value of .174, but still

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very low, and means that the result is possibly due to chance for more than 95% of the respondents. Thus the correlation between the CAP Mathematics test and Mathematical Literacy year-end results is not significant. The coefficient of determination is an extremely low 6% for Black students.

In summary, it can be concluded that the correlation between CAP tests and year - end results are weaker for Black students than White and Coloured students, and weaker for speakers of South African indigenous languages than for speakers of Afrikaans and English. In terms of the prediction of future outcomes, the coefficient of determination for all three these groups is too low for the CAP test to be seen as a trustworthy predictive test.

Programme Correlations:

Table 6 below shows significant positive correlations between the CAP test and the final year-end results for English and Mathematics for most of the programmes. Data of all the students who were part of the sample group were used, based on the programmes they enrolled for. The + sign indicates a significant correlation and the 0 indicates that there is no significant correlation. It is interesting that there is no end of the year Mathematical Literacy mark for the Electrical students ($n=18$) who wrote the CAP test in January 2010.

The exact reason is unknown and further investigation into this occurrence is needed. A possible reason, in retrospect, could be that there was an administrative error with the results such as that the Mathematical Literacy results were still unavailable from the Department, or the continuous assessment marks accumulated during the year, were not yet processed. The CAP results ranged between 15% and 79% which minimizes the possibility that the zero scores is a true reflection of the students' results. However, there is no correlation between the English placement test and the final year-end results for this group. The r is below .444, which indicates that the result is quite possibly due to chance and there is no real correlation. Further investigation into the results of this and other Electrical Engineering groups should be done to bring some clarity.

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NC(V) Level 2 Programmes	Maths				+/ 0	Eng				+/ 0
	Critical value of r	n	r	r^2		Critical value of r	n	r	r^2	
Tourism	0.273	57	0.506	0.25	+	0.25	56	0.638	0.40	+
Safety in Society	0.288	43	0.369	0.13	+	0.666	7	0.77	0.59	+
Office Administration	0.304	169	0.387	0.14	+	0.195	90	0.474	0.22	+
Marketing	0.325	33	0.286	0.08	0	0.355	28	0.485	0.23	+
IT	0.273	49	0.67	0.44	+	0.381	24	0.407	0.16	+
Hospitality	0.288	45	0.452	0.20	+	0.349	29	0.404	0.16	+
Finance	0.456	17	0.512	0.26	+	0.325	34	0.678	0.45	+
Engineering and Related Design	0.325	37	0.488	0.23	+	0.707	6	0.892	0.79	+
Electrical Engineering	0	0	0	0	0	0.444	18	- 0.087	0.01	0
Civil Construction	0.325	34	0.56	0.31	+	0.388	23	0.73	0.53	+

Table 6: Programme Correlations.

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Some of the programmes have a very small number of participants, such as Safety in Society (only 7 students participated in the English correlational study), and the Engineering and Related Design ($n=6$). Although there might be positive correlations, the validity of these results cannot be proven as the numbers are too small to reflect correlations of statistical significance. In terms of predictive validity, only these two programmes yielded coefficients of determination that would be high enough to place confidence in the CAP test, but for both of these the sample size is too small to reach statistical significance.

Correlation between the CAP test and the PACE test:

As discussed earlier, there are currently only two placement tools available that are in frequent use at FET colleges, namely the CAP test and the PACE test. For purposes of triangulation, a Pearson product moment coefficient of these tests was calculated to gauge the extent of correlation between students' scores on these two placement tests, both of which are used as placement tools prior to registration at FET colleges. An analysis of the results of grade 9 learners ($n = 33$) at a school that completed both the CAP test and the PACE test was done in September 2011. Both instruments consist of three subtests: an English subtest, Mathematics or Numeracy subtest and a Career Interest Questionnaire, and both instruments have been used by different schools and/or colleges. For the purpose of this study, only the scores from the English and Numeracy subtests were used.

Grade 9 CAP / PACE Correlation	
$n=33$, critical value = .325	
English	Mathematics
0.485	0.276

Table 7: Grade 9 CAP/PACE Correlation.

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English correlation: For the CAP and PACE English Tests, the level of statistical significance of the correlation was moderate $r = 0.485$ indicating that a positive correlation was found between the CAP English test and the PACE English test ($n = 33$) at the $p = .05$ level.

Mathematics correlation: For this group ($r = .276$), there is no correlation between the CAP Mathematics Test and PACE Numeracy Test results for the grade 9 learners ($n = 33$) at the $p = 0.05$ level. It is possible that, as above, the comparison of the CAP Mathematics Test and the final year-end Mathematical Literacy results could explain the weak correlation between the two instruments. The PACE test is a general Numeracy Test which focused on Mathematical Literacy, while the CAP test is a pure Mathematics test, designed to be a diagnostic tool to identify the prospective student's strengths and weaknesses based on the outcomes of the grade 9 Mathematics curriculum. It was decided to include this correlation study to find what correlation, if any, there would be with the only other current alternative tool used at FET Colleges.

Reliability of the CAP English and Mathematics results

The consistency of CAP test results can be measured by comparing the averages of the different campuses, as shown in table 8 and figure 14 below.

Averages of the CAP English results have a standard deviation of 1.605 which is relatively small compared with the standard deviation of the English final year-end results of 4.691. This indicates that the consistency of results for the CAP test is greater than the consistency of the final year-end English results across the different campuses. There are factors influencing the greater standard deviation of the final results. For example, the different qualifications and experience of the lecturers. Another reason might be that because the different campuses offer different programmes, they draw students from different schooling backgrounds, for example Caledon offer Safety in Society with grade 12 as an entry criteria. Paarl and Stellenbosch offer Hospitality and Tourism where it is compulsory to take Mathematical Literacy as a subject, whereas Strand offers engineering

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programmes with Mathematics as a compulsory subject. Students also come from different socio-economic areas such as Stellenbosch which draw post matriculants from all over the country because of the specific “student life character” of the town, compared to Caledon which is a small rural area catering mainly for children of workers in the agricultural sector.

Campus averages								
Campus	n=	CAP English	n=	CAP Maths	n=	Final English	n=	Final Maths Lit
Caledon	104	50.22	103	29.3	25	66.4	57	47.03
Paarl	118	47.3	116	28.1	56	53.24	86	41.45
Stellenbosch	158	50.36	157	29.3	130	59.51	131	45.93
Strand	118	50.56	117	29.6	75	59	68	42.36
Worcester	204	47.63	206	28.9	39	60.66	149	48,9
Standard Dev		1.605		0.581		4.691		2.704

Table 8: Campus Averages

A similar pattern is found between the CAP Mathematics results with a standard deviation of 0.581, and the final year-end Mathematical Literacy results with a standard deviation of 2.704.

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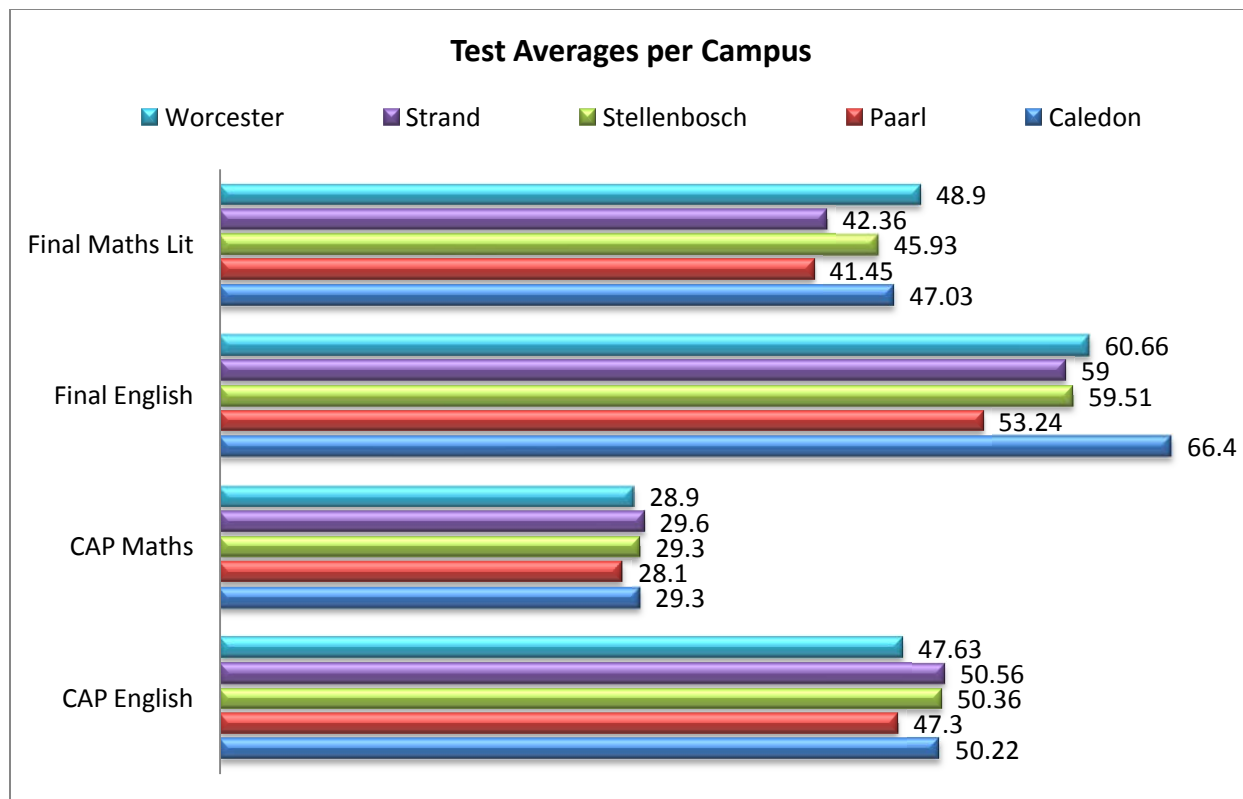


Figure 14: Test Averages per Campus.

In this research, the analysis of the total averages for the combined subtests reveals the following:

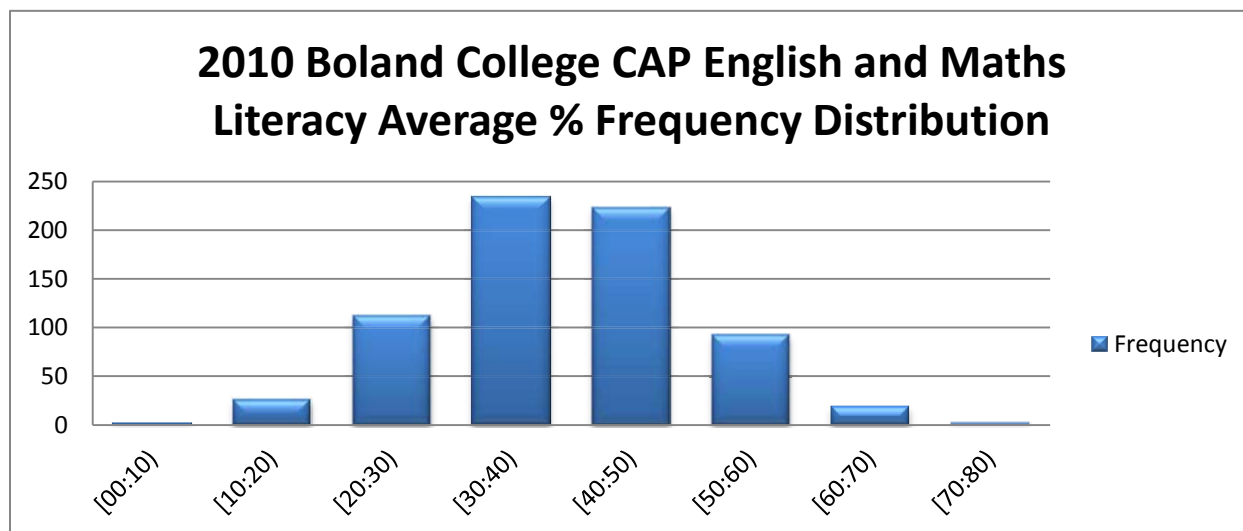


Figure 15: 2010 Boland College CAP English and Mathematical Literacy Average % Frequency Distribution.

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The CAP average frequency distribution displays a normal distribution with the larger percentage of students achieving a percentage between 30% and 50%.

The analysis of the total averages for the different subtests reveals the following:

Campus	<i>n</i> =	CAP English	<i>n</i> =	Final English	<i>n</i> =	CAP Maths	<i>n</i> =	Final Maths Lit
Total/Averages	702	49.21	325	59.76	699	29.04	491	44.19

Table 9: Total Averages for the Different Subtest Results

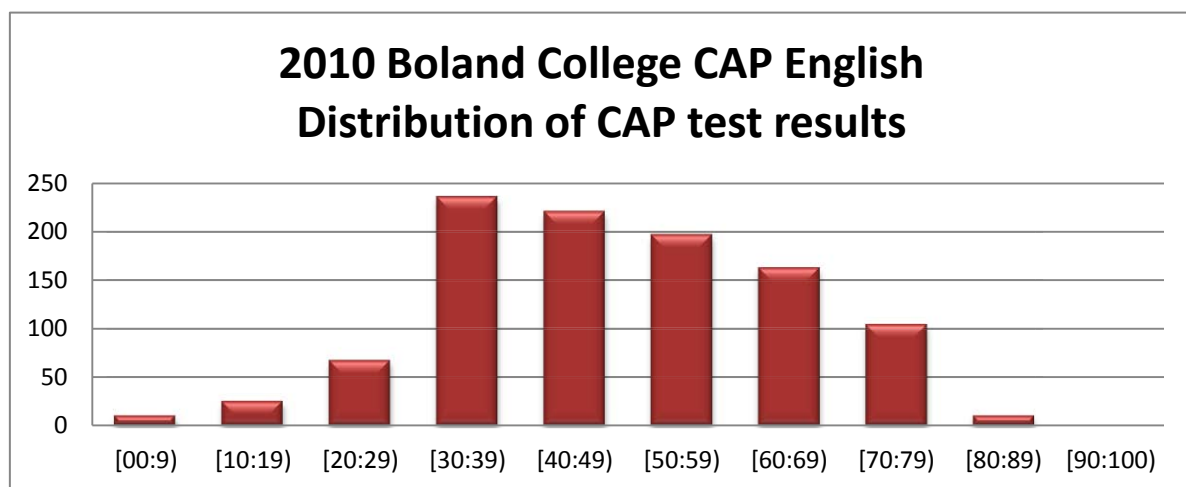


Figure 16: Distribution of CAP English Test

Results from students with zero values were excluded from the database in the calculation of the averages as the reason for the zero value is unknown.

When the CAP English test average 49.21% is compared with the English final year-end results average of 59.76% one could conclude that students' competence increased after they attended college instructional classes for a year, although some differences should be expected since they are different tests.

The poor level of Mathematics in South Africa is well known. Following the discussion of the comparison between the CAP Mathematics Test and the final year-end results, the context of the national situation must be borne in mind. However, although the

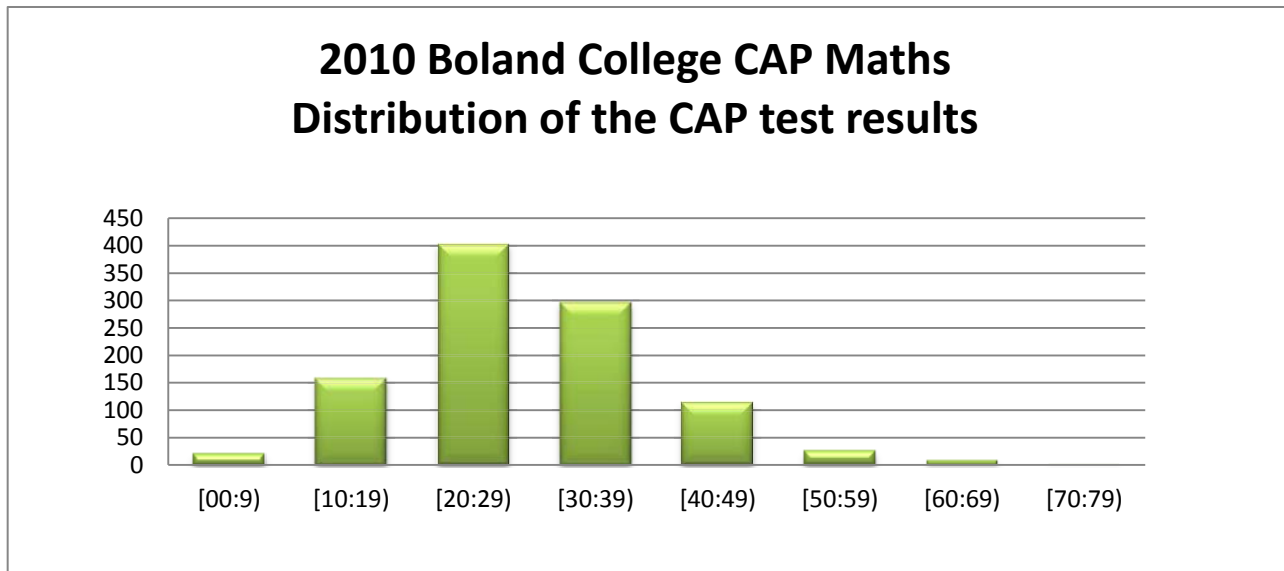


Figure 17: Distribution of the CAP Test Results

TIMSS studies (Howie, 2000; HRSC, 2003) and other research (Bohlmann, 2005; De Beer, 2010, and Wagner-Welsh, 2008) confirm the poor state of Mathematics in South Africa, it is still important to ask whether the skewness in the CAP results could suggest that the standard of the CAP Mathematics Test is too high for the grade 9 learners, if a function of the test would be to predict their success in the year-end results, as it is based on the outcomes of the grade 9 curriculum. Still, considering the coefficients of determination discussed above, there can be no confidence that the CAP Mathematics test has any predictive validity.

A few reasons could be suggested for these differences:

- The CAP test, being written in the beginning of the year, measures the knowledge of the students after / during their holiday time, whereas the final year-end results reflect the results after exposure to classes for 10 months prior to the examination.
- Students matured during the year.
- The final year-end results reflect the formative and summative assessment marks, while the CAP reflects the students' knowledge at one specific moment.

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- Students studied for the final year-end results whereas they didn't study for the CAP test.
- Testing conditions differ: Students know what to expect in and from the final year-end examination. Students completed the CAP tests on computers. Some of them might have been extremely unfamiliar with computers and although care was taken to assist them in completing the test, the effect of using computers for the first time might have had a negative impact. It is also possible that excitement and interest in the technology might have affected results.
- Tests are different. The CAP test is a standardised test used prior to registration in order to determine the level of a student's skills in Mathematics and English, while the year-end examinations are set by officials of the department of education, and marked externally at examination centres all over the country.

USE OF THE CAP TEST AS A PREDICTIVE TOOL TO GUIDE AND PLACE NC(V) LEVEL 2 STUDENTS

The internet version (version 2.0, 2007, p.1) of the CAP manual states the following:

A prerequisite of the National Certificate (Vocational) (NC(V)) Level 2 is that prospective students must have passed Grade 9 or achieved an equivalent qualification of NQF Level one. The **purpose** of this test will be to determine if the prospective FET College student has the basic fundamental knowledge of the English language and numeracy skills to cope with the learning material of NC(V) level 2. This section of the test is not dependent on his/her desired vocational field. The Placement Test will assist the prospective student to choose a vocational field aligned to his/her interest and guide the College to place the student in an appropriate field. The **purpose** of the test is not to exclude students from the FET sector, but rather to assist the College in placing prospective students that have the fundamental skills in appropriate vocational fields. Thus, the focus is to identify the level of additional academic support some students may require. This test is not a psychometric test. (CAP, 2007)

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According to the manual, one of the two uses of the test is to determine the previously acquired knowledge and career interests of the student and to provide this information for decision making. The CAP test measures acquired knowledge of grade 9 English and Mathematics syllabuses and identify the outcomes not yet mastered. They are not psychometric tools to indicate English or Mathematical aptitude, or measure interest as psychological constructs. It is also not a “placement intervention” as referred to by Adams (2011, p.16) that will ensure academic success. Certainly the issue of academic success is much more complex and dependent on the culmination of many different influential factors, and not the single results of one pre-placement assessment. In evaluating the CAP instrument, an evaluator should take care to ensure that s/he has a thorough understanding of the complexity of placement testing and other factors such as the time frame after the implementation of the NC(V) programme, as well as the specific logistical problems with implementation on college level. One of the key principles in psychometrics is that instruments should be used for the purpose that they were designed for, and it is unethical to use a test for another purpose (Smit, 1991; Murphy & Davidshofer, 2001). The purpose of the CAP test is simply to provide more information that might be helpful in supporting a student prior to registration, as well as identifying those specific areas in the grade 9 curriculum which they have not yet completely mastered. This information enables the college to support students for example with. College managements can make decisions and implement supportive and specific remedial interventions based on this information.

In this study different types of correlations were calculated between the CAP test and the final year-end results, with the aim of investigating the predictive value of the CAP test. Although some of the coefficients point towards moderate correlations, the coefficients of determination were never high enough to indicate that the CAP test can be used to predict year-end results. These findings echo those of a number of researchers (Lee & Greene, 2007) who studied correlations between placement instruments and academic success rate. Kim and Suen (2003, p. 561) found that although there is “a relatively small coefficient...early assessment measures are not predictive”. Gere, Aull,

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Green and Porter (2010) found in their research that the Directed Self-Placement instrument at their university does not have a strong predictive validity. Armstrong (2002), in Mattern and Packman (2009), studied the correlation between the ACCUPLACER test prior to registration and the success rate of students at colleges in the USA. Initial studies generally found that there is a weak relationship when the predictive validity coefficients of placement test scores and final academic results are compared. “For English courses, the observed correlation was approximately 0.25 for full-time and part-time instructors, and the correlations for Mathematics were 0.14 for full-time and 0.19 for part-time instructors” (Armstrong, 2002, p. 1). Hughes and Scott-Clayton (2011), in Jaggars and Hodara (2011), confirm that standardised placement tests only weakly predict students’ future academic achievement.

Based on the correlations done, the overall finding in this research similarly finds that the correlations between the CAP test and the year-end results, although stronger than those of Armstrong (2002), tend to be weak. However, it is interesting to note is that, similar to the findings of Armstrong, this research found that the English correlations are much stronger than the Mathematics correlations.

SUMMARY

As placement testing is a very complex matter and many other variables play a role in the eventual successful academic achievement, it is imperative to use an instrument for the purpose that it was developed. In this chapter, correlations were calculated between the CAP test and the final year-end results, for different gender, language and culture groups within the sample, with the aim of investigating the predictive value of the CAP test for each of these subgroups.. Although some of the coefficients point to moderate correlations, the coefficients of determination were never high enough to indicate that the CAP test can be used to predict year-end results. The CAP test was primarily developed as an instrument to identify skills or knowledge gaps in the mastering of the grade 9 curricula, and should therefore be used for this purpose. Inferences drawn from these research results will be discussed in the next chapter.

CHAPTER 5

INFERENCES AND SUGGESTIONS

This research is a correlation study and the purpose thereof is to determine if there is any predictive value in the CAP test in relation to the final year-end marks of NC(V) level 2 students. Walsh and Betz (2001), explain that predictive validity exists where data that is available or can be easily acquired (for example test scores), can be used to predict some future outcome, with confidence. In the understanding of the predictive value of an instrument it must be noted that a true value, or stable characteristic over time, cannot be a fixed constant, and should rather be interpreted in terms of a trend.

PROGRESSIVE INTERPRETATION OF VALIDITY INDICATOR.

As noted in earlier chapters, Messick (1995) explained that validity can be interpreted by means of a progressive matrix.

The first step or phase: The test is interpreted based on the basic evidence. Construct Validity (CV) refers to the extent to which what a test measures matches people's idea of what it should measure. This study investigates the validity of the CAP tool as a predictive test. In that case, the extent of its construct validity is the extent to which it matches what people expect of a predictive test. General expectation of a predictive instrument is that if a student achieves well in the placement test, the student would also do well in the year-end assessments, and poor achievement in the placement test, would indicate a high risk student who will struggle with the academic curriculum. Evidence of validity is gained by the Pearson correlation and (r^2)

The second step or phase: If there is some evidence of construct validity, it is interpreted in relation to the relevance or the utility thereof. In the case of this study on the CAP test, the different r and (r^2) indicate that the test cannot be used as a prediction instrument.

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The third step or phase: The content validity is now interpreted in relation to the value implications thereof. For this study, the value of (r) and (r^2) lies in the knowledge that CAP cannot predict success in college examinations, and hence it would be unethical if the test results were applied as such. Furthermore, it indicates that there are differences in the extent of correlation between the language groups, and care should be exercised in the interpretation of an individual's results.

The final step or phase in the interpretation of validity: This takes place when the Content Validity is interpreted in relation to the utility or relevance thereof, as well as the value implications and the social consequences thereof. The social consequences of the validity coefficient are relevant when the CAP test is used prior to registration at college. When using CAP results, focus should not be on whether the student will pass NCV Level 2 because there is no significant correlation. Focus should rather be on identifying the skills gaps and deciding how best the institution can assist the student. Further research is imperative to determine whether grade 9 is indeed sufficient background for NCV Level 2, or if there are deficiencies and/or omissions in the grade 9 curriculum.

INFERENCES FROM THE PATTERN OF CORRELATION BETWEEN THESE RESULTS.

Mkele's first assumption states that all jobs or tasks need a specific level of skills or knowledge. To study English and Mathematics on NCV level 2, it is assumed that a student needs the necessary foundational skills and knowledge. The Department of Education identified this level of knowledge as that acquired during the first 9 years at school, hence the entry criteria of grade 9. Unfortunately, Grade 9 examinations are set and marked at schools and therefore the standard is inconsistent and subjective. The use of a single instrument aligned to the grade 9 curriculum content would be useful as a standardized measure. The CAP test is such a measure.

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Mkele's second assumption is that all individuals possess relatively stable attributes, at least over a short period of time. In this case these attributes would be the extent of students' mastery of grade 9 Mathematics and English outcomes.

Mkele's third assumption is that these attributes can be measured. The rationale is that the CAP test should be used as a valid and reliable measurement tool to measure the extent of a person's abilities/ skills/ knowledge relating to the grade 9 Mathematics and English outcomes. However, Jagers and Hodara's (2011) opposing forces framework adds a qualitative dimension to the measurement of attributes. The tension between efficiency of placement testing versus the effectiveness thereof can severely influence the correlation, and hence the measurement of validity. The validity of the CAP computer-based test needs investigation because one cannot be sure whether students who have no computer skills, would have achieved the same results when responding to the CAP paper-based testing.

Mkele's fourth assumption is that inferences can be made based on the measurements. Here the inferences relate directly to the extent to which mastery of grade 9 Mathematics and English outcomes (as shown by scores on the CAP test) predict year-end examination scores. In this study the statistical analysis indicated that the CAP test cannot be used as a valid instrument to predict future outcomes in the form of year-end NC(V) level 2 examination results. This finding echoes results of other research in different disciplines which indicated that placement testing has a low correlation with academic achievement. It seems that the "secret ingredient", or that specific "it" that ensures successful academic achievement in the first year, has not yet been discovered by developers of predictive tests.

The CAP test is designed to measure students' knowledge and skills pertaining to the grade 9 curriculum, and is therefore strictly based on the outcomes of the grade 9 curriculum. A student who does well on the CAP test but poorly in the final year-end examination could have mastered all she should in grade 9, but yet be the victim of any of the many factors that cause attrition, as indicated by Papier (2009) and Maharaj (2008).

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On the other hand, a student who does poorly in the CAP test (implying poor grade 9 knowledge) but who passes well at college could have benefitted from excellent lecturers and possibly could have made up for not having mastered what she should have in grade 9, by working very hard.

Hence, it can be concluded that if grade 9 was needed for successful learning and passing of the level 2 curriculum, the extremely poor coefficient of determination could actually indicate that the grade 9 prerequisite-knowledge of the students do not suffice as a foundation. Therefore the articulation of grade 9 with learning at level 2 is questioned.

To conclude the discussion of the research questions, “What is the correlation between the student’s CAP results and the final year end results?” and “To what extent can the Competency and Placement Test be used as a predictive tool to guide and place National Qualification Framework level 2 students of FET Colleges” the following statement can be made: *The correlations between the CAP English and the English year-end results indicate that there is a statistically significant correlation between the CAP test and the English year-end results but the coefficient of determination indicates that this correlation is not strong enough for the CAP test to be used as a predictive test.*

Sample sizes in this study (see Figure 19 above) are large enough to allow generalisation of the results within the context of Boland college students. Values of (r) for correlations between the CAP Mathematics and year-end Mathematical Literacy results indicate that there is a statistically significant but only moderately positive correlation between the CAP scores and the final year-end results of the Afrikaans and English speaking students for both Mathematics and English. In contrast, there is no correlation between the CAP Mathematics scores and year-end Mathematical Literacy results of isiXhosa and Sesotho speaking students. While the relatively low correlations between CAP scores and year-end examination results spell a lack of predictive validity for the CAP tests, this does not imply that the test has no value as a placement instrument since it has a diagnostic value in identifying grade 9 outcomes not yet mastered. The CAP test is constructed on these outcomes and can be compared to a year-end examination of the

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grade 9 curriculum. It is not an indication of an innate ability to work with numbers or English, but rather an indication of the level of the acquired knowledge and skills relating to this specific curriculum.

The last assumption is that these inferences can be used to improve the academic or training opportunity. Here the findings clearly indicate that the CAP test cannot predict students' future success in year-end NCV level 2 examinations, but show particular patterns of higher and lower levels of correlation. These patterns, specifically the differences between the language groups, point towards issues that need further clarification for possible future improvements in the academic training in question.

LIMITATIONS OF THIS RESEARCH.

This research has a number of limitations.

Personal involvement of the researcher:

First, the researcher was one of the developers of the CAP test which could imply bias. Simultaneously, however, it could indicate a strength since there is first-hand knowledge and understanding of the purpose of the CAP test and the developmental processes. Attempts to limit bias were made by approaching this study as a structured empirical research project as part of the M Ed degree, and thus subject to scrutiny, and also requiring a thorough literature review which enhanced objectivity. Furthermore, the researcher ceased being part of the CAP Company in 2010 and this has given her some distance from the project.

Sampling.

The sample, albeit statistically large enough for valid application of findings to Boland College, could have been more representative of the national student population if students from different colleges in different provinces were included. A more representative national sample would provide answers to these research questions for FET students in other contexts in South Africa.

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Testing procedure.

Although the computerised format is more standardised than the pen and paper test, research should be done to determine if students would obtain the same marks on both formats. Being unfamiliar with the equipment is bound to have an effect. For future development of the CAP test, it could be useful to include a short computer skills program such as a game, before starting with the actual test. This “ice-breaker exercise” would serve as a short induction to the basic computer skills that they might need.

The test.

The CAP test is based on the Grade 9 syllabus and hence is not geared for students who have done ABET level 4 or NQF Level 1, nor for students with a grade 12 qualification. Students with these accepted entry qualifications have not been taken into account in the development of the tests. A shortcoming of the instrument is thus that it caters for only a specific portion of the target population and can therefore not be an effective assessment method for all possible Level 2 candidates.

SUGGESTIONS FOR RESEARCH

A number of related research topics can be identified.

✓ The identified differences between the language and population groups point towards issues that need further clarification for possible future improvements in the academic training in question.

✓ Research into the factors of academic non- completion or failure. It is imperative to investigate the reasons why none of the Electrical Engineering students passed Mathematical Literacy at the end of the year. One of the questions that come to mind is whether they had sufficient prior knowledge to cope with the academic content of the programme. Another question that arises is whether they were aware that the

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programme is highly theoretical, or whether they expected to learn only practical electrical engineering skills. Another factor to investigate is the role of lecturing staff.

✓ As the CAP test identifies gaps in the prospective student's background knowledge relating to the grade 9 curriculum, it is necessary to investigate best ways to address these gaps. The nature of a bridging programme could be investigated. For example, would a bridging programme that links to the identified gaps be sufficient to address the poor Mathematical skills of the student, or should the bridging programme rather address more general foundational concepts?

✓ The CAP interest questionnaire has not been investigated within the parameters of this study. Research on the degree of satisfaction with a career field chosen on the basis of indications from the CAP interest questionnaire after involvement for a few months or a year, might reveal interesting information relating to the validity of the questionnaire.

✓ The value that a diagnostic test such as the CAP placement test has is that it could be used to assess RPL (recognition of prior learning) in terms of placement in a Mathematics or remedial Mathematics programme. This deserves further investigation.

✓ The CAP test is a multiple choice questionnaire. The possibility that its predictive validity in relation to academic success would be enhanced if the English test included a writing component, could be investigated.

✓ Career guidance in the FET sector and the validity of an interest questionnaire. Researchers need to investigate a prospective student's concept of the world of work, and the effect of unemployment in South Africa.

SUMMARY

This study investigated the correlation between the English and Mathematical subtests of the CAP test and the English and Mathematical Literacy final year-end examination results of NC(V) level 2 students at Boland College with the purpose of determining whether the CAP test could predict future achievement. Findings from this research indicated that the CAP English test has a statistically significant but only moderate correlation with the English final year-end results for all population groups, but the low coefficients of determination indicate that the CAP English test scores cannot be used to predict year end scores. It was also found that the CAP Mathematics test has no statistically significant correlation with the Mathematical Literacy final year end results for the Xhosa and Sotho speaking groups, and that therefore the CAP Mathematics scores can also not be used to predict year-end scores for Mathematical Literacy.

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INVESTIGATING THE PREDICTIVE VALIDITY OF CAP TEST

ADDENDUM A : Example of CAP Student Report

In relation with NQF level 1 unit standards, Mr. John Doe's score on this aspect of the test indicates that his current competency is above average/average/below average/poor. This score indicates that he will need additional academic assistance in the following areas:

- Outcome 1
- Outcome 2
- Outcome 3

Mathematical Literacy

In all 12 NCV vocational fields, students will have to either register for Mathematics or Mathematical Literacy. This numeracy test determines if the prospective student has the basic numeracy skills in place to work successfully through the academic material as required by mathematics and mathematical literacy. This test is based on the Unit Standards, as specified by the General Education and Training Certificate.

On this test Mr. John Doe's results indicate that his current level of competency is above average/average/below average/poor. This score indicates that he will need additional academic assistance in the following areas:

- Outcome 1
- Outcome 2
- Outcome 3

Placement Test

The Placement Test assists the prospective student to choose a vocational field that is aligned with his/her interest by giving more information on the 12 different vocational fields available in NCV. The Placement Test also guides the FET College to place and advise students in appropriate vocational fields. The Placement Test is based on giving the prospective student more information on the vocational fields and the student must then order these fields according to their preferences.

In this dimension of the test, Mr. John Doe indicated that he is interested in pursuing the following vocational programmes in order of preference:

1. <First Preference>
2. <Second Preference>
3. <Third Preference>

Please note, the vocational programme and subject availability is dependant infrastructure of the College and campus.

Conclusion and recommendations

The Mathematical Literacy and English competency tests dimensions given in this test can be put together into an overall score. One should bear in mind that this score can change over time, due to additional learning or programmes focusing on bridging learning gaps. The score Mr. John Doe received in this test administration reflects only his current level of competency.

On this dimension, Mr. John Doe score was average.

Mr. John Doe's overall performance suggests that at present s/he should be able to cope successfully with a tertiary learning programme offered at an NQF 2 as long as she is willing to work diligently and consistently.

As stated before, the test is not designed to exclude individuals from the FET sector, but to identify students that will need additional academic support from lecturers and Student Support Services.



PRIVATE AND CONFIDENTIAL COMPETENCY AND PLACEMENT TEST

NAME: Mr. John Doe

DATE OF BIRTH: 03 March 1974

IDENTITY NUMBER: 9087098709870987

AGE: 30 years old

DATE OF TEST: 07 May 2004

PURPOSE OF TEST

To determine Mr. John Doe's current level of competency in English and Mathematics Literacy on NQF level 1 and placing him in an appropriate vocational field to further his career development.

TEST

The test used measured competency and identified potential National Certificate (Vocational) programme options for placement.

RESULTS

The testing instrument used in measuring Mr. John Doe's current level of competency is aligned to NQF level 1 and the unit standards linked to the General Education and Training Certificate. Please note that this test does not give an indication of aptitude or intelligence quotient (IQ) and should thus not be interpreted as such.

The scores on this test were obtained by comparing his performance against the unit standards aligned with General Education and Training Certificate.

Mr. John Doe's test results should not be viewed as permanent. Any of these scores may change depending on the kind of mental activities he performs on a regular basis.

Brief descriptions of the tests in which he was tested are given below, and his performance in comparison to the outcomes as specified by the unit standards aligned to the General Education and Training Certificate.

English Second Language

English is the language of instruction in FET Colleges and thus imperative that the student is competent on NQF Level 1. If a student have not achieved the fundamental outcomes of NQF Level 1, he/she will find it difficult to work successfully through his/her academic material, participate in class discussions, understand instructions given by lecturers and work on group assignments with fellow students. However, it must be stated that academic support can also be given to a students who has is not yet competent in this section of the test. This test will then also assist the FET College to identify the degree of additional academic support this student will require.

The test is based on the unit standards aligned with, NQF Level 1 as outlined by the General Education and Training Certificate:

- Comprehension
- Vocabulary
- Sentence construction

INVESTIGATING THE PREDICTIVE VALIDITY OF CAP TEST

ADDENDUM B: Example of a Lecturers Report

LECTURER REPORT: MATHEMATICS CLASS: 11A 15/10/2009 Confidential

#	FULL NAME	ID NUMBER	Relationships	Measure: area	Functions	Patterns	Algebra	Measure total surface	Transformation	Operations	Data handling	Numbers	Co	ponents	Ratio	Finance	Geometry	Space	Polygons	Position	Shape	Measurements	Similar triangles	Measure volume	Pythagoras	Math Percentage
23	MALESAKE KGADISI	891031000000	33%	0%	9%	73%	27%	0%	100%	0%	0%	87%	0%	50%	0%	50%	67%	63%	33%	100%	88%	0%	500%	100%	100%	58%
20	TEGOGO BALOYI	8105300300891	78%	0%	36%	18%	64%	0%	100%	0%	30%	100%	100%	100%	100%	50%	33%	63%	33%	100%	63%	100%	100%	100%	100%	86%
1	INDUTSO MELLO	9107040600281	33%	100%	64%	73%	73%	0%	100%	44%	0%	100%	100%	100%	50%	100%	33%	38%	87%	100%	25%	100%	50%	0%	100%	85%
22	EDUARD MOKARA	8101070501087	33%	0%	64%	82%	36%	0%	100%	66%	0%	100%	100%	100%	50%	23%	100%	50%	100%	0%	75%	0%	0%	100%	100%	84%
3	TEGOGO BALOYI	7107030444770	33%	0%	64%	36%	73%	0%	100%	0%	0%	100%	100%	100%	50%	100%	87%	38%	87%	0%	100%	100%	0%	0%	100%	84%
28	RAMADIME JA KOLOTSI	8106133541080	33%	100%	49%	59%	73%	0%	100%	0%	100%	100%	100%	100%	50%	100%	87%	63%	87%	0%	75%	0%	0%	100%	100%	83%
27	THABANG APHANE	8807140705084	22%	100%	45%	61%	36%	0%	100%	0%	0%	100%	100%	100%	50%	100%	75%	87%	75%	0%	100%	100%	0%	0%	100%	83%
19	MOKGAELE TALE	8809256206080	89%	100%	64%	45%	73%	0%	100%	0%	0%	100%	100%	100%	50%	100%	25%	87%	87%	0%	50%	0%	0%	100%	100%	82%
14	INTHABENGO AFRANA	8712273404082	22%	0%	8%	71%	36%	0%	100%	100%	0%	100%	100%	100%	50%	100%	100%	83%	87%	0%	100%	100%	0%	0%	100%	82%
9	GRACE APHANE	9207150000000	33%	0%	64%	64%	36%	0%	100%	100%	0%	100%	100%	100%	50%	100%	25%	87%	87%	0%	100%	100%	0%	0%	100%	82%
13	RAGIBE APHANE	8608145572085	33%	0%	64%	64%	36%	0%	100%	100%	0%	100%	100%	100%	50%	100%	25%	87%	87%	0%	100%	100%	0%	0%	100%	81%
7	PHIBANTHE KGABAO	9106150414080	89%	0%	71%	71%	36%	0%	100%	44%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	81%
16	MOKELENG KGATLE	9003190923083	33%	0%	27%	36%	73%	0%	100%	44%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	81%
24	MAHLAKOGBHE MARIANE	9008254470082	22%	100%	55%	51%	36%	0%	100%	44%	0%	100%	100%	100%	50%	100%	75%	87%	33%	0%	25%	100%	0%	0%	100%	81%
28	MATLAMANE RUTUMELA	8606017500000	11%	100%	77%	77%	36%	0%	100%	0%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	81%
15	RAMOSALE KGOKOLO	8929250000000	31%	100%	55%	55%	36%	0%	100%	56%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
5	DONALD KGOKONYANE	8702250000000	67%	0%	36%	18%	36%	0%	100%	44%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
12	MOGEBOTSE KOVALE	8702270406083	45%	0%	45%	18%	8%	0%	100%	44%	0%	100%	100%	100%	50%	100%	33%	38%	87%	0%	100%	100%	0%	0%	100%	80%
25	NTIKE KGAGUBI	9104040000000	0%	0%	27%	36%	36%	0%	100%	11%	0%	100%	100%	100%	50%	100%	33%	38%	87%	0%	100%	100%	0%	0%	100%	80%
17	KHONYANA KOKELA	8603000000000	0%	0%	45%	45%	64%	0%	100%	0%	0%	100%	100%	100%	50%	100%	25%	87%	33%	0%	75%	100%	0%	0%	100%	80%
18	RAMATHAMATHE KGOMQESOGANA	8603000000000	100%	100%	27%	36%	27%	0%	100%	44%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
30	LEJUTHWELEDI LEHALERONA	83250320088	33%	100%	18%	27%	36%	0%	100%	44%	0%	100%	100%	100%	50%	100%	33%	38%	87%	0%	100%	100%	0%	0%	100%	80%
29	LEHLOGOKOLO LESUFI	8221500000000	33%	0%	27%	36%	36%	0%	100%	44%	0%	100%	100%	100%	50%	100%	33%	38%	87%	0%	100%	100%	0%	0%	100%	80%
8	INKHOLEFO LEFOKA	8603000000000	0%	0%	27%	27%	64%	0%	100%	10%	11%	0%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
11	MABOTSEHELE KOOBONA	8603000000000	27%	100%	27%	27%	64%	0%	100%	10%	11%	0%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
6	INKHOLEFO LEBETJA	8503000170085	56%	100%	27%	27%	64%	0%	100%	10%	11%	0%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
4	TAMELA LEKGOOTHOANE	9007180408083	33%	0%	73%	36%	45%	0%	100%	0%	0%	100%	100%	100%	50%	100%	33%	38%	87%	0%	100%	100%	0%	0%	100%	80%
10	LEHLOGOKOLO LESUFI	8105090200088	33%	100%	45%	45%	36%	0%	100%	0%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
21	RAMADIME TJE MABOTHA	8901085657089	33%	0%	65%	36%	36%	0%	100%	0%	0%	100%	100%	100%	50%	100%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
2	RAMADIME TJE MABOTHA	8606040306082	0%	0%	36%	1%	18%	0%	100%	22%	50%	56%	0%	0%	0%	50%	87%	63%	87%	0%	100%	100%	0%	0%	100%	80%
			Average Percentage:	37%	37%	40%	42%	5%	43%	43%	45%	46%	47%	47%	50%	51%	51%	52%	53%	53%	55%	57%	62%	63%	67%	46%

SUMMARY	
Number of Students:	30
Highest Math Percentage:	84%
Lowest Math Percentage:	31%
Average Math Percentage:	46%