**Faculty of Community and Health Sciences**

PREDICTORS OF ACADEMIC PERFORMANCE AND THROUGHPUT AMONG

SECOND-YEAR NURSING STUDENTS AT A UNIVERSITY IN THE WESTERN CAPE

A mini-thesis submitted in partial fulfilment of the requirements for the Degree of Master in Nursing (Education) in the School of Nursing, Faculty of Community and Health Sciences, University of the Western Cape
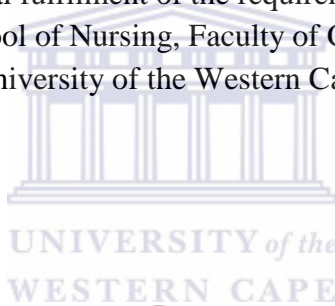
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Abstract

Background: Institutions offering Bachelor of Nursing programmes worldwide are under increasing pressure to graduate larger numbers of students to meet the demands of the desired nurse workforce. High academic performance, which is measured by continuous assessment and examination results, is one of the major goals of higher education. However many students experience difficulty during their second year of study at the university used in this study.

Aim: The overall aim of the study is to assess whether the identified predictor variables (cognitive, non-cognitive and demographic) influence academic performance of second-year nursing students at the University of the Western Cape.

Methodology: A non-experimental quantitative research approach with a cross-sectional predictive design was applied. The selected sample (*n*=226) included all first-time enrolled Bachelor of Nursing students for the years 2012 – 2013 at the University of the Western Cape. An all-inclusive sampling method was applied. Data were obtained from the Student Administrative System Integrated and recorded in the data collection check list. Statistical Package for Social Sciences software version 23.0 was used sort and analyse the data. Simple and multiple linear regression were done.

Ethics: Permission to conduct the present research study at the University of the Western Cape was obtained from the Registrar and the Director of The School of Nursing. The Research Ethics Committee of the University of the Western Cape granted ethics approval related to the research. The researcher maintained the principles of anonymity and confidentiality throughout the study.

Results: The study found that the cognitive predictor variables had the strongest predictive power in association with student performance in comparison to the non-cognitive predictors and demographic variable, besides race which rejected the null hypothesis.

i

Conclusion: The findings provided evidence to the School of Nursing to assist them in identifying students who may be at risk of unsatisfactory academic performance and who ultimately fail to proceed to the next level of study.

DECLARATION

I, Katlego Dumisani Trevor Mthimunye, declare that **Predictors of academic performance and throughput among second-year nursing students at a university in the Western Cape** is my own work, that it has not been submitted before for any degree or examination to any other university, and that all sources I have used or quoted have been indicated and acknowledged as complete references.

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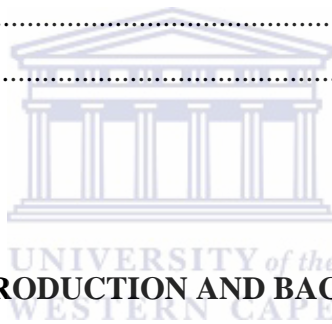
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TABLE OF CONTENTS

CHAPTER 1:   INTRODUCTION AND BACKGROUND

CHAPTER 2:   **LITERATURE REVIEW**

CHAPTER 3:   **RESEARCH METHODOLOGY**

viii

CHAPTER 4:   **DATA ANALYSIS AND INTERPRETATION**

x

CHAPTER 5:   SUMMARY OF FINDINGS AND DISCUSSION, LIMITATIONS, CONCLUSION AND RECOMMENDATIONS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS   **MEANING**

AARP   Alternative Admissions Research Project

ANOVA   Analysis of variance

BNurs   Bachelor of Nursing

CHS   Community Health Science

GNS   General Nursing Science

ESL   English as a second language

HE   Higher education

HEI   Higher education institution

GPA   Grade point average

HESA   Higher Education South Africa

NBT   National Benchmark Test

NURS   Nursing undergraduate retention and success

NQF   National Qualification Framework

NSC   National Senior Certificate

R425   Regulation for registration as registered nurse (general, psychiatric and community) and midwife
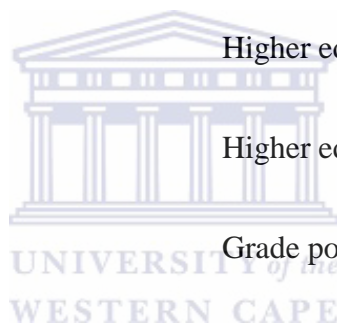
RN	Registered nurse
SASI	Student Administrative System Integrated
SAQA	South African Qualifications Authority
SANC	South African Nursing Council
SAT	Scholastic aptitude test
SEMS	Student Enrolment Management Systems
SoN	School of Nursing
SPSS	Statistical Package for Social Sciences
UWC	University of the Western Cape
VIF	Variance inflation

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Higher educational institutions in South Africa are confronted with the great challenge of how to produce quality students in a constantly increasing globalised and competitive environment (Harvey & Kamvounias, 2008). During the apartheid years in South Africa, the government established separate universities for non-whites. This action was controversial as many felt there was no justification for such universities other than the racial ideology of the day (Wolpe, 1995). Originally established in 1959 as an ethnic college for coloured students, the University of the Western Cape (UWC) is one of the most recent of these universities to maintain its autonomy, as most other such universities merged with other tertiary institutions around 2005(University of the Western Cape, n.d.).

UWC provides facilities for over 12 000 students across 68 departments and 16 institutes, schools and research centres. At UWC, the School of Nursing (SoN) is one of only two enrolling institutions for undergraduate nursing in the higher education sector in Western Cape Province. Furthermore, it is one of the biggest departments/schools in the Faculty of Community and Health Sciences (FCHS), and the number of students registering and showing interest in the field is escalating.

Learners wanting to study nursing would generally go to a tertiary institution such as a university to obtain a Bachelor of Nursing (BNurs) programme. Buerhaus, Staiger and Auerbach (2008)

reported that the demand for qualified nursing practitioners is increasing at a rate of 2 – 3% per year. However, not all of the students admitted to a BNurs programme will meet the academic expectations and complete the programme. According to Mellish, Brink and Paton (2009), nursing education is designed with the purpose of educating and training student nurses to become competent and significantly qualified professional nurses. However, nursing students need to acquire the necessary theoretical nursing knowledge and nursing skills to ensure adequate healthcare services. High academic performance, which is measured by continuous assessment and examination results, is one of the major goals of higher education (Council on Higher Education, 2010). The SoN at UWC has a vision that is geared towards student excellence in both academic and clinical spheres. Meyer and Van Niekerk (2008) emphasised that excellent performance forms the integral foundation of quality assurance and maintenance of high standards with specific reference to the requirements of the Education and Training Quality Assurance Body (ETQA). The SoN at UWC therefore finds it imperative to identify and recruit students who exhibit potential for excellent academic and clinical performance.

To ensure that the SoN at UWC recruits high-quality prospective students, there are certain requirements that the students should meet, or learning that should be in place, for applicants to be considered for admission to the BNurs programme. UWC's admission policy (Part One) from 2009 has stipulated the following as the minimum requirements for admission to the BNurs programme for applicants who matriculated from 2008 to date: the National Senior Certificate for Bachelor's Degree study plus a score of not less than 27 points calculated according to the university's approved points system, as well as the following specific subject requirements: level 4 (50 – 59%) in English (home or first additional language) and level 3 (40 – 49%) in another language (home or first additional language), level 4 (50 – 59%) in life sciences and level 3 (40 –

49%) in mathematics or level 4 (50– 59%) in mathematical literacy. Table 1 below illustrates the points system used by UWC to grant prospective nursing students admission status. In addition to students' high school grades, students may be required to write the National Benchmark Test (NBT) prior to admission into the BNurs programme at UWC.

Table 1.1: Points system used to calculate whether prospective students meet the minimum requirements for admission to the Bachelor of Nursing programme
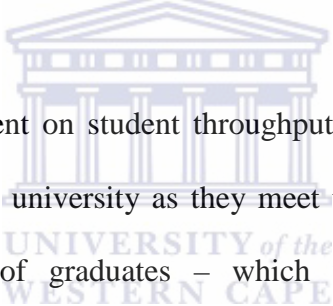
NSC LEVELS		UWC POINTS			
Level	Percentages	Points for English	Points for maths or maths literacy	Points for life orientation	Points for each other subject
8	90 – 100%	15	15	3	8
7	80 – 89%	13	13	3	7
6	70 – 79%	11	11	2	6
5	60 – 69%	9	9	2	5
4	50 – 59%	7	7	2	4
3	40 – 49%	5	5	1	3
2	30 – 39%	3	3	1	2
1	20 – 29%	1	1	1	1
	<20%	0	0	0	0

1.2 SIGNIFICANCE OF THE STUDY

In the literature, authors such as Horton (2006) and Jeffreys (2007) have emphasised the emotional as well as the psychological aspects of students as determining factors influencing the

academic performance of nursing students. There is a great need for yet more predictive studies to be conducted, using regression analysis to identify factors that are predictive of high academic performance.

The results of predictive analyses can provide the FCHS and the institution (UWC) with significant information to refine the admission criteria to reflect the changing profile of applicants who are applying for the undergraduate nursing programme at UWC. The results may also assist nurse educators to identify at-risk (the likelihood that a student will experience difficulty in current studies) students, and thus attempt to help those who may be at risk of unsatisfactory academic performance during their second year of the BNurs programme.

Government subsidies are dependent on student throughput, and therefore the findings of the present study may also benefit the university as they meet the demands set by government in securing an increasing number of graduates – which will ultimately increase funding. Additionally, the findings might be of interest to academics involved in the training and development of undergraduate nursing programmes at UWC and at other universities.

The present study addresses the various predictor variables that contribute towards students' potential academic performance in BNurs programmes; its primary focus is on facts and statistics that will substantially contribute to student performance in the area of nursing education.

1.3 PROBLEM STATEMENT

When interviewed in March 2014, Professor F. Daniels, Mrs N. Linda and Mrs L. Fakude from the SoN confirmed that many nursing students encounter difficulties in their second year of study, which is evident from unsatisfactory performance and pass rates at that level of the programme. The literature reveals that studies have been conducted regarding the factors that affect academic performance and the throughput rate of undergraduate nursing students over the past few decades (Jeffreys, 1998, 2001, 2002, 2007; Lockie & Burke, 1999; Manifold & Rambur, 2001; Shelton, 2003). Nevertheless, research has not been decisive on which factor or combination of factors has had the greatest predictive influence on nursing students' academic performance. The obvious lack of research on the predictors of academic performance supports the need for further studies to be conducted.

1.4 AIM AND OBJECTIVES

The aim of the present research study was to examine the relationship between demographic and academic achievements and the academic performance of second-year nursing students at UWC.

The following objectives have been developed to guide this study:

- to determine the predictive value of demographics on academic performance of nursing students currently completing their second year of the BNurs programme at UWC
- to determine the predictive value of previous academic achievements on academic performance of nursing students attempting the second year of the BNurs programme.

1.5   HYPOTHESES

On the basis of the above-mentioned, the hypotheses included the following.

H1: Students' age, gender, and ethnicity are significant predictors of high academic performance of second-year nursing students.

H2: Student's grades (high school average grade, grades in science and mathematics, NBT grade, first year average grade) are significant predictors of academic performance of second year nursing students.

The other remaining factors (i.e. English as second language, students' place of residence during the second year of study and throughput/success) will serve as the control variables in order to provide a more complete analysis.

1.6 RESEARCH METHODOLOGY

A brief outline of the research methodology is described in this chapter; more detail related to the literature and implementation of the methodology is elaborated on in Chapter 3.

1.6.1   Research design

For the present quantitative, non-experimental research study, a cross-sectional predictive design was applied to examine the predictive value of the identified predictor variables that influence the performance of second-year nursing students at a university in Western Cape Province. Babbie and Mouton (2002) assert that quantitative research designs are the best means of measuring properties of phenomena and therefore the reason why this design was

operationalised, which was to measure the relationship between the study variables and to determine the predictive value of independent predictor variables on students' performance.

1.6.2 Population and sampling

The selected sample (*n*=226) included all nursing students registered for BNurs second year at UWC in the study year 2012 – 2013. An all-inclusive sampling method was applied. The reason why all-inclusive sampling was applied was to give all participants the opportunity to be representative of the phenomenon under study (Babbie, 2008).

1.6.3 Pre-test of instrument

A pre-test of the instrument was conducted to test the feasibility of the checklist used to collect data from the Student Administrative System Integrated (SASI) used by the university and to establish the inter-rater reliability.

1.6.4 Reliability and validity

The reliability and validity were tested via a pre-test of instrument and were supported by experts in the field of teaching and learning in nursing education, research methodology and statistics.

1.6.5 Selection criteria

The criteria set for the present research study were to include only those for students who obtained a National Senior Certificate (NSC) as certified by the ETQA (Umalusi) and attempted the second year of BNurs programme for the first time in the year 2012 –2013 at UWC.

1.6.6 Data collection tool

The instrument (a data collection checklist (Appendix A)) was used to collect the data of each student from SASI. The data collected included student demographic data, academic and non-academic history and student performance at second year of study.

1.6.7 Data collection

The researcher, with the help of the research assistant, appointed by the Director of the School of Nursing at UWC extracted the requested data from the SASI.

1.6.8 Data analysis and interpretation

Descriptive and inferential statistics were utilised to analyse obtained data by means of the IBM Statistical Package for Social Sciences (SPSS-23; IBM, New York). Descriptive statistics included frequencies, means and standard deviations. Inferential statistics were used to analyse the relationship between variables. The study used simple and multiple regression analyses to test the hypotheses listed above.

1.6.9 Ethics

Kosslyn and Rosenberg (2005) highlighted the seriousness of the researcher's adherence to ethics when conducting a research study. Permission to conduct the research study at UWC was obtained from the Registrar and the Director of School of Nursing (Appendix E). The proposal was approved by the Senate Higher Degrees Committee of UWC (Appendix F). The Research Ethics Committee of UWC granted approval of the ethics management related to the research (Appendix F). The researcher maintained the principle of anonymity and confidentiality throughout the study (Grove, Burns & Gray, 2012). Student's identification such as name,

contact details and student numbers were not reflected in the study. Furthermore, all results from SASI that were used were reported in aggregate to minimise the potential for identification of any individual. All data were kept safe and in a secure file that was password protected to maintain and uphold confidentiality.

1.7   OPERATIONAL DEFINITIONS

1.7.1   At-risk

The likelihood that a student will experience difficulty achieving the minimum requirement to pass a module or modules, that will negatively affect the student's promotion to the next year of the BNurs programme.

1.7.2   Attrition

Non-completion of the nursing programme: voluntary or non-voluntary withdrawal from the nursing programme.

1.7.3   Cognitive predictors

Independent variables that are evidence of a student's academic ability and educational background, namely high school grade, science grade, mathematics grade, previous qualifications, NBT, aggregate results in first year of study.

1.7.4   Ethnicity

A student's self-reported ethnic origin.
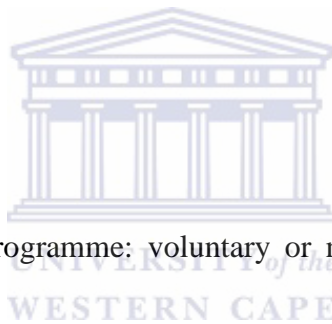
1.7.5   High school grade

High school grade refers to the total admission points that the student received prior to entering the BNurs programme according to UWC's point system.

1.7.6   Mathematics grade

Average grade obtained for high school mathematical subjects. Maths skill indicates the ability to perform basic operations in maths and algebra. Frost (2004) reported that maths skills are essential for success in the healthcare professions.

1.7.7   Non-cognitive predictors

Non-academic independent variables that are evidence of having an indirect influence on the student's academic performance, namely English as second language, whether residing at university residence or at home.
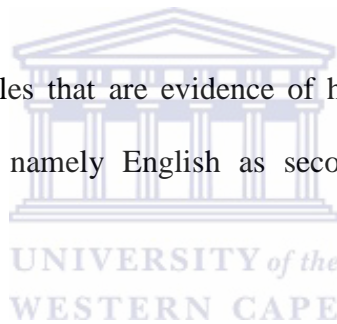
1.7.8   Performance

Academic performance is a complex concept to define (Jansen, 2004). It refers to what a student have learned or what skills the student has learned (Santrock, 2006). In the present study, academic performance was measured as the final aggregate mark that a student obtained at the end of the second year of study.

1.7.9   Predictors

Mahoney (2013) defined the term 'predictor' as an independent variable that can be used to draw reliable conclusions about current conditions and future events.

1.7.10 Previous qualifications

Previous qualifications refer to earned nursing certificates and baccalaureate, master's or doctoral degrees in any area.

1.7.11 Science grade

Average grade obtained in high school science subjects, including anatomy and physiology, physiology, microbiology, psychology, chemistry, physical science and natural science.

1.7.12 Success/throughput

Success means that the student obtains the minimum requirements stipulated by the university to proceed to the next level of study.

1.8   OUTLINE OF THE STUDY

A brief outline of how the chapters were divided follows below:

Chapter 1: Introduction

This chapter introduces the problem of the study and describes the background, rationale, aims, hypothesis and a brief description of the research methodology applied in the study.

Chapter 2: Literature review

Reviewed literature is explored, which includes theoretical and empirical literature on predictors as well as the factors that influence students' academic performance.

Chapter 3: Research methodology

Describes and discusses the methodology of the study, i.e. the research design, data collection tool and sampling procedure are outlined in detail.

Chapter 4: Data analysis, interpretation and discussion

Describes and discusses the processing, analysis, interpretation and evaluation of data.

Chapter 5: Conclusion and recommendations

Discussion of the recommendations based on scientific evidence as well as the conclusions and recommendations related to the findings.

1.9   CONCLUSION

Here the researcher provides a brief description of the study with specific reference to the significance of the study and the problem statement, hypotheses, aims, objectives and research methodology applied.

CHAPTER 2

LITERATURE REVIEW

2.1   INTRODUCTION

Several studies have been conducted with the aim of identifying predictors of academic performance as well as other factors that influence students' performance generally. Nursing education received similar attention in this regard at both the theoretical and clinical levels. The NURS (2013) model indicates that the academic performance and ultimately the retention of nursing students is based on the interaction of student profile characteristics, student affective factors, academic factors, environmental factors, academic outcomes, psychological outcomes, outside surrounding factors, and professional integration factors (Figure 1.1). Various predictors of academic performance were antecedently identified in prior studies but there are certain predictors that were notably published. Meggimson (2007) suggested that background predictors of high academic performance, such as previous academic performance and age, predicted a student's success. Furthermore, Meggimson (2007) stated that negative academic achievements have an influence on the success and academic performance of the student. Other studies such as those by Ofori and Charlton (2002) and Magerman (2011) suggest that age, gender, race, first language, prior academic achievement and number of attempts influence the degree of performance by nursing students. Acknowledging that the above factors are tested in prior research studies, the findings do not seem to be coherent and reproducible, however. Taking into consideration that the interpretation of the findings and ultimately the conclusion will directly be affected by the setting, it is therefore implied that the results are not unconditionally generalisable beyond the setting of the study. In the next paragraph, the author discusses the

demographic, cognitive and non-cognitive predictors of academic performance that are of interest to the study.

2.2 PREDICTORS OF ACADEMIC PERFORMANCE

2.2.1   Demographic predictors

Age, gender and ethnicity have been shown to be the strongest demographic predictors of academic performance and throughput among nursing students (Wong & Wong, 1999; Gravett, 2005; Salamonson &Andrew, 2006; Meadus & Twomey, 2007).

2.2.1.1 Age

The cognitive theorist Malcolm Knowles in his assumptions describes adult learners as experienced beings, self-directed, ready-to-learn-students; these characteristics may contribute towards adult learners' academic performance (Gravett, 2005). Studies such as that by Salamonson and Andrew (2006) have shown that older, mature students performed better academically than younger students. This finding may be linked to the fact that older students are self-directed and display a high level of self-motivation. Goddard, Mannion and Smith (2004) reported that older nursing students perform better in their nursing studies regardless of their previous qualifications, whilst younger students with better academic background perform unsatisfactorily. Based on these findings, a conclusion was drawn that entry qualification does not indicate performance in nursing undergraduate nursing studies (Goddard et al., 2004). Ansari (2002) found that students between the ages of 26 and 50 performed better in their examinations than those below the age of 26. This may be because adult students have accumulated a large amount of life experience and sense of maturity. However, Steele William, Caperchione and

Anastasi (2005) reported that older students go through problems, such as financial constraints and psychosocial stressors, which may affect their academic performance; these may serve as a motivation and encourage students to perform well.

2.2.1.2 Gender

Like age, the impact of gender was a factor that was considered by many researchers. Various studies have been conducted evaluating the effect of student gender on performance, and it was found that there were no substantial variations between male and female students regarding academic performance (Meadus & Twomey, 2007). However, one has to bear in mind that traditionally the nursing profession has been predominantly a female profession. Female nurses have a caring nature inherent in nursing, and this is associated with the female role. Meadus and Twomey (2007) reported that male applicants were prevented from taking nursing as a profession, owing to the perceptions of the community, the value of nursing to society and sexual stereotypes. Males are seen as a nursing minority, which might negatively affect their performance. The profession has grown enormously, however, and more men are being recruited into the profession (Mullen & Wise, 2009).

2.2.1.3 Ethnicity

Like age and gender, ethnicity has been shown to be one of the strongest demographic predictors of high academic performance and throughput amongst nursing students (Wong & Wong, 1999; Lewis & Lewis, 2000; Beeson & Kissling, 2001). A study by Haas, Nugent and Rule (2004) found a high rate of success among BNurs white ($n=309$) and African-American ($n=32$) students. Enders (1997) and Higgins (2005) reported that there was no significant relationship between student ethnicity and success in undergraduate nursing programmes. However, these findings

may not necessarily apply at UWC owing to the level of ethnic and racial diversity in South Africa.

Over the years, the profile of students registering for nursing programmes has changed, particularly in South Africa post-apartheid. More and more previously disadvantaged races such as black and coloured students are admitted at HEIs (Chisholm, 2004). Such changes allow new research to be undertaken to re-examine the predictive value of ethnicity on the academic performance of second-year nursing students at UWC.

2.2.2   Non-cognitive predictors:

2.2.2.1 English as a second language (ESL)

Owing to the history of the Republic of South Africa, most South African universities use English and Afrikaans as the primary mediums of tuition. The ESL students are those whose primary language or mother tongue is not English; consequently, these students find it difficult to express themselves in English (Guhde 2003). According to Bruce and Klopper (2011), language is one of the barriers to learning. In a classroom setting, language differences between the educator and the learner may result in the learning process being hindered. Gupta and Mutha (2006) extended their study of language barriers to healthcare and reported that many people residing in the USA speak little English and thus may experience language barriers when seeking healthcare. The same report findings may apply in South Africa. Consequently, the language barrier may affect nursing students in a clinical setting as well.

English has become the most-used medium of communication in most institutions, including educational institutions. The majority of prescribed study material uses the English language; this includes textbooks, journals and the internet. In recent years, there has been an increase in the number of African students enrolling at universities, which implies that a majority of students in the classroom may be studying in a language that is not their first language. Consequently, this may lead to unsatisfactory academic performance by students who may ultimately drop out.

According to the HESA, the challenges experienced by the by students regarding the medium of communication is one of the leading factors contributing to unsatisfactory academic performance (Higher Education South Africa, 2014). MacGregor (2004) reported that academic literacy offered to prospective students as one of the three NBTs showed that 47% of students were proficient in English, 46% fell in the average category, and 7% had only basic academic literacy.

2.2.2.2 Place residence

Living at a university residence can have a significant impact on the academic performance of students. This impact can affect students' academic performance positively or negatively. Students living in a university residence may lack support from their parents, friends and family and may experience psychological, emotional and social challenges that might have a negative effect on their studies (Magerman, 2011). However, students living off campus with their parents, family and friends might have sufficient support and are likely to perform better in their studies (Paltridge, Mayson & Schapper, 2010). Another consideration is that students living in university residence have the advantage of access to university facilities such as the internet, laboratories and libraries. Other advantages of living in residence close to or on the university campus may be time saved, and less stress, energy and traveling costs than that of students

residing off campus, which may have a positive impact on the former's academic performance. Previous studies (Paltridge et al., 2010; Snyder, Kras, Bressel and Reeve, 2011) found that there is a positive relationship between students living on campus and academic performance.

2.2.3 Cognitive predictors

2.2.3.1 Final year high school grade (admission points)

The South African National Senior Certificate (NSC) is awarded to students who have complied with the specific requirements (as published by UMALUSI – the Council for Quality Assurance in General and Further Education and Training). These requirements form the basis for determining whether the student is to be accepted at any of the HEIs for the higher certificate, diploma or degree programmes.
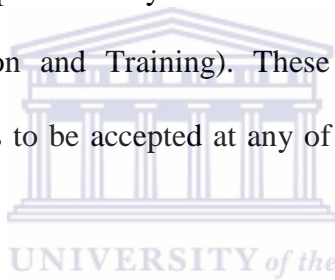
To obtain the NSC, a student must have completed examinations in the following subjects. The following Group A subjects are compulsory for all grade 12 students:

- one home language

- one home or first additional language

- mathematics or mathematical literacy

- life orientation.

The learner must have also completed three elective subjects selected from the Group B category: agriculture; culture and arts; business, commerce and management studies; official languages at second additional level and non-official languages; engineering and technology; human and social studies; physical, mathematical, computer and life sciences; services.

To qualify for admission to bachelor's degree studies at a HEI, the student must pass with a minimum of 30% in the language of learning and teaching of the HEI concerned. Furthermore, the student will be required to obtain a minimum achievement of 50% – 59% or higher in four subjects chosen from the designated subject list determined by the HEI (Umalusi, 2015).

Table 2.1 summarises the rating levels and descriptions for the NSC.

Table 2.1: Rating levels and descriptions for NSC.

Grade	Level	Description
0% – 29%	Level 1	Unsatisfactory performance
30% – 39%	Level 2	Elementary performance
40% – 49%	Level 3	Adequate performance
50% – 59%	Level 4	Moderate performance
60% – 69%	Level 5	Substantial performance
70% – 79%	Level 6	Meritorious performance
80% – 100%	Level 7	Outstanding performance

The final-year high school grade (admission points) is vital in assisting students with the transition from high school to higher education. Traditionally it would be highly probable that students who performed better during their final high school year (grade 12) would perform better than those students who did not do well (Hopkins, 2008). This assertion may be based on the presumption that students who have scored high grades for grade 12 have inherent advanced cognitive abilities or levels of intelligence and/or are hard working. One would stereotypically

anticipate these dimensions to extend to tertiary level. Hopkins (2008) argued that the high school average grade, the Scholastic Aptitude Tests (SAT) and the reasoning test were predictors of academic success.

2.2.3.2 High school science and mathematics grade

It would be reasonable to anticipate that students who scored high grades in the Grade 12 science and mathematics subjects will perform better than those students with lower grades or those with no science or mathematics background. This assumption stems from the fact that nursing also forms part of science and therefore the relationship between high school science subjects and nursing science is of high correlation. According to the South African Nursing Council, Regulation 425 of the Nursing Act 33 of 2005, as amended, stipulates that general nursing science (GNS) should be a compulsory module in the nursing curriculum and should form the foundation of nursing science which requires an understanding of anatomy, physiology, patho-physiology, physics, chemistry and pharmacology. GNS should also be incorporated with social and biological sciences. This statement implies that mathematics, physical science, life science and life orientation are highly recommended grade 12 subjects for understanding the basis of nursing and for success in general nursing science. However, little evidence has been published whether students who are admitted to BNurs programmes need a science and mathematics background as it is thought to augment their likelihood of success in their nursing studies.

2.2.3.3 Previous nursing certificates, diplomas or degree

It would be expected of students who had previously earned a nursing certificate (nursing assistant and pupil enrolled nurse), degree or diploma in higher education to outperform those students who did not have any higher education qualification (Barbee & Gibson, 2001; Jeffreys,

2004). Alden (2008) found that students who earned qualifications at HEIs prior to entering the BNurs Science tended to perform better than their counterparts. Furthermore, Alden (2008) found that there was a significant relationship between previous degrees and students' success in undergraduate nursing programmes.

2.2.3.4 National Benchmark Test (NBT)

In 2005, Higher Education South Africa (HESA) commissioned the National Benchmark Tests (NBT) to replace the Alternative Admissions Research Project (AARP) which as of 2012 is no longer used. The NBT is an assessment for prospective first-year entry students into higher education. Data proportional to the predictor variables of maths skills, science background and students' responses on standardised nursing aptitude assessments are tested by the NBT. The tests are used by many tertiary institutions including the SoN at UWC as an admission screening tool. The NBT was designed to measure a student's ability to transfer understanding of academic literacy, quantitative literacy and mathematics to the demands of tertiary coursework. The test results provide schools and HEIs with information about the academic competence of students on entry to tertiary educational institutions. It also provides information to assist in the placement of prospective students in appropriate curricular routes (e.g. regular, augmented, extended, bridging or foundation programmes) and with the development of curricula for Higher Education programmes. The aim of the NBT is not to reproduce the same information as that derived from the matriculation examination (Admission Test, n.d). According to Griesel (2006), the main purpose of the NBT is to measure students' verbal reasoning, quantitative literacy and mathematical proficiency. Two tests (academic and quantitative literacy and mathematics) are designed to facilitate the placement of first-year students into the extended nursing or

21

mainstream programmes. These tests were first offered in 2009, and it is as yet too early to determine their predictive capacity regarding students' academic performance. Therefore it is very important that research is conducted to determine the predictive value of the NBTs regarding nursing students' academic performance at the second-year level.

2.2.3.5 Aggregate results in first year

There is a great level of integration between various levels in the BNurs programme; this implies that the curriculum being taught in second year would build on the knowledge gained in the first year of study. This practice is referred to as vertical articulation by the National Qualification Framework (NQF). One would strongly anticipate that a student's aggregate result in the first year of study would be indicative of their performance in their second year of study. However, Mouton, Louw and Strydom, (2012) argued that the quality of secondary education level has a direct implication on the performance of students at university level, with many learners subsequently underperforming due to lack of preparedness at school level.

2.3 THEORETICAL FRAMEWORK

The theoretical models for this research study are based on Jeffreys' model of Nursing Undergraduate Retention and Success (NURS) and clarify the predictive value of selected factors from the model that have been proved to have an effect on academic performance and throughput rate Jeffreys (2013). The present study constitutes a unique combination of variables that have not been studied as such by previous researchers. Jeffreys (2013) suggests that a nursing student's success and retention in the nursing profession is a complex and a

22

multidimensional phenomenon. She also stated that academic success is influenced by the interaction of personal, academic and environmental factors (Jeffreys, 2013). However, it is not within the scope of the present study to test the entire NURS model. The NURS (2013) model is used to examine and predict the value and the impact of selected cognitive (average high school grade, science grade, previous degree, reading comprehension, mathematics skill) and demographic (age, gender and ethnicity) student profile characteristics on the academic performance and throughput of second-year Bachelor of Nursing students. Jeffreys (2013) argued that students' academic success and retention decisions are based on the interaction of student profile characteristics, student affective factors, academic factors, environmental factors, professional integration factors, academic outcomes, psychological outcomes, and outside surrounding factors.
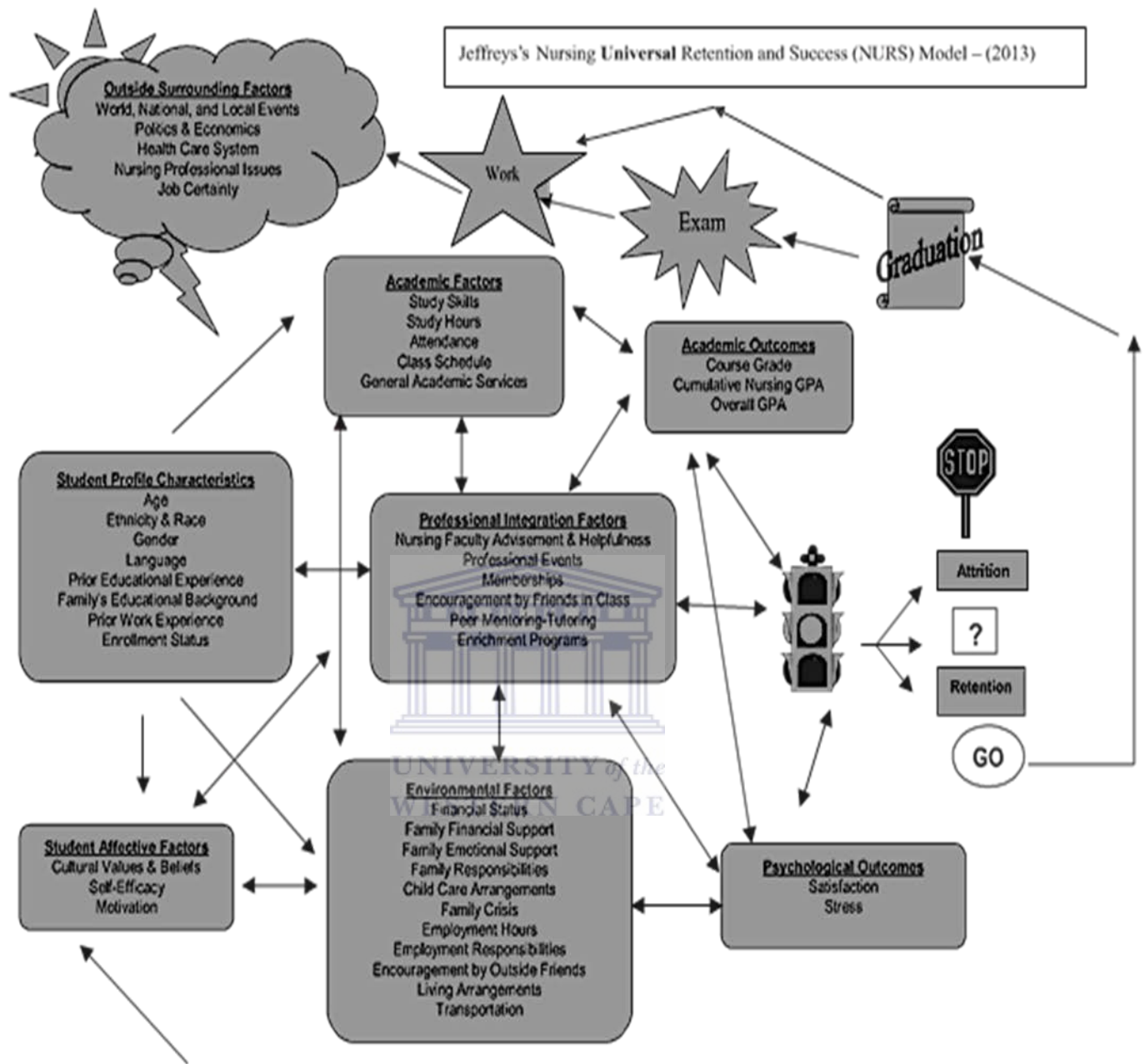
Figure 1.1: Model of Nursing Undergraduate Student Retention (Jeffreys, 2012).

Source: Jeffreys, (2013) Nursing Student Retention: Understanding the Process and Making a Difference. (2nd Ed), New York: Springer p.12.

The dependent variable in conceptual model A and conceptual model B for the present study is second-year performance for nursing modules and second-year performance for science modules respectively, categorised by Jeffreys (2013) as 'academic outcomes'.

The dependent variable in model C is throughput/success categorised in Jeffreys model as 'retention'.

The independent variables in the conceptual models are categorised for the purposes of this study as cognitive, non-cognitive, and demographic variables.
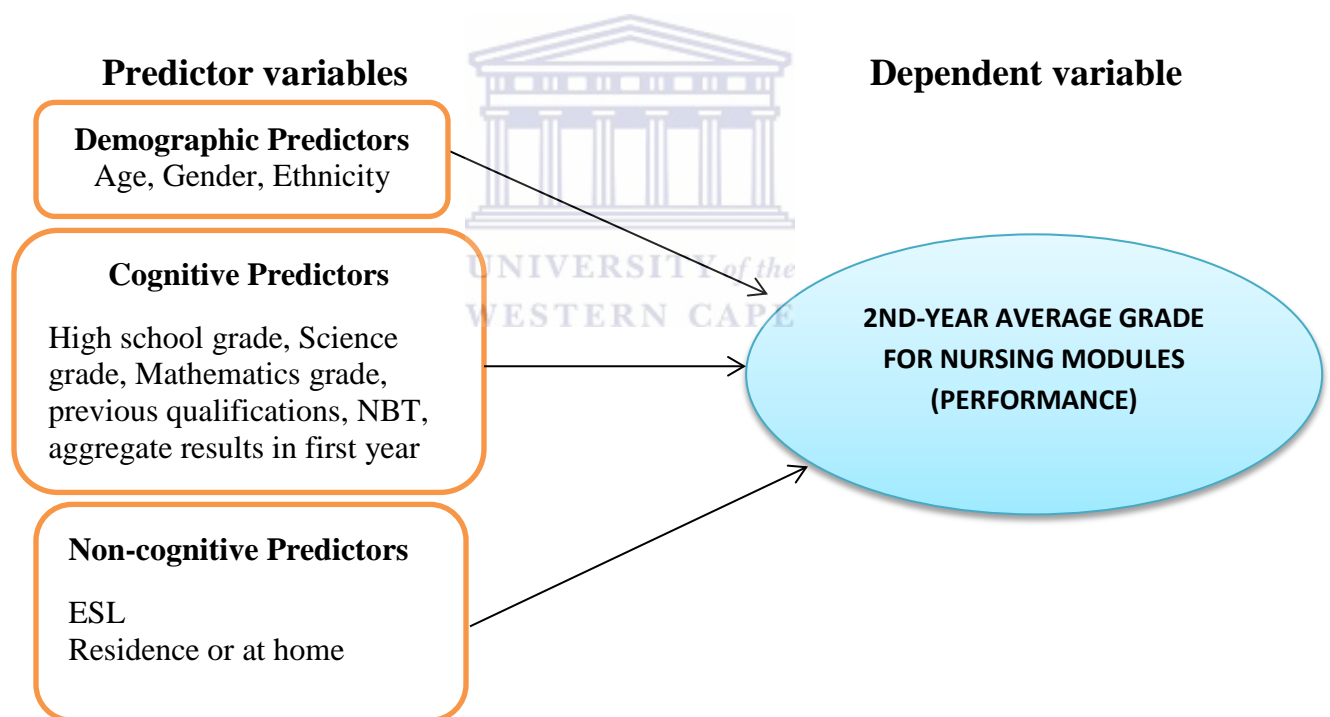
Figure 1.2: Conceptual model A – predictors of nursing modules performance.

Predictor variables   Dependent variable

Demographic Predictors
Age, Gender, Ethnicity

Cognitive Predictors
 High school grade, Science
grade, Mathematics grade,
previous qualifications, NBT,
aggregate results in first year

Non-cognitive Predictors

ESL
Residence or at home

**2ND-YEAR AVERAGE
GRADE FOR SCIENCE
MODULES
(PERFORMANCE)**
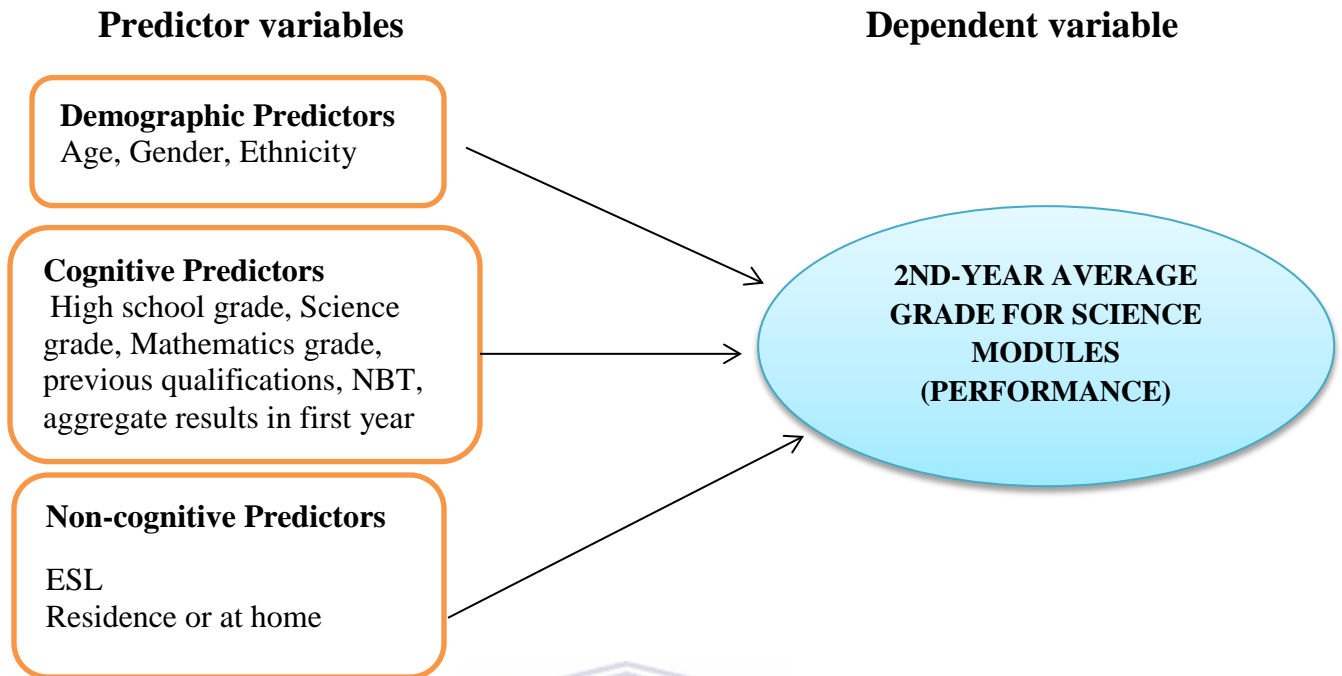
Figure 1.3: Conceptual model B – predictors of science modules performance.

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Predictor variables   Dependent variable

Demographic Predictors
Age, Gender, Ethnicity

Cognitive Predictors
High school grade, Science
grade, Mathematics grade,
previous qualifications, NBT,
aggregate results in first year

Non-cognitive Predictors

ESL
Residence or at home

THROUGHPUT/SUCCESS
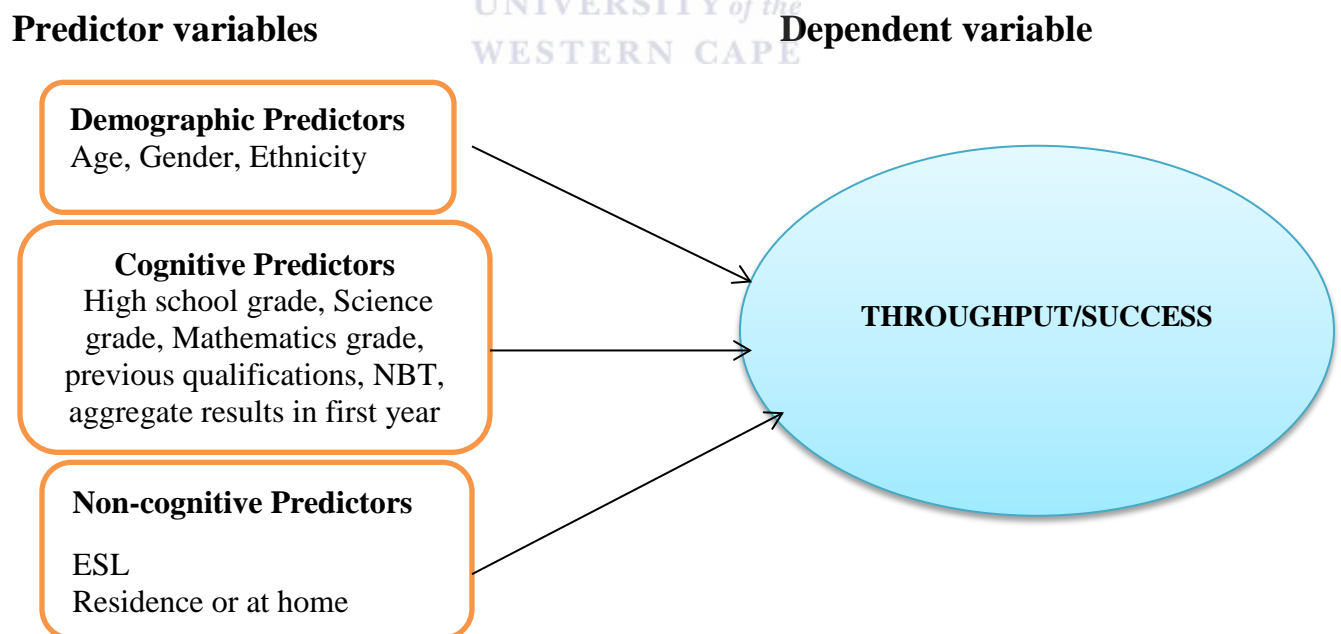
Figure 1.4: Conceptual model C – predictors of throughput.

2.4 SUMMARY

There are few research studies that address the predictive values of demographic variables (such as age, gender and ethnicity), cognitive predictors (such as grade 12 scores and pre-admission aptitude tests) and subsequent academic performance of student nurses (Aiken, Cervero, & Bailey, 2001; Campbell & Dickson, 1996, Jeffreys 2002, 2007). There is also a lack of empirical evidence about the predictive relationship between academic performance and non-cognitive predictors such as ESL and place of residence. Furthermore, there is some scientific evidence to support the view that previous academic achievement, such as degrees and diplomas obtained prior to the commencement of the undergraduate nursing programme, may predict subsequent performance in subsequent levels of undergraduate nursing programmes (Janes, 1997; Jeffreys, 1998, 2001; Lockie & Burke, 1999; Manifold & Rambur; 2001; Shelton, 2003). The literature also revealed few published studies related to academic performance and throughput among BNurs students that based their scientific finding on a theoretical framework. The NURS (2013) model by Jeffreys (2014) is one of the few comprehensible models that provided a theoretical framework for a limited number of published studies, and therefore this model still requires further testing. While a large number of the studies have put more emphasis on the factors that affect students' performance, few studies have focused on the predictors of high academic performance. The present study therefore aims to examine the relationship between demographic and academic achievements and the academic performance of second-year nursing students at UWC.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter describes the hypothesis, aims, objectives, research context, the population and sample, and data collection. Descriptions of the dependent and independent variables are included along with information relative to their operationalisation in the study. Methods of data analysis are also discussed.

3.2 HYPOTHESES

H1: Student age, gender and ethnicity are significant predictors of high academic performance of second-year nursing students.

H2: Student grades (high school average grade, grades in science and mathematics, National Benchmark Test grade, first-year average grade) are significant predictors of academic performance of second-year nursing students.

3.3 AIM

The aim of the present research study is to examine the relationship between demographic and academic achievements and the academic performance of second-year nursing students at the University of the Western Cape (UWC).

3.4 OBJECTIVES

Research objectives are clear, concise, declarative statements towards which desired goals are directed (Brink, 2008). The following objectives have been developed to guide the present study:

- to determine the predictive value of demographics on academic performance of nursing students attempting the second year of the BNurs programme at UWC

- to determine the predictive value of previous academic achievements on academic performance of nursing students attempting the second year of the BNurs programme.

3.5   RESEARCH METHODOLOGY

3.5.1   Research methods and design

De Vos, Strydom, Fouche and Delport (2011) define research design as a plan or blueprint for the conduct of a study. Therefore the research design can be referred to as the overall plan for the study. Furthermore, Grove, Burns and Gray (2012) suggests that research design maximises control over factors that could affect the study outcomes. The type of design selected determines the type of population sampling and the methods of measurement, and assists the researcher with the planning of data collection and data analysis (Grove, Burns & Gray, 2012). Burns and Grove (2007) suggests that the quality of the research design is dependent on the researcher's general insight about the proposed study, the problem and purpose of the study and the extent to which the researcher wishes to simplify the findings.

For the present quantitative, non-experimental research study, a cross-sectional predictive design was applied. According to Burns and Grove (2012), quantitative research is a systematic approach in which numerical data are used to obtain information about the world. The present

study adopted a non-experimental design. The purpose of a non-experimental study design is to describe the existing characteristics such as achievements, attitudes and relationships without manipulation of predictor variables (Grove, Burns & Gray, 2012). The present research study was conducted in order to predict a phenomenon, without regard for cause and effect (Creswell, 2013). Therefore this study offers a view of a single moment in time and does not consider what happens before or after the snapshot was taken.

3.5.2   Research context

The researcher focused on the UWC School of Nursing (SoN). UWC is a national university that strives to be a place of quality and a place of growth. This Higher Educational Institution is committed to excellence in teaching, learning and research. The SoN at UWC is one of the schools in the Community and Health Science (CHS) Faculty. The school offers a full range of education and training programmes at both under- and postgraduate level. The undergraduate qualification offered by the SoN includes the four-year BNurs qualification which affords graduates the opportunity to practice as a general nurse, midwife, and community health and psychiatric nurse after registration with South African Nursing Council. The second year in the four-year BNurs programme was the main focus for this research study.

3.5.3 Population

Grove, Burns and Gray (2012) defines the population as all elements, individuals, objects or substances that meet the criteria for inclusion into a study. Therefore the population refers to the entire group of people or objects that is of interest to the researcher. For the purpose of the

present study, the general population (*N*=543) included all nursing students registered for the second year of the BNurs programme at UWC for the previous two years (2013 and 2014). The cohorts of the students who were followed in the study included the BNurs class of the year 2012 and 2013. This population of the study provided the latest data of nursing students after the implementation of the national senior certificate in 2008.

3.5.4   Sampling

Grove, Burns and Gray (2012) define sampling as a process of selecting a group of people, events, behaviours or elements that is representative of the population. This definition therefore implies that a sample is a subset of members who traditionally belong to the population and are selected by the researcher for the study. A sample resembles the population in as many ways as possible. For the purpose of the present study, all-inclusive sampling was operationalised. The selected sample *n*=226 was obtained after consideration of inclusion criteria. The sample selection was based on specific inclusion criteria.

3.5.4.1 Inclusion criteria

Inclusion criteria constitute and lay the groundwork for the properties and the prominent attributes that subjects must have to be eligible to participate in the study (Heavey, 2010). Stommel and Wills (2004) suggest that generalisability of the study findings is dependent on the inclusion criteria; therefore it is highly preferable to have extensive inclusion criteria. For the purpose of the present study, the sample comprised students who:

- were registered for the 4-year BNurs programme at UWC for the academic year 2012 - 2013

- were first enrolled as a second-year nursing student at UWC in 2012 and 2013

- presented with a complete set of required data recorded

- obtained the National Senior Certificate (NSC) certified by the ETQA (UMALUSI) which was implemented as of the year 2008.

3.5.5 Instrument

According to Grove, Burns and Gray (2012), instrumentation is the application of specific rules aiming at developing a measurement device or instrument. An instrument is used to value specific variables in a research study. The present research study involves the secondary analysis of data from the student data base belonging to the UWC administration department. The administrative data tool commonly known as the Student Administrative System Intergraded (SASI) was the main source of data collection in this study. In 2010, the SASI project was initiated with the main aim of improving the efficiency and integrity of UWC's student document management system. The year 2012 saw the consolidation and completion of the SASI project as part of the larger Student Enrolment Management Systems (SEMS) project. SASI was designed and has been demonstrated to be an efficient and effective method for allowing access to histories of individual students, student demographics, and measurements of achievement related to current and previous academic records.

3.5.6 Pre-test of research instrument

De Vos et al. (2011) define a pre-test of research instrument as a procedure for testing and validating an instrument by administering it to a small group of participants from the intended test population. Grove, Burns and Gray (2012) suggest that the pre-test of research instrument is a small-scale preliminary test conducted prior to the proposed main study. A pre-test of the research instrument was conducted to test the feasibility of the data collection tool. The test was conducted by two individuals using the data extraction sheet to extract the data of about 15 students to ensure that the instrument was suitable and to establish the inter-rater reliability. McLeod (2013) defined inter-rater reliability as a measure of reliability used to assess the extent to which two or more raters agree to the data collection process interpretation of the findings.

3.5.7 Reliability and validity

LoBiondo-Wood and Haber (2010) discussed reliability as the ability of an instrument to measure the quality of a concept or construct consistently. In addition, reliability refers to the consistency of a tool in measuring the proposed variables; the higher the consistency of the tool, the more reliable it is said to be (Polit & Beck, 2008). A pre-test of the instrument was conducted prior to the main study to investigate the inter-rater reliability and to check for flaws of the data collection tool. Denzin and Lincoln (2005) emphasised the importance of an appropriate instrument in a research study. The statistician, the supervisor and the co-supervisor were consulted to check and confirm the appropriateness and the accuracy of the instrument. Consistency relates to the data collection tool being clear and well-defined so as not to confuse the respondents; and repeatability means that if the researcher has findings from a group, he/she should be able to repeat the study and obtain exactly the same results under similar conditions

(Brink, 2003 and McNeill & Chapman, 2005). In the present study, consistence and repeatability were maintained by ensuring that the data collection tool was clearly worded in English to avoid misinterpretation.

Validity refers to the degree to which the measurement procedure actually measures the concept that it is intended to measure (Trochim, 2006). Jackson (2012) stated that validity refers to whether the instrument used for data collection is truthful or accurate. Reliability does not ensure accuracy, as bias may also be portrayed (Babbie & Mouton, 2006). Therefore, it is of vital importance that the research is transparent and does not allow personal bias in the study being conducted. According to De Vos, Strydom, Fouché, and Delport (2007), one of the most common and useful methods to validate underlying measurements is content validity. Content validity ensures that the instrument measures the content that is desired for the study (Burns & Grove, 2009). Content validity of the instrument was based on the theoretical NURS framework by Jeffreys (2004).

3.5.8   Data collection process

The present study involved the analysis of data from a student data base belonging to UWC that is referred to as the Student Administrative System Intergraded (SASI). Admission and academic records of nursing students registered for their second year BNurs programme from 2012 to 2013 provided the main source of data for the study. The relevant data were extracted from the original documentation of students (such as required application documents and student transcripts) by personnel in the student administration office. The SASI database includes variables representing student profile characteristics such as demographics, high school subjects

and grades, earned degrees, grades in post matric courses, NBT grade, and grades in nursing courses. The following variables were requested from SASI: demographic variables (age, gender, ethnicity), cognitive predictors (second-year grade for science modules, second-year grade for nursing modules, success, previous qualifications, National Benchmark Test, high school life orientation grade, high school life science grade, high school physical science grade, high school mathematics grade, final-year high school grade (admission points), first-year grade for nursing modules, first-year grade for science modules) and non-cognitive predictors (place of residence and home language).

The above variables were obtained to enable the researcher to test the hypothesis of their relating to the study. Data were collected using a data collection check list (Appendix A).

3.5.9   Study variables

3.5.9.1 Dependent variables

The first dependent or outcome variable in a research study is performance. In the present study, performance was further broken down into two categories, namely performance in second-year nursing modules and performance in science modules (discussed below).

Second year grade for science modules

This dependent/outcome variable consists of ordinal indicator variables, where the average grade for science modules is calculated, and included in the regressions. The science modules in the second year of BNurs include the following: Human Biology HUB218, Human Biology (HUB

228) and Pharmacology (PHA 204). The score for second-year science modules is obtained by calculating the average mark for the modules listed above.

Second-year grade for nursing modules

The second dependent/outcome variable in the research study is second-year average grade for nursing modules. This outcome variable was operationalised by calculating the average score for second-year nursing modules. The second-year nursing modules include: General Nursing Science (NRS21) and General Nursing Science (NRS212). Average score for second-year nursing modules was operationalised as a continuous variable with the average grade obtained added to the regression as the outcome variable.

Throughput/success

Throughput or success is the only outcome variable added in this study as a control variable in order to provide a more complete analysis. According to the Faculty of Community & Health Sciences (2014), students in the second-year BNurs programme are expected to meet the following requirements in order to progress to the third level of study:

- The student must pass all modules from group 1.

- No Level 1 modules may be carried into Level 3.

- Brain and Behaviour 112 (PSY112) or Introduction to Psychology (PSY111) may be carried to Level 3 provided that the credits carried do not exceed 30 credits.

- The student should provide proof of clinical hours in Level 2 and proof of completion of all clinical hours in the first year of study.

In the present study, throughput/success was operationalised with students being categorised as 1 = successful or 0 = unsuccessful.

3.5.9.2 Independent variables

The independent or predictor variables in this study were student profile characteristics categorised as demographic, cognitive and non-cognitive predictors. The demographic variables were age, gender and ethnicity. The cognitive predictors included final-year high school grade, high school science and mathematics grade, previous nursing certificates/diploma/degree, the National Benchmark Test (NBT) and aggregate results in first year. The two non-cognitive predictors were English as a second language (ESL), and living in residence or at home.

3.5.9.2.1   Demographic variables

Age

This indicator independent variable was defined as the student's chronological age in years; the mean average age was determined and found to be 19.5 years. Students found to be younger or equal to the average age were coded 1. Students found to be older than the average age were coded 0.

Gender

This independent demographic variable was determined from the students' selected response on the application forms for admission to the BNurs programme at UWC. The following codes were operationalised: female nursing students were coded as 1, and male students as 0.

Ethnicity

This independent demographic variable was determined from the students' self-selected response on the application for admission to the university. Each student was placed in one of the five categories of White, Coloured, Indian, Black or other. The following codes were operationalised: Coded 4 if the student was Black, Code 3 if Coloured, Code 2 if White, Code 1 if Indian and Code 0 for other race.

3.5.9.2.2 Cognitive independent variables

The independent variables representing student cognitive abilities included final-year high school grade mathematics, physical science, life science, life orientation, previous qualifications, NBT, aggregate results in first year, final first-year average grade for science modules, and final first-year average grade for nursing modules.

Final-year high school grade (admission points)

Final-year high school grade was calculated according to UWC-approved point system as illustrated in Table 1.1. These points are also referred to as the Student's Admissions Points. Each high school subject mark from the student's official transcripts is graded according to the weight of the subject. The sum of all the high school subject points will determine the student's admission points after completing high school and prior to entering the university. Final-year high school grade is a continuous variable where the total points obtained by the student for each subject at high school are added together and included in the regression.

High school mathematics grade

Students' mathematics grades were obtained from official student transcripts submitted at the time of application. Mathematics grade is an ordinal variable, where the symbol obtained by the student for grade 12 mathematics was ranked and coded as illustrated in Table 2.1.

High school physical science grade

As for high school mathematics grade, students' science grades were obtained from the student transcripts submitted at the time of application. In the case where the student had completed more than one physical science subject (e.g. chemistry and physics), the grade was calculated by obtaining the average grade of the subjects concerned. The grade obtained for science subjects at high school level was ranked and coded as illustrated in Table 3.1.

High school life science grade

High school life science grade was operationalised as the grade that the student scored in life science at grade 12. The high school life science grade was obtained from the student's transcripts at the time of application. The high school life science grade is an ordinal variable with the symbol obtained ranked and coded according to the ranking.

High school life orientation grade

As for high school mathematics and life science, the high school life orientation grade was obtained from the student's transcripts submitted at the time of application. The grade obtained for life orientation at high school level was ranked and coded according to the ranking.

Previous qualifications, previous nursing certificates, diploma or degree

The independent predictor variable of previous qualifications was designed to identify those students who entered the BNurs programme having previously obtained a nursing certificate or diploma/degree in higher education. Students were categorised and coded 1 if the student completed the nursing qualification, diploma or degree (not nursing related); students who did not earn any qualifications prior to entering the BNurs programme were coded 0.

National Benchmark Test (NBT)

This variable was operationalised as the student's average score on the National Benchmark Test. The NBT consists of three tests, namely academic literacy (AL), quantitative literacy (QL) and mathematics. The NBT mark was obtained by calculating the average mark obtained from the three prescribed NBTs. Student scores were recorded as percentages (0 – 100). The NBT grade obtained is a continuous variable with the symbol obtained coded and included in the regression.

Aggregate results in first year

- first-year grade for science modules

  This independent predictor variable consists of continuous indicator variables, where the average grade for science modules is calculated and coded accordingly. The science modules in the first-year BNurs programme include the following: Human Biology (HUB118), Human Biology (HUB128), Physics for CHS (PHY118) and Chemistry 128 (CHS 128).

- first year grade for nursing modules

  This independent predictor variable is defined as the average score for nursing modules obtained by the student in the first year of the BNurs programme. The first-year nursing modules include: Fundamentals of Nursing Science (NUR 112), Fundamentals of Nursing Science (NUR 111) and Clinical Nursing (CUR 111). The first-year average grade for nursing modules is obtained by calculating the average grade obtained for the nursing modules listed above. The average grade obtained was operationalised as a continuous variable with the symbol obtained coded and included in the regression.

3.5.9.2.3   Non-cognitive independent variables

English as a second language and the student's place of residence during the second year of the BNurs programme were the only two non-cognitive independent predictor variables for the research study.

English as a second language (ESL)

This non-cognitive independent variable is defined as the student's home language or mother tongue as indicated on the application forms completed by the student prior to entering the BNurs programme. The following codes were operationalised: Code 1 if the student's first language was English, and code 0 if English was the second language.

Place of residence

The second non-cognitive independent variable is defined by whether the student lived in or out of university residence during the second-year of BNurs. The variable was coded 1 for students

who lived in a university residence during the second-year BNurs programme, and coded 0 for otherwise.

Table 3.1 provides a summary of the variable names and description.

Tables 3.2, 3.3, 3.4 and 3.5 summarise the nursing as well as the science modules provided in the first and second years respectively.

Table 3.1: Variable name, related description and codes

Variable name	Type	Description	Code
Throughput/success	Ordinal		1=successful 0=unsuccessful
Second-year grade for science grade	Continuous	Defined as the average score for science modules obtained in the 2nd year of study.	Grade obtained included in the regression for analysis
Second year grade for nursing grade	Continuous	The average score for nursing modules obtained in the 2nd year of study.	Grade obtained included in the regression for analysis
First-year grade for science modules	Continuous	Defined as the average score for science modules obtained in the 1st year.	Grade obtained included in the regression for analysis.
First-year grade for nursing modules	Continuous	Defined as the average score for nursing modules in 1st year.	Grade obtained included in the regression for analysis.
Final-year HS grade (admission points)	Continuous	Admission points calculated according to UWC-approved point system (See Table 1.1)	Continuous variable with points calculated according to the UWC point system.

HS maths grade	Ordinal	Defined by the score obtained for high school mathematics.	Grade obtained ranked and included in the regression.
Gender	Ordinal	Self-reported sex on admission to undergraduate programme.	1=female 0=male
ESL	Ordinal	Defined as the student's self-reported home language or mother tongue.	1=Home language English 0=Other language
Age	Continuous	Self-reported age on admission to undergraduate programme.	Age in years
Ethnicity	Ordinal	Self-reported race/ethnicity on admission to undergraduate programme.	1=Indian, 2=White, 3=Coloured, ; 4=Black, 0=Other
HS physical science grade	Ordinal	Defined by the score obtained for high school physical science.	Grade obtained ranked and included in the regression.
HS life science grade	Ordinal	Defined by the score obtained for high school life science.	Grade obtained ranked and included in the regression.
HS life orientation grade	Ordinal	Defined by the score obtained on high school life orientation.	Grade obtained ranked and included in the regression.
NBT grade	Ordinal	Defined by the score obtained for the NBT.	Grade obtained ranked and the rank included in the regression.
Previous nursing certificates, diploma or degree	Ordinal	Students with post grade 12 qualifications.	1=nursing qualification, diploma or degree (not nursing related); 0=no previous qualifications.

Residence	Ordinal	Defined by whether the student lived in or out of university residence.	1=student lived in a university residence during second-year of study, and 0 if otherwise.
Year	Ordinal		Code 1 if student attempted second year of study in 2012, and code 0 if student attempted second year in 2013.

Table 3.2: First-year nursing modules and related codes

Module name	Alpha code	Credits
Fundamentals of Nursing Science 112	NUR112	15
Fundamentals of Nursing Science 111	NUR111	15
Clinical Nursing (Lab) 111	CUR111	15

Table3.3: First-year science modules and related codes

Module name	Alpha code	Credits
Human Biology 118	HUB118	15
Human Biology 128	HUB128	15

Physics for CHS	PHY118	15
Chemistry 128 (CHS)	CHM128	15

Table 3.4: Second-year nursing modules and related codes

Module name	Alpha code	Credits
General Nursing Science 211	NRS211	20
General Nursing Science 212	NRS212	20
Intro to Mental Health 214	CUR214	10
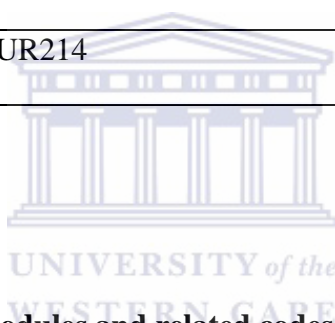
Table 3.5: Second-year science modules and related codes

Module name	Alpha code	Credits
Human Biology 218	HUB218	20
Human Biology 228	HUB228	20
Pharmacology 204	PHA204	20

3.5.9   Data analysis

Hypothesis 1: A student's age, gender, and ethnicity are significant predictors of high academic performance of second-year nursing students.

Hypothesis 2: A student's grades (high school average grade, grades in science and mathematics, NBT grade, first-year average grade) are significant predictors of academic performance of second-year nursing students.

Descriptive and inferential statistics were performed to analyse obtained data by means of the IBM Statistical Package for Social Sciences (IBM SPSS-23). Descriptive statistics was used to provide the statistical summaries of the data. According to Struwig and Stead (2003), descriptive statistics aims to provide an overall, coherent and straightforward picture of a large amount of data. In the present research study, descriptive statistics included frequencies, means and standard deviation. Inferential statistics was used to obtain more complex statistical analysis such as correlational analysis. Correlational analysis was performed to determine the relationship between study variables (Struwig & Stead, 2003).

The present study operationalised simple and multiple regression analyses to test the two hypotheses above. Simple regression allows one to assess the prediction between two variables, with only one predictor or dependent variable (Field, 2005). Multiple regression, on the other hand, is a statistical technique that allows one to predict the score on one variable on the basis of the scores on several other variables (Field, 2005). Simple and multiple regression analysis were performed to determine whether students' high school average grade, high school science and mathematics grade, previous qualifications, NBT grade, first-year grade and a combination of

46

these variables could predict high academic performance by second-year nursing students at UWC. The following statistical tests were applied to analyse the data.

3.5.9.1 Analysis of variance

Analysis of variance (ANOVA) is a statistical test that is used to examine differences among two or more groups by comparing the variability between the groups with the variability within each of the groups (Burns & Grove, 2009). In this study ANOVA was used to test the relationship between gender (male and female), ethnicity (White, Black, Coloured and Indian) and academic performance of students in their second-year of study.

3.5.9.2 Chi-square

The chi-square test is a test for significance, used to quantify the degree to which chance variability may account for the results observed in any individual study (Burns & Grove, 2009).

3.5.9.3 Kruskal-Wallis

The Kruskal-Wallis test is a non-parametric test that is used to test the differences between variables when one variable is nominal (or ordinal with a limited number of categories) and the other variable is ordinal, interval, or ratio scale (Plichta & Garzon, 2009). Furthermore the Kruskal-Wallis test is used to determine if the difference exist between the groups (Plichta & Garzon, 2009). The Kruskal-Wallis test is defined as a most powerful non-parametric analysis technique for examining two independent groups for differences (Burns & Grove, 2009). In this study Kruskal-Wallis test was used to test the relationship between gender (male and female),

ethnicity (White, Black, Coloured and Indian) and academic performance of students in their second-year of study.

3.5.9.4 Correlational analysis

The correlation coefficient ranges from -1 to +1 with 0 representing no relationship (Struwig & Stead, 2003; Pretorius, 2007). According to Pretorius (2007), the coefficient magnitude is affected by factors such as sample size; however, he suggested that the following guideline can be followed to track the strength of the correlation among the variables (see Tables 4.9, 4.10 and 4.11). Table 3.6 illustrates the description of coefficient magnitudes. In the present study, correlational analysis is used to determine the strength of the relationship among the variables being tested.
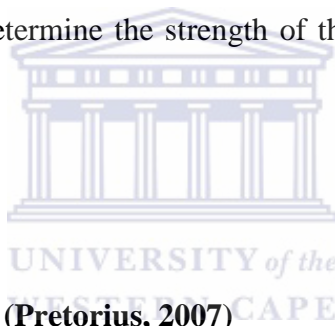
Table 3.6: Coefficient magnitude (Pretorius, 2007)

Magnitude	Description
<0.20	None to extremely weak relationship
0.20 – 0.40	Low correlation; weak relationship
0.40 – 0.70	Moderate correlation; substantial relationship
0.70 – 0.90	High correlation; marked relationship
>0.90	Very high correlation; very dependable relationship

3.5.9.5 Mean

A mean is defined as the value obtained by adding all the scores in a given range and dividing the total by the number of scores being summed (Burns & Grove, 2009). Therefore the mean refers to the average score within the variable range.

3.5.9.6 Median

The median is a score at the exact centre of the ungrouped frequency distribution (Burns & Grove, 2009), which implies that the median has an equal number of scores above and below it.

3.5.9.7 Mode

The mode is the most frequently occurring score. It is the numerical value or score that occurs with the greatest frequency in a distribution but does not necessarily indicate the centre of the data set (Burns & Grove, 2009).
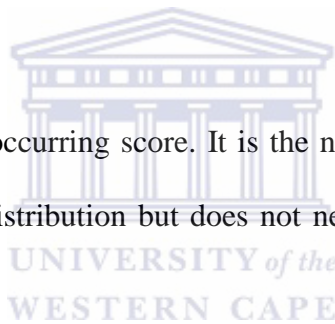
3.5.9.8 Pearson's product-moment correlation (Pearson's *r*)

Pearson's *r* is used to determine the extent to which variation in one continuous variable explains the variation in another continuous variable (Pretorius, 2007). Pearson's *r* test also determines the strength and the direction of the relationship between variables. A positive value indicates that the variation change is in the same direction, whereas the negative value indicates that the change is in the opposite direction (Burns & Grove, 2009). The correlation coefficient varies from -1 to 1 with zero (0) indicating no relationship between the variables. In the present study, Pearson's *r* is used to determine the relationship between continuous variables.

3.5.9.9 Probability theory (*p*-value)

Probability theory is used to explain the extent of a relationship – the probability that an event will occur in a given situation, or probability that an event can be accurately predicted. Probability is expressed in a lowercase italic letter *p*, with values expressed as percentages or as a decimal value ranging from 0 to 1 (Burns & Grove, 2009:451). Probability values can also be stated as less than a specific value, such as 0.05, expressed as $p<0.05$ (Burns & Grove, 2007:406). The *p*-value can be defined as the probability that an effect at least as extreme as that observed, in a particular study, could have occurred by chance alone. The *p*-value in the present study was determined to explain the significance of relationships among the study variables.

3.5.9.10 Regression

Linear regression is a statistical technique that aims to examine the relationship between one or more predictor variables with one outcome variable (Pretorius, 2007). It can also be used to measure the extent to which a predictor variable predicts the outcome variable. The strength of association between the predictor variable and the outcome variable is measured by R^2 (Burns & Grove, 2009). Regression technique is used in the present study to determine which variables or combinations of variables are predictive of performance by second-year nursing students.

3.5.9.11 Standard deviation
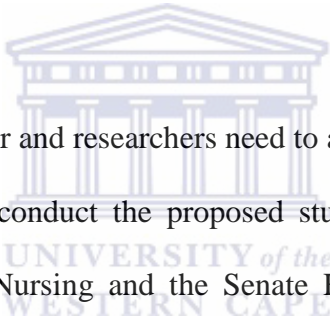
Standard deviation (SD) can be defined as a measure of dispersion that is calculated by taking the square root of the variance (Burns & Grove, 2007). Standard deviation measures the deviation of each score from the mean and then averages the deviations (Struwig & Stead, 2003; Pretorius, 2007). In the present study, SD is used to measure the average level of deviation of

scores (in a particular module or subject) obtained by the participants from the mean score. SD is also used to assess the deviation of participant's age from the mean age.

3.5.9.12 Spearman's rank-order correlations (Spearman's *rho*)

Spearman *rho* is a correlation coefficient indicating the magnitude of a relationship between variables measured on the ordinal scale (Polit & Beck, 2008). In this study Spearman's *rho* is used to determine the relationship between ordinal variables.

3.6   ETHICS

Ethics in research is a serious matter and researchers need to adhere to the strict rules (Kosslyn & Rosenberg, 2005). Permission to conduct the proposed study at UWC was sought from the Registrar, Director of School of Nursing and the Senate High Degrees Committee at UWC (Appendix D and Appendix E) and from the Research Ethical Committee of UWC (Appendix F). It was, however, acknowledged that, given that the researcher was a masters' student himself at the time of the study, accessing undergraduate student records was viewed as contravening students' right to confidentiality. However, permission was requested to access information on SASI without the names or student numbers of the participant group. In addition, a research assistant who was not affiliated to the BNurs programme was employed and trained to extract the data from SASI. All data were kept safe and in a secure area to maintain and uphold confidentiality (Grove, Burns & Gray, 2012). The researcher maintained the principle of anonymity and confidentiality throughout the study (Grove, Burns & Gray, 2012). Students' identification such as names, contact details and student numbers were withheld. Furthermore,

all results from SASI that were used were reported in aggregate to minimise the potential for identification of any individual. All data were kept safe in a locked cupboard and a file that was password protected.

3.7   CONCLUSION

In the current chapter, the researcher has described the methodology of the study. The various steps in the research process such as aims, hypothesis, objectives and ethical considerations were set out.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1   INTRODUCTION

The aim of the present research study was to examine the relationship between demographic and academic achievements and the academic performance of second-year nursing students at UWC.

In the current chapter, the results of descriptive and inferential analysis are presented. These results are presented and interpreted in tables, frequencies and histograms. A statistician was consulted for statistical support throughout the analysis of data. The quantitative data obtained from the student database SASI was captured using Microsoft Excel Version 2010 spreadsheet program and was verified by the statistician. The data were uploaded onto data analysis software, namely IBM Statistical Package for Social Sciences (IBM SPSS-23) for analysis and generation of tables, frequencies and histograms. Descriptive statistics was performed to determine the frequency distributions, means and standard deviations. Correlational analysis was utilised to determine the relationship between variables. Furthermore, linear and multiple regression analysis was used to determine the predictive value of various independent predictor variables.

4.2   DESCRIPTION OF STATISTICAL ANALYSIS

A full description of the tests performed during the data analysis was provided in Chapter 3, section 3.5.9.

4.3 DESCRIPTION OF THE POPULATION AND SAMPLE

The target population of the present study included all the first-enrolment students (N=543) admitted in the second year of the Bachelor of Nursing (BNurs) programme at the University of the Western Cape. Of the 543 students, 277 (51%) were admitted to the BNurs programme in 2012, and 266 (49%) were admitted in 2013.

Table 4.1: Target population (N=543)

	Frequency	Percentage (%)
Year of study		
2012	277	51
2013	266	49

4.3.1 Admission year 2012 (N=277)

Of the students admitted to the programme in 2012 and who were in the second year of the programme in 2013, the study sample was 101 (n_1=101) after consideration of inclusion criteria set for the present study. The following students were excluded from the sample: 57 who registered for the extended BNurs programme, 54 with incomplete data, 11 foreign students and 54 students who completed matric before 2008.Therefore, the number of students excluded from the 2012 cohort was 176.

Table 4.2. Description of admission year 2012 population (*N=277*)

Admission year 2012	Frequency	Percentage (%)
Sample	101	36.46
BNurs extended programme	57	20.58
Foreign students	11	3.97
Students with incomplete data	54	19.49
Completed matric before 2008	54	19.49
Total	**277**	**100**

4.3.2 Admission year 2013 (*N=266*)

Of the students admitted to the programme in 2013 and who were in the second year of the programme in 2014, the study sample was 125 ($n_2=125$) after consideration of inclusion criteria set for the study. The following students were excluded from the sample: 49 students who registered for the extended BNurs programme, 43 students with incomplete data, 18 foreign students and 31students who completed matric before 2008.

Table 4.3: Description of admission year 2013 population (*N=266*)

Admission year 2013	Frequency	Percentage (%)
Sample	125	46.99
BNurs extended programme	49	18.42
Foreign students	18	6.77
Students with incomplete data	43	16.17
Completed matric before 2008	31	11.65
Total	266	100

4.3.3   Total sample of the study

The total sample for the study constitutes the sum of the sample obtained in the cohort of 2012 ($n_1=101$) and the cohort of 2013 ($n_2=125$). Therefore the total sample of the study was 226 ($n=226$).

Table 4.4: Description of the total sample (*n=226*)

Cohort	Frequency	Percentage (%)
2012	101	44.69
2013	125	55.31
Total sample	226	100

4.4 ANALYSIS OF STUDENT'S DEMOGRAPHY RELATIVE TO OBJECTIVE 1 OF THE STUDY (to determine the predictive value of demographics on academic performance of nursing students)

The hypothesis was: Student age, gender and ethnicity are significant predictors of high academic performance among second-year nursing students.

4.4.1 Age

All students reported their age on their admission documentation which was captured by the administration office. At the time of admission to the BNurs programme, the youngest student was 17 years old whilst the oldest was 30 years of age. The mean age of the students was 19.5 years with a standard deviation (SD) of 1.4; the median age was 19 years. The distribution of age is illustrated in Table 4.5. Figure 4.1 shows that the sample age leans more to the younger side.

Table 4.5: Age distribution

Variable	Minimum	Maximum	Mean	Standard deviation
Age	17	30	19.5	1.4
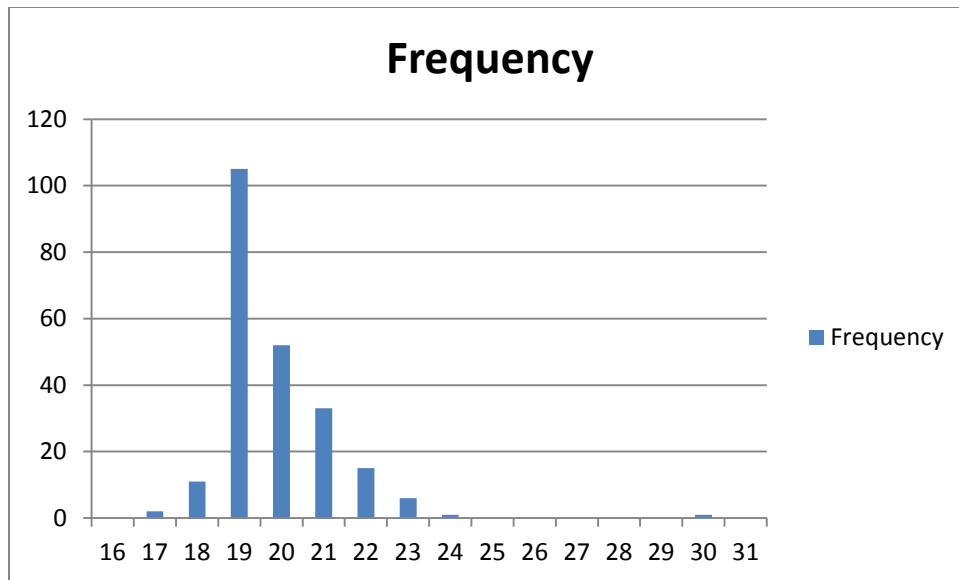
Figure 4.1: Histogram of age distribution

4.4.2   Gender and ethnicity

Analysis of student demographic data revealed that, of the 226 students, 188 (83.19%) were female and 38 (16.81%) were male. As Table 4.6 indicates, the nursing profession tends to attract more female than male personnel. Previous studies support the predominance of female nurses over male in the profession (Billings & Halstead, 2009; Dyck, Oliffe, Phinney & Garrett, 2009; Mooney, Glacken & O' Brien, 2008). However, it has been reported that the throughput-rate of male students exceeds that of their female counterparts (McLaughlin, Muldoon & Moutray, 2010; Dyck, Oliffe, Phinney & Garrett, 2009). O'Lynn (2004) suggests that the general perspective of nursing as a whole has hugely failed to create an optimally conducive environment to retain and support male students in their training as well as in their entire nursing career ahead of them. Furthermore, Brady and Sherrod (2003) suggest that engaging and retaining male nurses in the profession of nursing should be explored and be highly prioritised.

Analysis of the ethnical diversity among the study participants revealed that the sample was of predominantly black students ($n=120$; 53.10%), and the second largest ethnic group was of Coloured students ($n=80$; 35.40%). The smallest ethnic group of students was Indian ($n=2$; 0.88%) followed by white students ($n=23$; 10.18%). The category classified as 'Other' comprised one student (1; 0.44%).

Table 4.6: Summary of students' gender and ethnicity

Race	Female	Male	Total
Black	88	32	120
Coloured	74	6	80
White	23		23
Indian	2		2
Other	1		1
Total	188	38	226

4.5   ANALYSIS OF NON-COGNITIVE PREDICTORS

The following are the results of non-cognitive predictors which were used as control variables to provide a more complete analysis.

4.5.1 English as second language

The teaching medium at the university, which is English, often poses a challenge and becomes a language barrier for some students. Table 4.7 indicates that the majority of study participants are not English speaking. Home language was indicated by students on the university admission

document. Therefore, in the present study, English-speaking participants comprised only 26.99% (*n*=61) while speakers of other languages such as Afrikaans, IsiXhosa, isiZulu, Setswana and Sotho represented 73.01% (*n*=165) of the sample. The ordinal variable of ESL was operationalised by 1 = English and 0 = other language.

Table 4.7: Student's home language

Home language	Number of students	Percentage (%)
English	61	26.99
Other	165	73.01
Total	226	100

4.5.2 Place of residence

Place of residence during the period of study is vital to all university students. Students need a conducive environment that promotes learning. Figure 4.2 indicates the distribution of this predictor variable. Of the 226 participants, 89.82% (*n*=203) stayed outside university campus; only a minority (10.18%; *n*=23) of students resided at a university residence. This ordinal variable was operationalised by coding 1 for university residence and 0 for outside the university.

FREQUENCY

23

203

Out side UNIV
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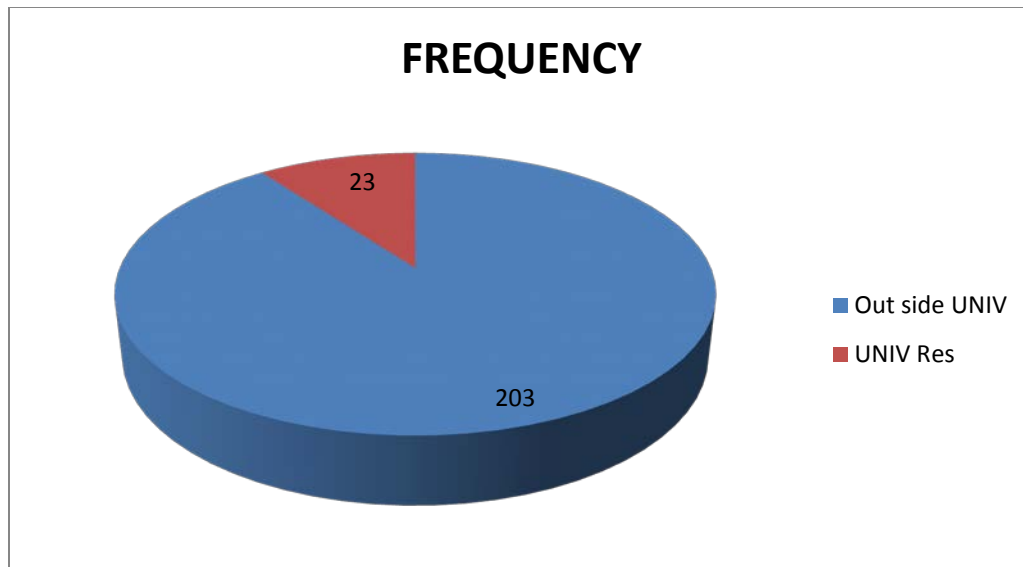
Figure 4.2: Student's place of residence

4.6 ANALYSES OF COGNITIVE PREDICTORS RELATED TO OBJECTIVE 2 (to determine the predictive value of previous academic achievements on academic performance of nursing students)

The hypothesis was: Student's grades (high school average grade, grades in science and mathematics, National Benchmark Test grade, first-year average grade) are significant predictors of academic performance of second-year nursing students.

Cognitive predictor variables reflect students' academic achievements prior to attempting the second-year BNurs programme at UWC. The cognitive predictor variables include final-year high school grade (admission points), high school mathematics grade, high school physical science grade, high school life science grade, high school life orientation grade, previous qualifications, NBT, first-year grade for science modules and first-year average grade for nursing modules.

For the present study, it was the researcher's desire to provide the SoN at UWC and the faculty of CHS relevant information that would enable them to identify students at risk of under-performance and ultimately failing their second year of study. Another desired outcome of the study was to provide the CHS faculty and UWC with significant information that may help to refine the admission criteria to reflect the changing profile of applicants who apply for the nursing programme. As for demographic and non-cognitive predictor variables, cognitive predictor variables were also expressed according to descriptive statistics.

4.6.1 Final high school grade (admission points)

The university has a points system for calculating whether an applicant meets the set entry requirements for the university and the nursing programme. This is done by grading all the grade 12 subjects to facilitate the calculation of the overall points that the student will score. The UWC-approved pointing system was used to grade the mark which the student obtained for each subject completed by the student in grade 12. The sum of the points (admission points) determines whether the student qualifies to be admitted to the BNurs programmes or not. Therefore, admission points play an essential role in making a decision regarding whether an applicant wishing to enrol for the BNurs programme will be accepted or not. According to UWC rules, for a prospective student to be admitted to the undergraduate nursing programme offered by the SoN, the student must have a minimum of 27 points (calculated according to the approved UWC point system) as well as the following specific subject requirements: level 4 (50% – 59%) in English (home or first additional language) and level 3 (40% – 49%) in another language (home or first additional language) and level 4 (50% – 59%) in life sciences and level 3 (40% –

49%) in mathematics or level 4 (50% – 59%) in mathematical literacy. The admission points of students in the present study ranged between 29 and 58 with a median of 37 and a mode of 36. The mean 'average' was calculated and found to be 37.8 with a standard deviation of 5.2. This predictor variable was operationalised as a continuous variable with the points obtained included in the regression for inferential analysis. Figure 4.3 summarises the distribution of admission points across the sample.
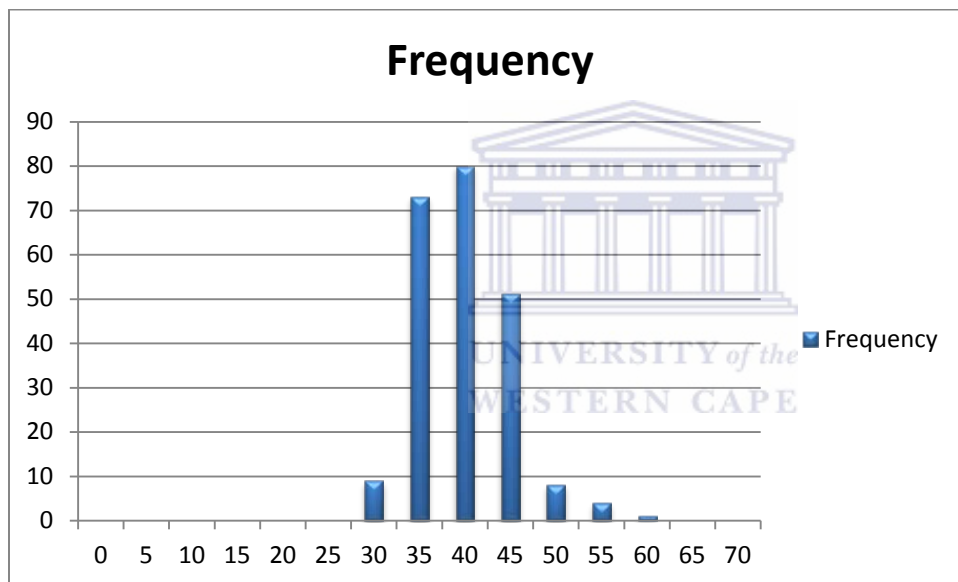
Figure 4.3: Histogram of admission points

4.6.2   High school life science grade

For the present study, the high school life science grade is representative of the life science subject completed by the student in the final year of high school. The life science subject may be very significant in predicting the performance of student nurses in science modules. The high school life science grade for this sample ranged from 3 to 7 with a mode of 5 and a median of 5.

The mean was calculated and found to be 4.9 with a standard deviation of 0.9. The high school life science grade was missing for one student. For this ordinal predictor variable, the coding was operationalised as the grade obtained for this subject according to UMALUSI. Figure 4.4 shows distribution of life science grades.
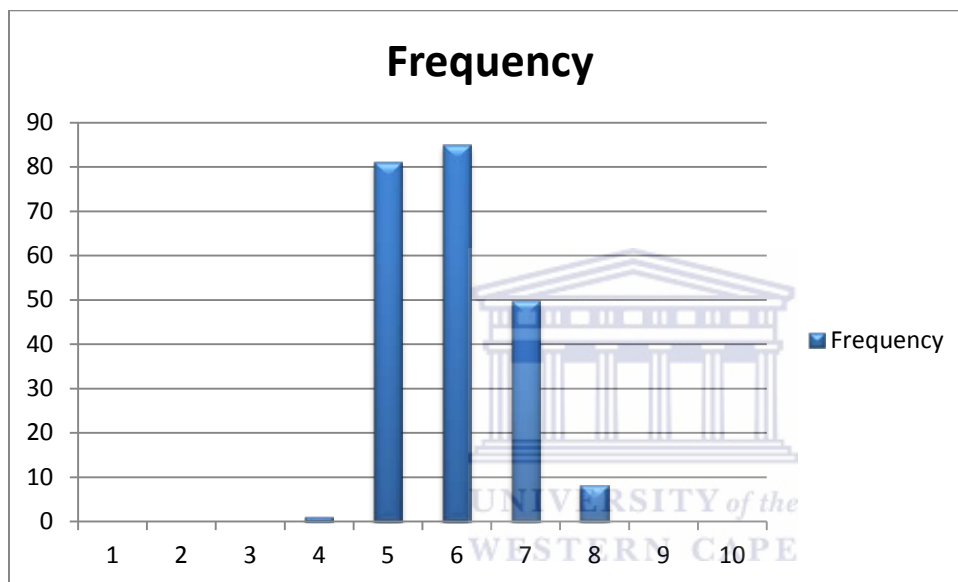
Figure 4.4: Histogram of high school life science grade

4.6.3   High school physical science grade

Participants' high school physical science grades ranged from 1 to 7 with a mode of 4 and median of 4. The mean for high school life science was found to be 3.6 with a standard deviation of 1.2. The high school physical science grade was missing for 70 students. Students with no grade for high school physical science are likely to have not registered for this subject at high school as it is not compulsory for grade 12. It is important to note that although this subject is recommended and not a required subject for admissions to the BNurs programme, it may still

hold significant predictive powers and therefore should be tested. For this ordinal predictor variable, the coding was operationalised as the grade obtained for this subject according to UMALUSI. Figure 4.5 illustrates the distribution of the physical science grade. The histogram of high school physical science implies that the grades are skewed towards the lower grades.
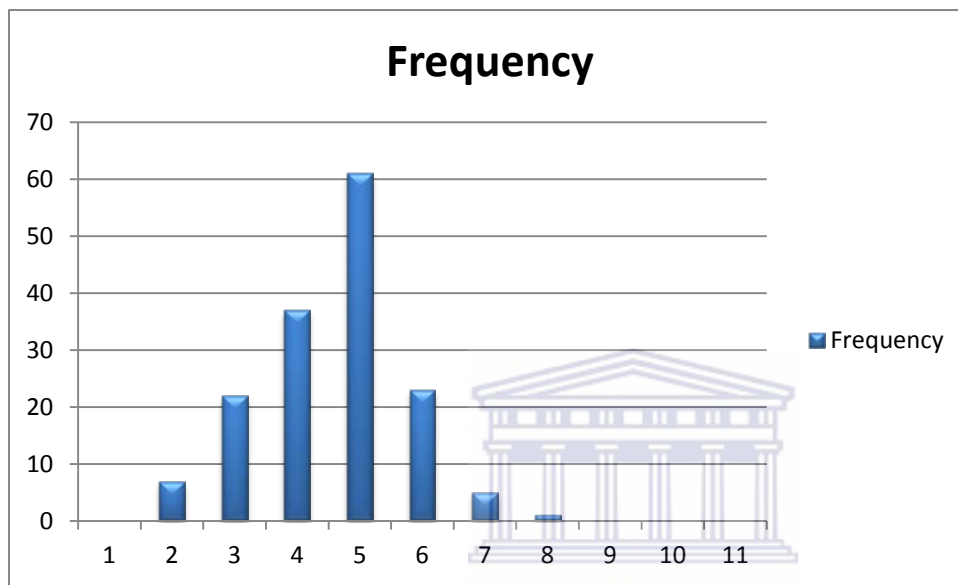
Figure 4.5: Histogram of high school physical science grades

4.6.4   Life orientation

There is no doubt that nurses should be able to understand social dynamics and the society we live in. This point therefore highlights the importance of investigating the high school life orientation grade and its role in predicting the performance of nursing students, more particularly in nursing-related modules. The grades for this subject ranged between 3 and 7 with a mode of 6 and a median of 6. The median of 6 was calculated with a standard deviation of 0.9. Grades for all 226 students were obtained. For this ordinal predictor variable, the coding was operationalised as the grade obtained for this subject according to UMALUSI. Figure 4.6 reflects the distribution of life orientation grades.
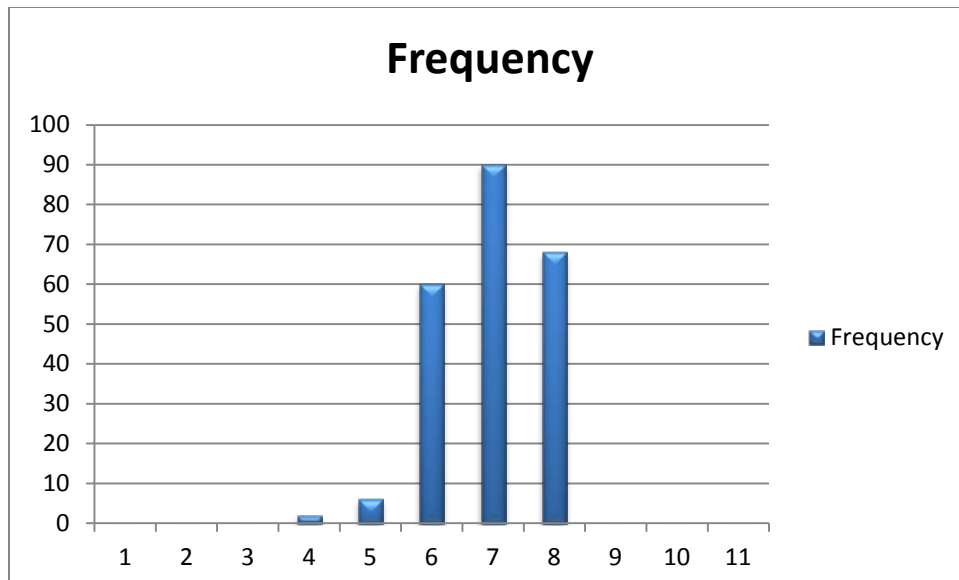
Figure 4.6: Histogram of high school life orientation grades

4.6.5   Mathematics

High school maths grades of the participants ranged from 3 to 7 with a mode of 3 and median of 4. The mean of 3.8 was calculated with a standard deviation of 0.9. For this ordinal predictor variable, the coding was operationalised as the grade obtained for this subject according to UMALUSI. Figure 4.7 reflects the distribution of mathematics grades. The histogram of high school mathematics shows that the grades are skewed to the left which means that they are predominantly low.
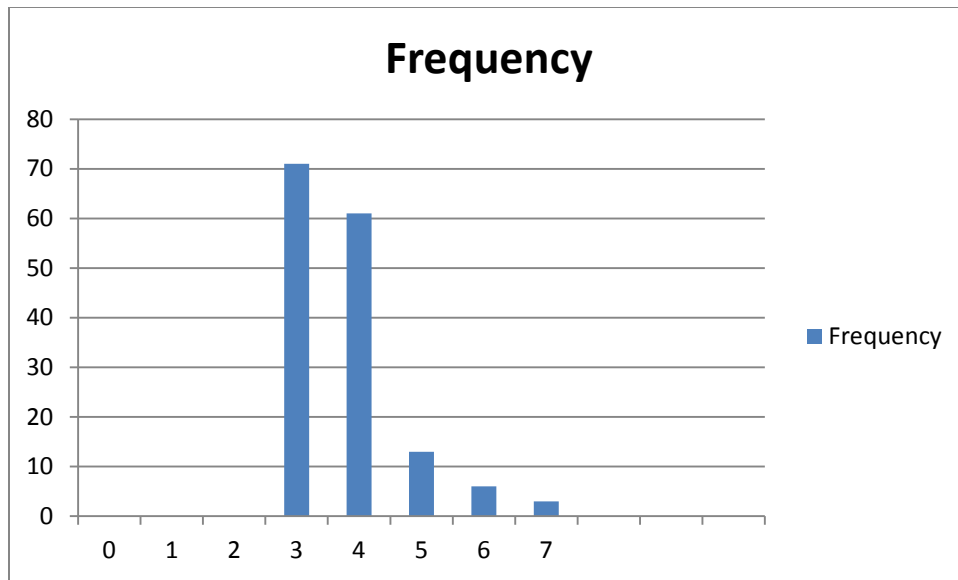
Figure 4.7: Histogram of high school maths grades

4.6.6   National Benchmark Test

The National Benchmark Test (NBT) is administered to prospective students prior to admission to the university and respective undergraduate programmes. The NBT is made up of three independent tests, namely Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics. For the present study, the NBT grade is represented by the average mark that the student obtained for these three tests. The NBT grade ranged between 28.33 and 65 with a mode of 42.33 and a median of 41.75. The median was also calculated and found to be 43.40 with a standard deviation of 8.38. The NBT grade for 122 students was missing. It is likely that some of the NBT results may be missing owing to the fact that not all students are requested to complete NBT or that some of the students completed a test at a venue other than the university under study, and did not submit their NBT test result on their application or the results were not available to the university. Only students who, according to the university rules, are identified to be at risk of having difficulties in the university undergraduate programme are requested to

complete the NBT. As not all students have their NBT grades, the variable remained continuous. Figure 4.8 illustrates the distribution of NBT grades for the study sample. The histogram indicates that the NBT results are slightly skewed towards the higher grades.
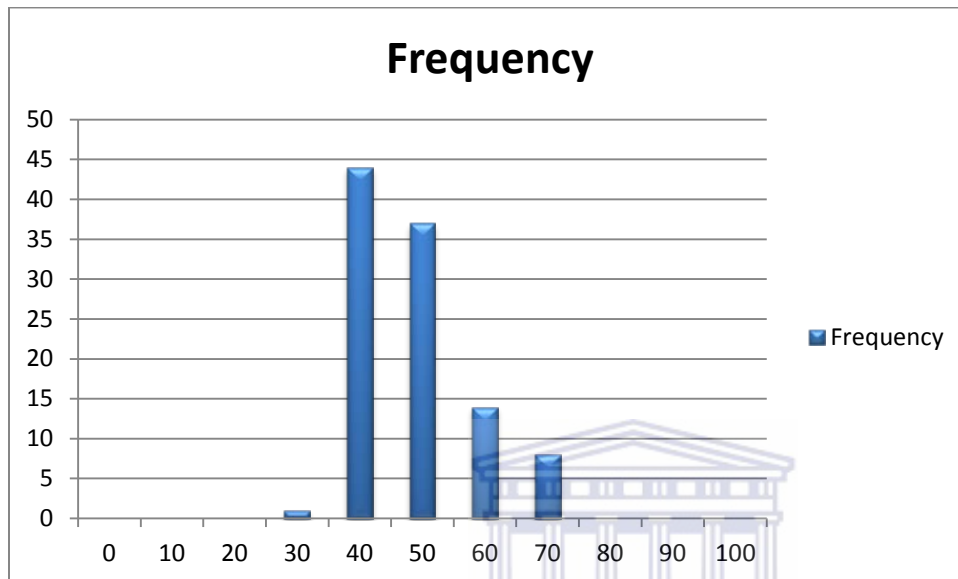
Figure 4.8: Histogram of NBT grades

4.6.7   First-year grade for nursing modules

As for any other degree offered at UWC, there is a high level of articulation among the levels of the BNurs programme. This implies that the second year of study will be a continuation of what was learned in the first year. The first-year nursing grade is represented by nursing modules completed by the student in the first year of the BNurs programme. The modules included in the calculation are Fundamentals of Nursing Science 111 (NUR111), Fundamentals of Nursing Science 112 (NUR112) and Clinical Nursing 111 (CUR111). The first-year grade for nursing modules was obtained by calculating the average grade for the above-mentioned module. The first-year nursing grades of participants ranged from 52.67% to 93.33% with a mode of 73% and

median of 71%. A mean of 71.14 was calculated with a standard deviation of 7.13. A continuous variable was adapted for this predictor variable, with the grade obtained being included in the regression for inferential analysis. The grades were skewed towards the higher scores (see Figure 4.9).
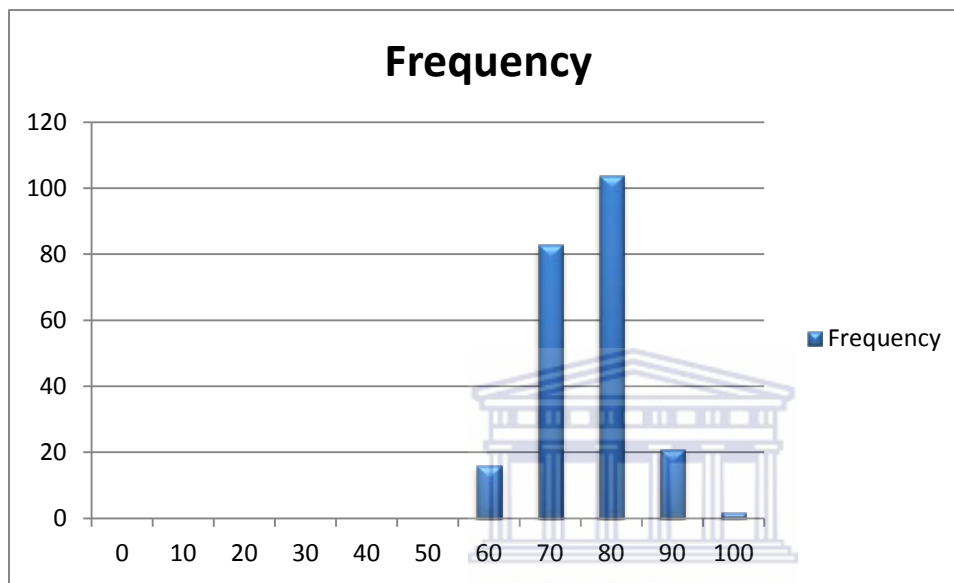
Figure 4.9: Histogram of first-year grades for nursing modules

4.6.8 First-year grades for science modules

First-year science grades included in the calculation were Human Biology 118 (HUB118), Human Biology 128 (HUB128), Physics for CHS (PHY118) and Chemistry 128 (CHM128). The first-year grade for science modules was obtained by calculating the average grade for the above-mentioned module. The first-year science grade of participants ranged from 43.25% to 90.5% with a mode of 57.5% and a median of 64.5%. The mean was 64.7% with a standard deviation of 9.2%. For this independent predictor variable, a continuous variable was adapted

and included in the regression for analysis. For this variable, the grades were skewed to the right and in line with the high scores (see Figure 4.10).
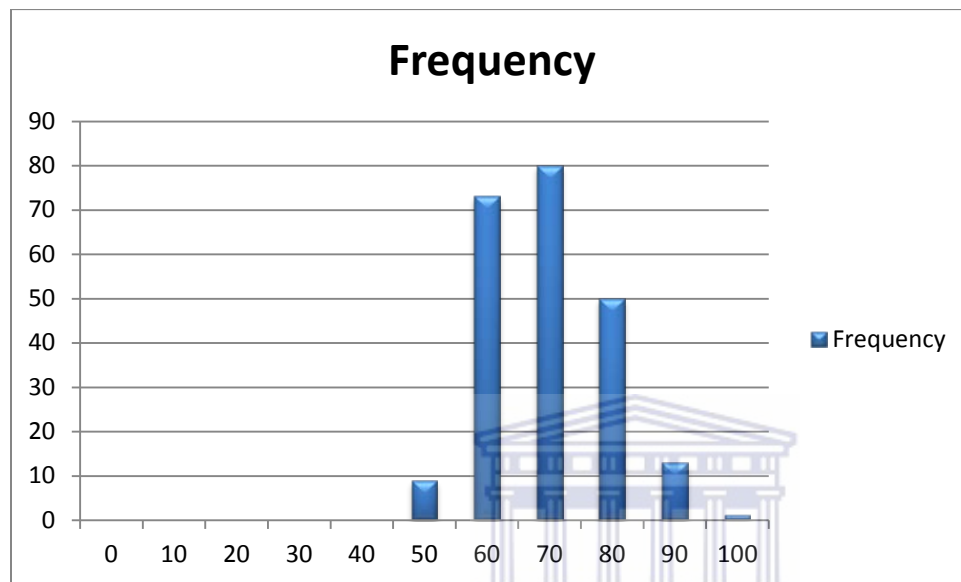
Figure 4.10: Histogram of first-year grades for science modules

4.7   ANALYSES OF DEPENDENT VARIABLES

4.7.1   Second-year grades for science modules

The dependent variable, final second (2nd)-year average grade for science modules used in the calculation include HUB218, HUB228 and Pharmacology (PHA204). For this continuous variable, the average grade obtained by participants across these three modules was recorded and included in the regression. For the present study, the second-year science grades ranged from 29 to 87.67 with a mode of 50 and a median of 58.5. The mean for this dependent variable was 53.41 with a standard deviation of 10.61. For this variable, the grades were skewed to the right,

indicative of the high values (see Figure 4.11). A continuous variable was adapted for this dependent outcome variable with the grade obtained included in the regression for analysis.
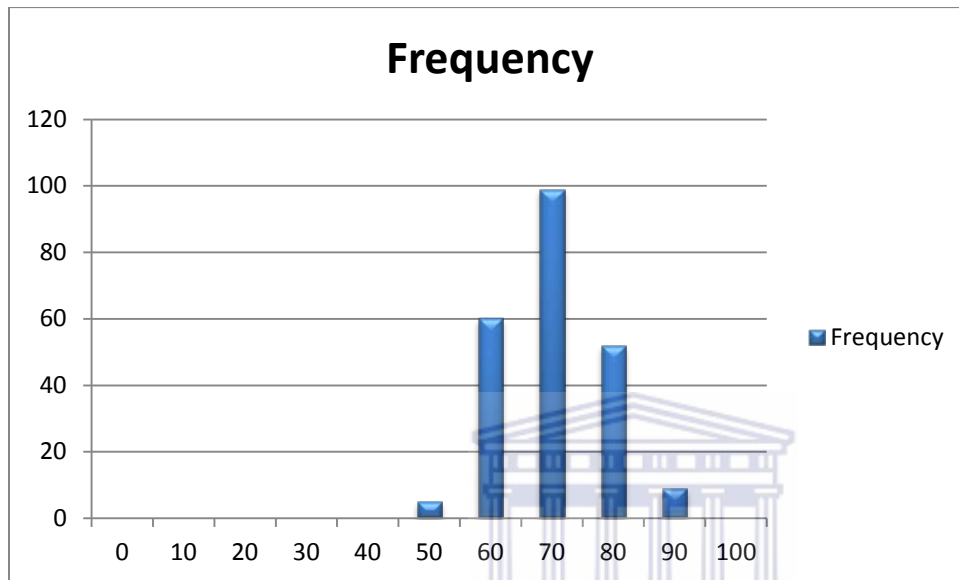
Figure 4.11: Histogram of second-year grades for science modules

4.7.2   Second-year grades for nursing modules

The second dependent variable for the present study was the final second (2nd)-year average grade for nursing modules. The nursing modules included were General Nursing Science (NRS211), NRS212 and Clinical Nursing (CUR214). The final second-year average grade for nursing modules is a continuous variable with the grade obtained included in the regression. The grades ranged from 48.5 to 90 with a mode of 65 and a median of 53. The median was 65.6 with a standard deviation of 8.2. For this dependent outcome variable, a continuous variable was adapted and included in the regression for analysis. The grades were skewed positively toward the higher values on the right (see Figure 4.12).
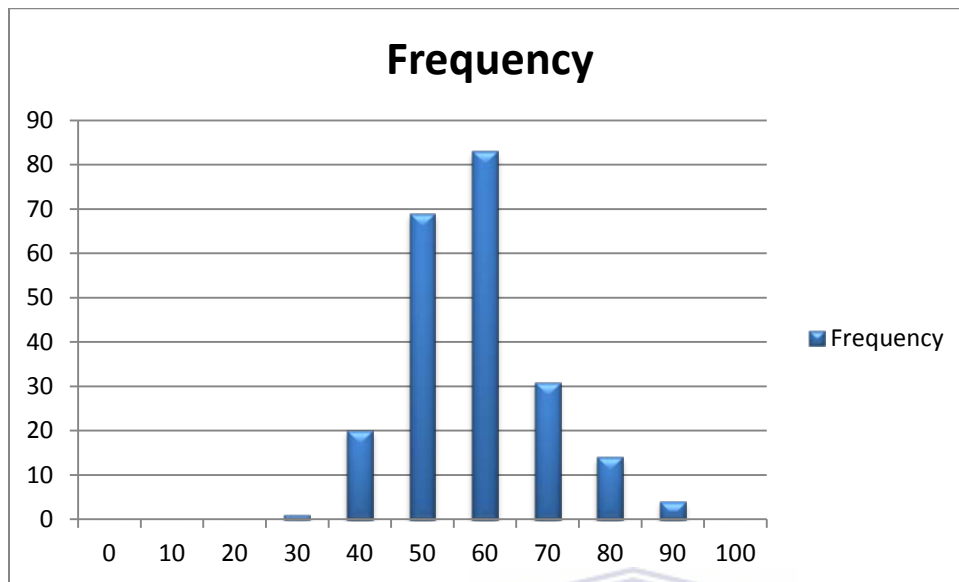
Figure 4.12: Histogram of second-year grades for nursing modules

4.7.3 Throughput (success)

The third dependent variable (included as a control variable) is throughput (success), and was operationalised as an ordinal variable which was coded as 1=successful and 0=unsuccessful. Students who were successfully passed (promoted) from the second to third year of study comprised 46.90% (*n*=106) of the sample, whilst 53.10% (*n*=120) were not promoted. This dependent variable included all participants (*n*=226). For this sample, the success skewed towards the left, indicating more negative results (see Figure 4.13).
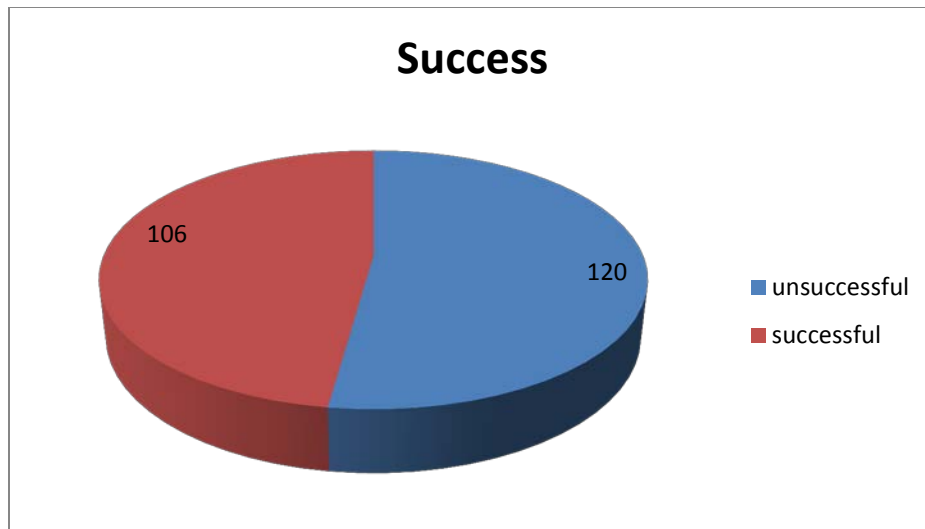
Figure 4.13: Histogram of success

4.8   RESULTS OF ANOVA

4.8.1   Variation of academic performance with gender

The study included the consideration of whether academic performance varied with gender. One-way ANOVAs (analysis of variance) were used to test for differences in mean performance (second-year science and nursing performance) for defined male and female students.

4.8.1.1 Variances between gender and second year nursing grade.

Figure 4.14 shows the relationship between gender and performance in second-year nursing modules as determined using ANOVA tests.
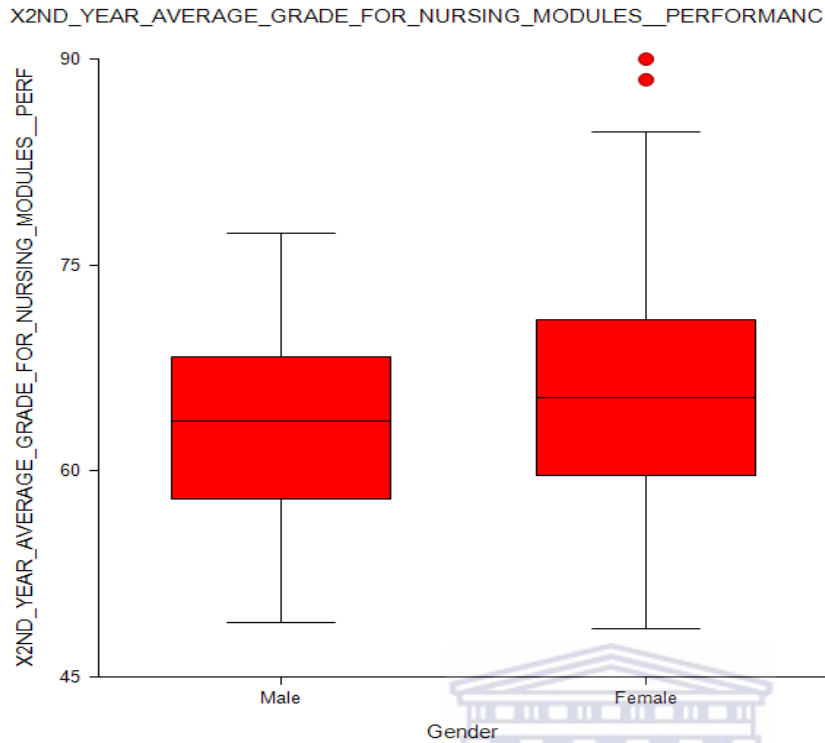
Figure 4.14: Mean distributions for nursing grade versus gender

Table 4.8: Summaries of the assumptions that were tested for ANOVAs

Assumption	Test values	Probability level	Decision (0.05)
Skewness normality of residuals	1.9134	0.055692	Accept H0
Kurtosis normality of residuals	-1.0289	0.303541	Accept H0
Omnibus normality of residuals	4.7198	0.094429	Accept H0
Modified-Levene equal-variance test	0.9633	0.327432	Accept H0

No statistical relationship was identified between gender and second year grade in nursing modules. Kruskal-Wallis ($p > 0.05$) one-way ANOVA accepted the null hypothesis for this

variable and all medians were found to be equal. Table 4.9 summarises the results of Kruskal-Wallis one-way ANOVA test.

Table 4.9: Kruskal-Wallis test results

Method	Degree of freedom (DF)	Chi-square	Probability level	Decision (0.05)
Not corrected for ties	1	3.77203547295194	0.052116	Accept H0
Corrected for ties	1	3.77327574057842	0.052078	Accept H0
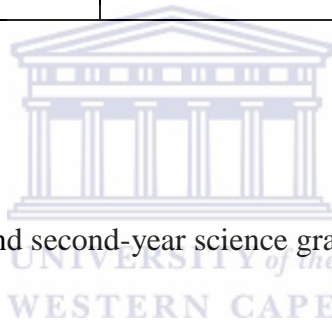
4.8.1.2 Variance between gender and second-year science grade.

Figure 4.15 shows the relationship between gender and performance in second-year science modules as determined using ANOVA tests. Table 4.10 summarises the assumptions that were tested for by this ANOVA.
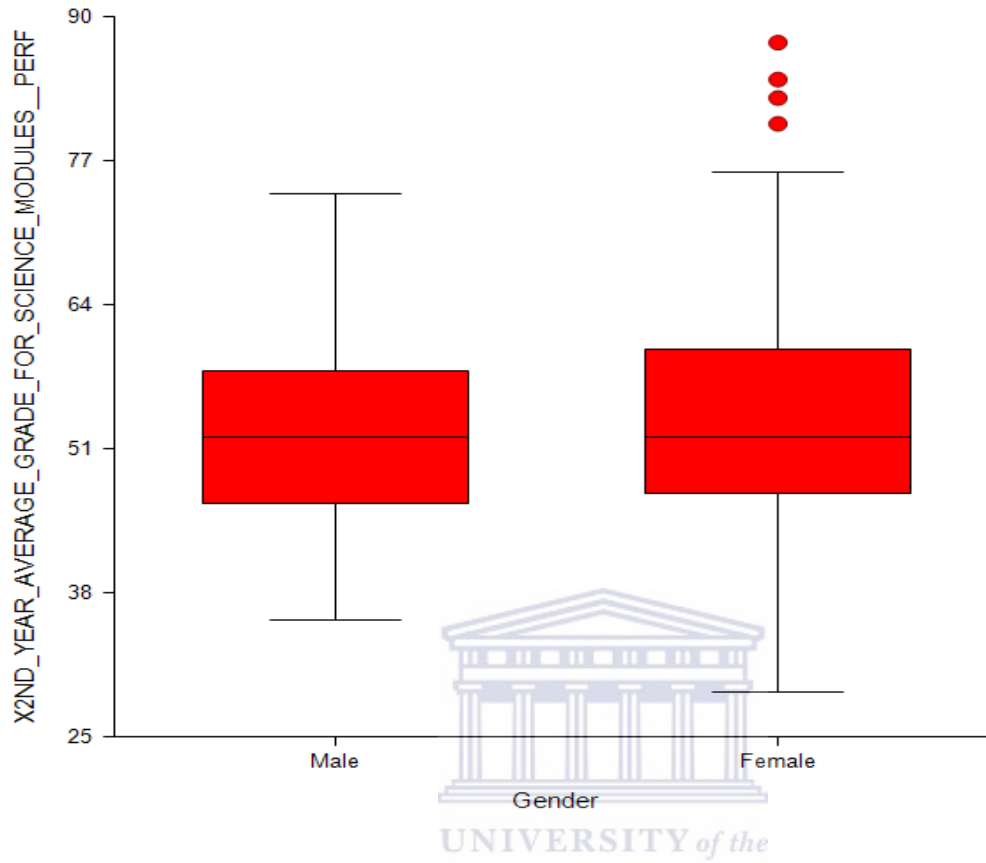
Figure 4.15: Mean distributions for second-year science grade versus gender

Table 4.10: Tests of assumptions

Assumption	Test values	Probability level	Decision (0.05)
Skewness normality of residuals	2.6647	0.007706	Accept H0
Kurtosis normality of residuals	1.0316	0.302240	Accept H0
Omnibus normality of residuals	8.1648	0.016867	Accept H0
Modified-Levene equal-variance test	1.6369	0.202104	Accept H0

No statistical relationship was identified between gender and second-year grade in science modules. Kruskal-Wallis (p >0.05) one-way ANOVA accepted the null hypothesis for this variable and all medians were found to be equal. Table 4.11 summarises the results of Kruskal-Wallis one-way ANOVA.

Table 4.11: Kruskal-Wallis test results.

Method	Degree of freedom (DF)	Chi-square	Probability level	Decision (0.05)
Not corrected for ties	1	0.106697632064254	0.743936	Accept H0
Corrected for ties	1	0.106739544172331	0.743887	Accept H0

4.8.2   Variation of academic performance with ethnicity

The present study was also concerned with whether academic performance varied with ethnicity. For the study, four main categories of ethnicity were represented. Most of the students were black (120; 53.10%) followed by coloured (79; 34.96%), white (23; 10.18%) and Indian (2; 0.88%) students. There was one (1; 0.44%) other ethnic group represented. One way ANOVAs were used to test for differences in mean performance (second-year science and nursing performance).

4.8.2.1 Variances between ethnicity and second-year nursing grades

Figure 4.16 shows the relationship between ethnicity (race) and performance in second-year nursing modules as determined using ANOVA. For the purpose of analysis, different ethnic groups were represented by codes. The following codes were operationalised: 4=black;

3=Coloured; 2=white; 1=Indian; 0=other. Table 4.12 summarises the assumptions that were tested for this ANOVA
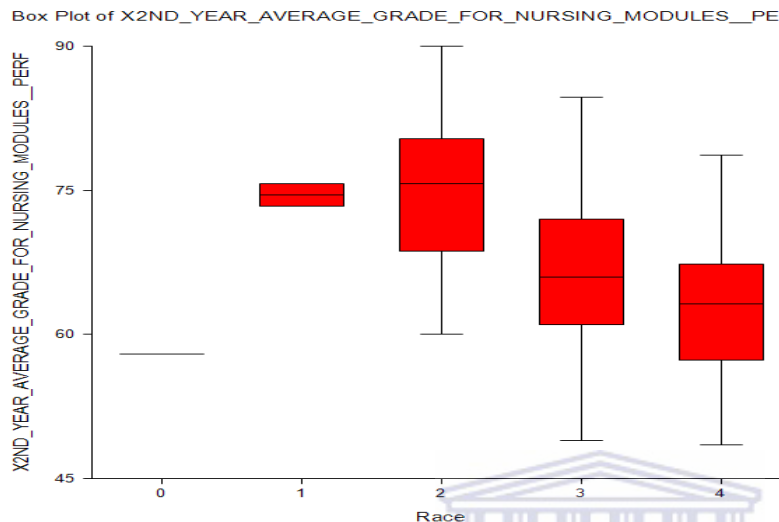
Figure 4.16: Mean distributions for nursing grade versus ethnicity

Table 4.12: Tests of assumptions

Assumption	Test values	Probability level	Decision (0.05)
Skewness normality of residuals	1.2424	0.214080	Accept H0
Kurtosis normality of residuals	-1.6641	0.096092	Accept H0
Omnibus normality of residuals	4.3129	0.115738	Accept H0
Modified-Levene equal-variance test	1.2120	0.299600	Accept H0

A statistical significant relationship was identified between ethnicity and second-year grade in nursing modules. Kruskal-Wallis (p <0.05) one-way ANOVA rejected the null hypothesis for

this variable and suggested that at least two medians were found to be different. Table 4.13 summarises the results of Kruskal-Wallis one-way ANOVA.

Table 4.13: Kruskal-Wallis test results

Method	Degree of Freedom (DF)	Chi-square	Probability level	Decision (0.05)
Not corrected for ties	4	41.9648505348536	0.000000	Reject H0
Corrected for ties	4	41.9786488265032	0.000000	Reject H0

4.8.2.2: Variances between ethnicity and second-year science grade

Figure 4.17 shows the relationship between ethnicity (race) and performance in second-year science modules as determined using ANOVA. Table 4.14 summarises the assumptions that were tested for by this ANOVA.
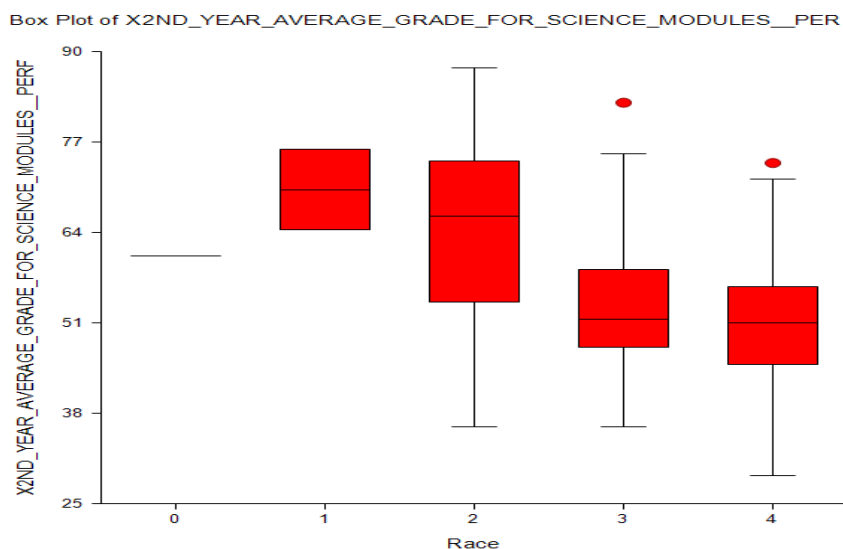
Figure 4.17: Mean distributions for science grade versus ethnicity

Table 4.14: Tests of assumptions

Assumption	Test values	Probability level	Decision (0.05)
Skewness normality of residuals	1.1240	0.261000	Accept H0
Kurtosis normality of residuals	0.8492	0.395786	Accept H0
Omnibus normality of residuals	1.9845	0.370735	Accept H0
Modified-Levene equal-variance test	1.2809	0.279879	Accept H0

A statistically significant relationship was identified between ethnicity and second-year grade in science modules. Kruskal-Wallis (p <0.05) one-way ANOVA rejected the null hypothesis for this variable and suggested that at least two medians were found to be different. Table 4.15 summarises the results of the Kruskal-Wallis one-way ANOVA.

Table 4.15: Kruskal-Wallis test results

Method	Degree of Freedom (DF)	Chi-square	Probability level	Decision (0.05)
Not corrected for ties	4	29.0272603377392	0.000008	Reject H0
Corrected for ties	4	29.0386625933368	0.000008	Reject H0

4.9   LINEARITY OF STUDY VARIABLE

Linearity for the variables was tested to investigate if a linear relationship exists among the variables by running various scatterplots at the same time. Figures 4.18 and 4.19 confirm the existence of a linear relationship among the study variables.
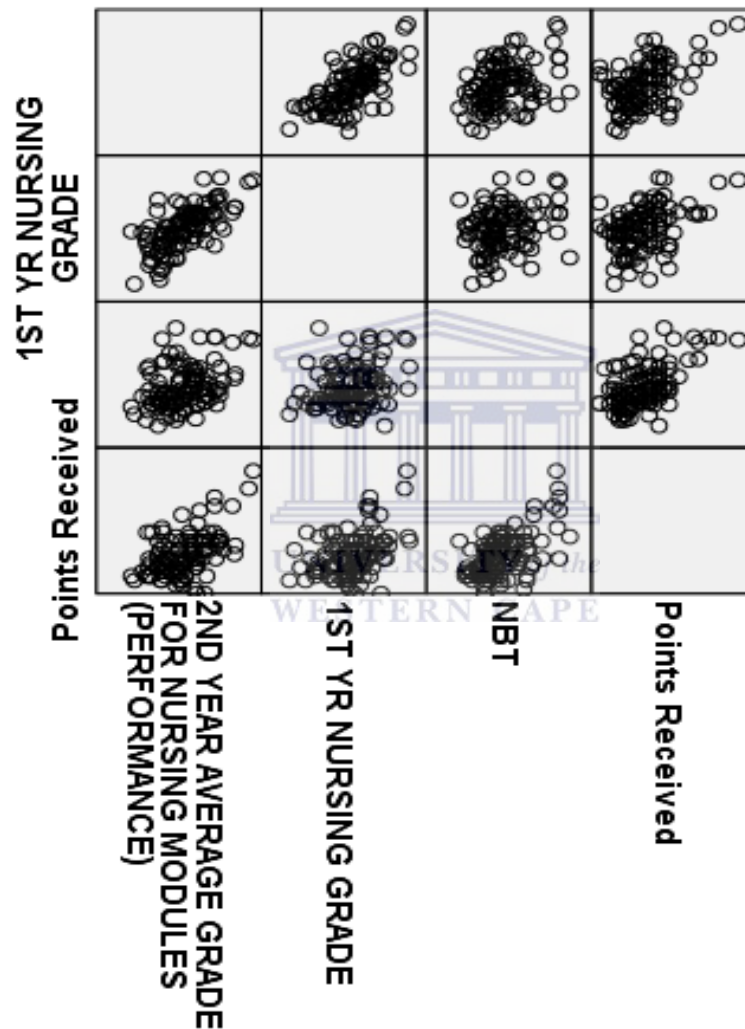
Figure 4.18: Linear relationship scatterplot: Second-year nursing grade and cognitive predictors
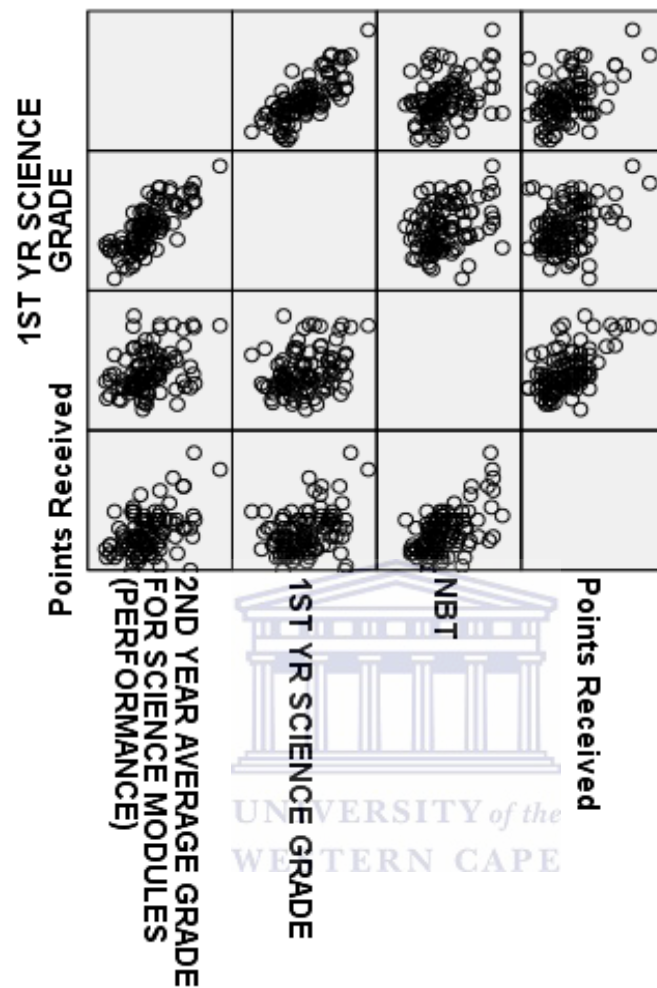
Figure 4.19: Linear relationship scatterplot: Second-year science grade and cognitive predictors

4.10   THE RESULTS OF CORRELATIONAL ANALYSIS

The validity and the direction of correlations among the predicting variables were measured using Spearman's *rho* rank order coefficients and Pearson's product-moment correlation (Pearson's *r*). Spearman's *rho* analysis is appropriate when determining the extent of variation between ordinal variables or when one variable is ordinal and the other is either interval or ration. The strength of correlation is determined on the basis of the absolute value of the coefficient: +1 = perfect correlation; strong correlation = + .80; moderate correlation = + .50 and weak correlation = + .20 (0'Rourke, Hatcher & Stepanski, 2005). On the other hand, Pearson's *r* is used to determine the extent to which variation in one continuous variable explains the variation in the other continuous variable. Pearson's *r* examines the strength and direction of the relationship between two variables (i.e. positive = same direction; zero = no relationship; negative = opposite direction). The correlation coefficient ranges from -1 to +1 with 0 representing no relationship (Struwig & Stead, 2003; Pretorius, 2007). The results of the correlations are summarised in Appendix G and Appendix H.

Both the Pearson and Spearman correlation coefficients revealed that there are no significantly large (+ 0.8) relationships between any of the independent variables. However, results of the Pearson *r* correlations analysis showed a high significant positive correlation between first-year science modules and first-year nursing modules (0.700, *p* <0.01); first-year science modules and second-year science modules (0.765, *p* <0.01); second-year nursing modules and second-year science modules (0.759, *p* <0.01). (See Appendix H)

Results of the Spearman correlations analysis showed a moderately significant positive relationship between the following variables: high school physical science and high school life

science (0.523, $p < 0.01$); high school life science and admission points (0.586, $p < 0.01$); high school life science and first year science modules (0.485, p < 0.01); high school physical science and mathematics (0.436, $p < 0.01$); high school physical science and admission points (0.581, $p < 0.01$); high school physical science and first year science modules (0.565); high school physical science and second year science modules (0.424, $p < 0.01$); high school mathematics and admission points (0.581, $p < 0.01$); high school mathematics and NBT (0.402, $p < 0.01$); high school mathematics and first year science modules (0.480, $p < 0.01$); high school mathematics and second year science modules (0.415, $p < 0.01$), admission points and NBT (0.492, $p < 0.01$).

The Spearman correlation matrix revealed a high significant correlation between throughput and second-year science modules (771, $p < 0.01$). A moderately significant relationship was revealed between throughput and high school physical science grade (450, $p < 0.01$), first-year nursing grade (540, $p < 0.01$), first-year science grade (665, $p < 0.01$) and second-year nursing modules (610, $p < 0.01$).

Results of the Pearson r correlations analysis showed a moderately significant positive relationship between first-year nursing modules and second-year nursing modules (0.677, $p < 0.01$); first-year nursing modules and second-year science modules (0.627, $p < 0.01$) and first-year science modules and second-year nursing modules (0.679, $p < 0.01$).

Seven out of nine independent variables were significantly correlated with the dependent variable of second-year science modules. The independent predictor variables that demonstrated the strongest correlation with second-year science modules were high school physical science (0.424, $p < 0.01$), high school mathematics (0.415, $p < 0.01$) and first-year science modules (0.765, $p < 0.01$). See Appendix G and Appendix H.

Seven out of nine independent variables were significantly correlated with the dependent variable of second-year nursing modules. The independent predictor variables that demonstrated the strongest correlation with second-year nursing modules were first-year science modules (0.679, p <0.01) and first-year nursing modules (0.662, p <0.01).

The following moderately strong correlations among the independent predictor variables were between high school life science grade and admission points (0.586, p <0.01); high school mathematics and admission points (0.581, p <0.01); high school physical science and first-year science modules (0.565, p <0.01); high school physical science and admission points (0.562, p <0.01); high school physical science and high school life science (0.523, p <0.01); admission points and NBT (0.492, p <0.01); high school life science and first-year science modules (0.485, p <0.01); high school mathematics and first-year science modules (0.480, p <0.01); high school physical science and mathematics (0.436); and high school mathematics and NBT (0.402).

Age showed significantly weak negative correlations with NBT (-0.255); admission points (-0.231); high school life science (-0124); physical sciences (-0.105); life orientation (-0.049); first-year science modules (-0.024) and mathematics (-0.017). These figures imply that younger age was associated with higher high school life science grade, physical sciences grade, life orientation grade, mathematics grade, admission points, NBT grade and higher first-year grade for science modules.

Place of residence showed a very weak correlation with second-year science modules (-0.056), second-year nursing modules (0.008), and throughput (-0.029).

4.11 COLLINEARITY STATISTICS

Tolerance for all variables was greater than 0.25 and variance inflation factors were all below 10, which implies that there should be no problems relating to collinearity (Table 4.16)

Table 4.16: Tolerance and variance inflation for independent variables

Model constant	Collinearity statistics	
	Tolerance	VIF
Age	.774	1.291
Gender	.801	1.249
Ethnicity	.484	2.067
ESL	.609	1.642
Life sciences	.492	2.031
Physical sciences	.387	2.582
Life orientation	.789	1.268
Maths	.437	2.290
Points received	.226	4.427
NBT	.446	2.243
First-year nursing grade	.395	2.534
First-year science grade	.288	3.472
Place of residence	.914	1.094

4.12   RESULTS OF MULTIPLE REGRESSION ANALYSIS PREDICTING AVERAGE PERFORMANCE FOR SECOND-YEAR SCIENCE MODULES

H1: The student's age, gender and ethnicity are significant predictors of high academic performance of second-year nursing students.

H2: Student's grades (high school average grade, grades in science and mathematics, NBT grade, first-year average grade) are significant predictors of academic performance of second-year nursing students.

Multiple regression analysis was used to predict academic performance in second-year science modules for undergraduate Bachelor of Nursing students at UWC. The method that was used to assess the predictive power of the predictor variables was generalized R^2 statistics. In multiple regressions, R^2 measures the amount of variance in the outcome variable.
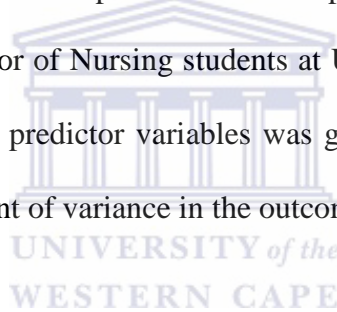
4.12.1 Models for second-year nursing grade

Model 1: Performs a standard multiple regression analysis between student performances in second-year nursing modules as the outcome variable and demographic predictor variables. Therefore, the variables included in this model were age, gender and ethnicity. This model attempts to identify the variables, for which information is available before the student enters the BNurs programme, that influence the student's performance in the second-year modules. The adjusted R^2 of 0.160 relating to model 1 is lower than the R^2 of model 2 (0.538) and model 3 (0.520).

Model 2: Performs a standard multiple regression analysis between student performances in second-year nursing modules as the outcome variable and cognitive predictor variables. Therefore the variables included were life sciences grade, physical sciences grade, mathematics grade, life orientation grade, admission points, first-year nursing grade and first-year science grade. This model attempts to identify the cognitive predictors that affect the student's performance in the second-year nursing modules .The adjusted R^2 of 0.538 relating to model 2 is high than the R^2 value of model 1 (0.160). A possible conclusion that can be drawn is that significant development occurs when considering the cognitive background of the students.

Model 3: Performs a standard multiple regression analysis including all of the variables relating to demographic factors and cognitive factors identified in the main model above as the predictor variables and second-year nursing modules as outcome variable. Second-year nursing grade as continuous outcome variable was operationalised by taking the average grade for nursing modules that are prescribed for second-year BNurs students. Of the 226 sample, 225 (99.56%) participants were included and only 1 (0.44%) student was excluded owing to the missing score. For this model, the generalised R^2 was 0.604 and the adjusted R^2 was 0.520, which indicates that the complete set of independent variables explain approximately 52% to 60.4% of the variation in student performance for nursing modules. The variables found to be moderately and highly significant (at least $p < 0.01$) for this outcome variable (according to rank) are first-year science grade (0.679), first-year nursing grade (0.677), mathematics grade (0.437), admission points (0.437) and NBT (0.383).

A stepwise regression for second-year nursing grade (outcome variables) was performed to identify the combination of variables that provide the highest adjusted R^2 and report the results under model 4.

Model 4: A stepwise regression for nursing modules revealed that first-year science grade (β = 0.345; p <0.01), first-year nursing grade (β = 0.394; p = 0.001) and NBT (β = 0.187; p <0.10) grade are significant predictors of second-year nursing modules whereas the rest of the predictor variables were excluded. The R^2 for this model was found to be 0.573 which is significantly higher than the R^2 value for the above models. These differences in R^2 implies that module 4 (0.573) explains more variations in second-year nursing modules than model 1 (R^2 = 160), model 2 (R^2 = 538) and model 3 (R^2 =520) and therefore suggest that first-year nursing grade, first-year science grade and NBT have more significant predictive power than other variables (admission points, high grades in science subjects and mathematics) included in the present study. Table 4.20 summarises the results of stepwise regression for second-year nursing modules.

Table 4.17: Coefficients dependent variable: Second-year nursing grade

Model		Unstandardised coefficients		Standardised coefficients		
		B	Standard error	Beta	*t*	Significance
1	(Constant)	26.385	5.441		4.849	.000
	First-year science grade	.606	.083	.679	7.285	.000
2	(Constant)	9.956	7.138		1.395	.168
	First-year science grade	.359	.108	.402	3.310	.002
	First-year nursing grade	.456	.140	.396	3.264	.002
3	(Constant)	7.223	7.068		1.022	.311
	First-year science grade	.308	.108	.345	2.843	.006
	First-year nursing grade	.454	.136	.394	3.338	.001
	NBT	.142	.068	.187	2.099	.040

4.12.2 Models for second-year science grade

Model 1: Performs a standard multiple regression analysis between student performances in second-year science modules as the outcome variable and demographic predictor variables. Therefore the variables included in this model were age, gender and ethnicity. This model attempts to identify the variables for which information is available before the student enters the BNurs programme, that affect the student's performance in the second-year modules. The adjusted R^2 of 0.120 relating to model 1 is lower than the R^2 of model 2 (0.569) and of model 3 (0.548).

Model 2: Performs a standard multiple regression analysis between student performances in second-year science modules as the outcome variable and cognitive predictor variables. Therefore the variables included were life sciences grade, physical sciences grade, mathematics grade, life orientation grade, admission points, first-year nursing grade and first-year science grade. As for model 2 of the second-year nursing models, this regression was designed to provide evidence of the predictive power of cognitive predictors known by the end of the first year on second-year science modules. The adjusted R^2 of 0.569 relating to model 2 is higher than that of model 1 (0.120). Model 2 provides the significance of cognitive predictive variables in predicting high academic performance in second-year science modules.

Model 3: Performs a standard multiple regression analysis including all of the variables relating to demographic factors and cognitive factors identified in the main model above as the predictor variables and second-year science modules as the outcome variable. This continuous outcome variable was operationalised by using the average grade for science modules that are prescribed for second-year BNurs students. Of the 226 (98.23%) participants, 222 (1.77%) were included

and 4 were excluded owing to missing scores. For this model, the generalised R^2 was 0.627 and the adjusted R^2 was 0.548, indicating that the complete set of independent variables explain approximately 54.8% to 62.7% of the variation in student performance. The only variables found to be significant (at least $p < 0.01$) for this outcome variable (according to rank) were first-year science grade (0.765), first-year nursing grade (0.627), physical science (0.448), admission points (0.428), maths (0.419), life science (0.418) and NBT (0.358).

A stepwise regression for second-year science grade (outcome variables) was performed to identify the combination of variables that provide the highest adjusted R^2 and report the results under model 4.

Model 4: A stepwise regression was performed on this model with second-year science grade as the outcome variable. All predictor variables were included in the regression to identify the combination of variables that best predict performance in second-year science modules. All predictor variables were excluded in this model except first-year science modules ($\beta = 0.765$; $p < 0.001$) which was found to be highly significant in this model with R^2 of (0.585). The R^2 in this model is higher than the R^2 in model 4 (0.540). This implies that model 4 explains more variations than model 1 ($R^2 = 120$), model 2 ($R^2 = 569$) and model 3 ($R^2 = 548$). The higher R^2 (Model 4; 0.585) indicates that first-year science modules have more predictive power than other variables included in the study. Table 4.21 summarises the results of stepwise regression for second-year nursing modules.

Table 4.18: Coefficients dependent variable: Second-year science grade

Model		Unstandardised coefficients		Standardised coefficients	t	Significance
		B	Std. Error	Beta		
1	(Constant)	-3.703	6.173		-.600	.551
	First-year science grade	.882	.094	.765	9.344	.000

4.13   SUMMARY

In the current chapter, data obtained from UWC's database were analysed, interpreted and discussed. Multiple regressions were used to examine the predictive value of cognitive, non-cognitive and demographic variables on performance (nursing grade and science grade) of second-year nursing students at UWC.

For multiple regression models predicting performance in nursing modules, three independent predictor variables were found to be significant. Interestingly, all predictor variables represented the cognitive characteristics of participants. These significant predictor variables included first-year science grade, first-year nursing grade and NBT grade. None of the demographic and non-cognitive predictor was found to be a significant predictor of performance in second-year nursing modules.

For multiple regression models predicting performance in second-year science modules, one independent predictor variable was found to be significant. As with the model predicting performance in nursing modules only, cognitive characteristics were represented in this model.

Therefore there was no significant relationship between demographic and non-cognitive predictors with second-year performance in science modules.

The results of one-way ANOVA testing of the variances between gender and students' performance in both nursing and science modules accepted the null hypothesis, and all medians were found to be equal. This implies that there is no significant relationship between gender and the performance in modules prescribed for the second-year BNurs programme.

The results of the one-way ANOVA test between ethnicity and students' performance in both nursing and science modules revealed that at least two medians were different and concluded the rejection of the null hypothesis. This then implies that there is a significant relationship between ethnicity and performance of students attempting the second year of the Bachelor of Nursing programme.

In the next and final chapter, recommendations are made on the basis of research outcomes generated during the present research study.
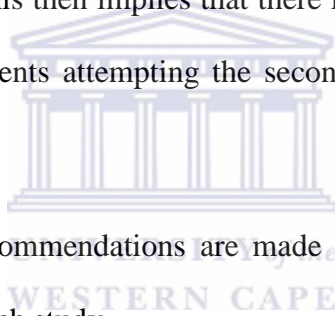
CHAPTER 5

SUMMARY OF FINDINGS AND DISCUSSION, LIMITATIONS, CONCLUSION AND RECOMMENDATIONS

5.1   INTRODUCTION

The current chapter comprises a summary of the findings and a discussion. The conclusions and recommendations are based on the scientific evidence obtained from the study. The chapter also presents limitations of the study.

The findings related to the outcome variables of average grade in nursing modules and average grade in science modules are discussed. Further in the chapter, both predictor variables found to be significant and those not significant are discussed individually.
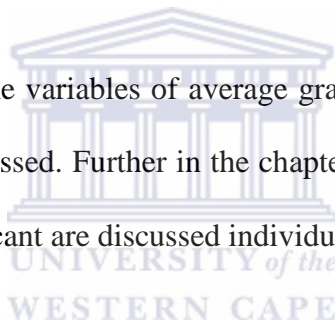
5.2 SUMMARY OF FINDINGS AND DISCUSSION

The aim of the study was to investigate the relationship and the predictive power of the demographic, cognitive and non-cognitive predictor variables on student's second-year nursing and science module grades. The demographic variable of ethnicity was found to be a significant predictor of both second-year grade nursing and science modules. The findings of one-way ANOVA revealed that the alternative hypothesis related to ethnicity is accepted. Therefore this analysis suggests that ethnicity is a significant predictor of performance in second-year nursing and science modules. The finding revealed that the cognitive predictors were the strongest predictors of both second-year grade nursing and science modules. NBT grade, first-year science

grade and first-year nursing grade were predictive of average grade in nursing modules. Only the first-year science grade cognitive predictor variable was found to be highly predictive of average grade in science modules.

5.2.1 Outcome variables

The following hypothesis guided the study:

H1: Student age, gender and ethnicity are significant predictors of high academic performance of second-year nursing students.

H2: Student grades (high school grade, grades in science and mathematics, NBT grade, first-year average grade) are significant predictors of academic performance of second-year nursing students.

5.2.1.1 Second-year nursing grade

The first hypothesis sought to identify the predictive value of demographic predictor variables on second-year nursing grade as well as second-year science grade. The second hypothesis for this study sought to identify the predictive value of previous cognitive achievements on second-year nursing grade as well as second-year science grade.

The nursing modules included were NRS211, NRS212 and CUR214. The grades ranged from 48.5% to 90% with a mode of 65% and a median of 65%. The mean was 65.6% with a standard deviation of 8.2.

5.2.1.2 Second-year science grade

The science modules included were HUB218, HUB228 and PHA204. For this study, the second-year science grade ranged from 29% to 87.67% with a mode of 50% and a median of 58.5%. The mean for this outcome variable was 53.41% with a standard deviation of 10.61.

It is difficult to compare academic performance with that found by other researchers, as researchers in other studies have implemented various scales and variables to measure performance.

5.2.2 Significant predictor variables

5.2.2.1 First-year science grade

The value of previous science achievements as a predictor of performance of nursing students has been demonstrated in previous studies (Brennan & Small, 1996; Schafer, 2002; Potolsky, Cohen, & Saylor, 2003; Lynn, 2005; Newton, Smith, & Moore, 2007; Newton, Smith, Moore, & Magnan, 2007). In the present study, student achievements in first-year science modules were found to be a significant predictor of both second-year nursing grade and second-year science grade. Similar to the findings of Lynn (2005), Potolsky et al. (2003) and Schafer (2002), student performance in previous science modules has a significant ($p=0.01$) relationship with nursing student academic performance. The first-year science grade was calculated from student grades in Human Biology 118 (HUB118), Human Biology 128 (HUB128), Physics for CHS (PHY118) and Chemistry 128 (CHM128). The mean score for first-year science grade was 64.7% (SD = 9.2). The Pearson *r* correlation results revealed a high significant (0.765, $p <0.01$) relationship

between first-year science modules and second-year nursing modules. Furthermore, a high significant (0.679; p <0.01) relationship was observed between first-year science modules and second-year science modules. In a stepwise regression (model 4) that was performed with second-year science grade as an outcome variable, all predictor variables were excluded in this model except first-year science modules (β = 0.765; p <0.001) which was found to be highly significant in this model with R^2 of (0.585). A stepwise regression for nursing modules revealed that first-year science grade is one of the three predictor variables found to be significant (β = 0.345; p <0.10) in predicting the average nursing grade for students attempting their second year of the BNurs programme at UWC. It therefore appears that first-year grade in science modules proves to be a good predictor of student performance in both second-year nursing and science modules.
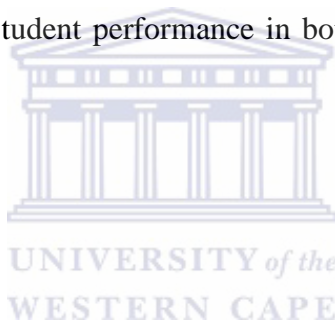
5.2.2.2 First-year nursing grade

In the present study, first-year nursing grade was found to be one of the significant (β = 0.394; p=0.001) predictors of performance in second-year nursing modules. This significance can be explained by the high level of articulation between the year levels of the undergraduate nursing programme. The first-year nursing grade was calculated from Fundamentals of Nursing Science (NUR112), Fundamentals of Nursing Science (NUR111), and Clinical Nursing (CUR111). The first-year nursing grade ranged from 52.67% to 93.33% with a mode of 73% and median of 71%. The mean of 71.14% was calculated with a standard deviation of 7.13. The Pearson r correlation results revealed a high significant (0.677, p <0.01) relationship between first-year nursing modules and second-year science modules. In a stepwise regression (model 4) that was

performed with second-year nursing grade as an outcome variable, first-year nursing grade was one of the three predictor variables that was found to be significant ($\beta = 0.394$; $p = 0.001$; $R^2 = 0.573$) in predicting academic performance of second-year nursing students in nursing modules. Therefore, first-year grade in nursing modules proves to be a good predictor of student performance in second-year nursing modules.

5.2.2.3 National Benchmark Test grade

According to previous studies, the value of university entrance tests was found to be significant in predicting performance of nursing students (Simmons, Haupt, & Davis, 2004; Symes, Tart & Travis, 2005; Alden, 2008). The grade of the NBT test, which was administered to students prior to entering the BNurs programme at UWC, was calculated from student scores in Academic Literacy (AL), Quantitative Literacy (QL) and Mathematics. The NBT grade for 122 (53.98%) students was missing. Analysis of this variable was performed on the total number of participants (n=144; 46.02%) who were requested to complete the tests. The NBT grade ranged between 28.33% and 65% with a mode of 42.33% and median of 41.75%. The mean was also calculated and found to be 43.40% with standard deviation of 8.38. The Pearson r correlation results revealed a moderately significant (0.383; $p <0.01$) relationship between NBT grade and grade in second-year nursing modules. The Pearson r correlation between NBT and other significant variables (first-year science grade and first-year nursing grade) was also analysed. The correlation between NBT grade and first-year science grade showed that there is a moderate correlation (0.224; $p <0.10$) between the two. Similarly, the Pearson r correlation between NBT grade and second-year science grade revealed a moderate correlation (0.313; $p <0.01$) between

the two. A stepwise regression for nursing modules revealed that NBT grade is one of the three predictor variables found to be significant ($\beta = 0.187$; $p < 0.10$) predictors of academic performance of second-year nursing models for undergraduate students at UWC registered for the BNurs programme. However, it was found to be non-significant in predicting the performance in second-year science grade.

5.2.3   Non-significant predictor variables

5.2.3.1 Age

Age was not a significant predictor variable for performance in second-year nursing and science modules. The researcher, however, believes that it would have been significant if the sample were larger. The lack of significance is probably because the researcher was interested in students with NSC, which was only implemented in 2008, and therefore this resulted in the sample being focused around and very close to the mean age. The mean age of the sample was 19.5 years with a standard deviation of 1.4. Previous studies about performance of nursing students have reported inconsistent results. Wong and Wong (1999) reported that older students were more likely to outperform their younger counterparts. They found that age was a significant predictor of academic performance and success of nursing students. Alden (2008) found in her study that age is not a significant predictor of nursing student performance. These findings imply that more research should be conducted with much larger sample sizes to verify the significance of age in predicting student performance.

5.2.3.2   Gender

Of the selected sample (*n*=226) in the study, the majority were female (*n*=188, 83.19%) and the minority were male (*n*=38, 16.81%). The results of the regression and the ANOVA indicated that there was no significant relationship between gender and performance of nursing students in both the nursing and science modules. However, the researcher believes that if the sample had been more diverse, different findings would have presented. Previous studies by Dyck, Oliffe, Phinney and Garrett (2009) and McLaughlin, Muldoon and Moutray (2010) reported that the throughput rate of male students exceeds that of their female counterparts. No evidence was found of studies reporting the significance of gender on the performance of second-year nursing students on nursing modules as well as science modules.

5.2.3.3   Ethnicity

Previous studies found that ethnicity plays an important role in predicting nursing student performance (Barbee & Gipson, 2001; Gardner, 2005; Harris, 2006). These studies revealed that the minority group is likely to encounter more barriers to their success and performance in nursing studies. However, in the present study, different results were obtained. The study sample was predominantly black students who comprised 53.10% (*n*=120) of the study participants. The second-largest group consisted of Coloured students who made up 35.40% (*n*=80) of the participants. The minority ethnical groups in the study included white students (*n*=23; 10.18%), followed by Indian students (*n*=2; 0.88%) and other ethnic groups amounted to one (*n*=1; 0.44%). In the present study, ethnicity was found to be a statistically non-significant predictor of nursing student performance during the stepwise regression analysis.

Although ethnicity was shown to be a non-significant predictor of performance in second-year nursing and science modules, the ANOVA results revealed different results. Additional one-way ANOVA was performed and, interestingly, the analysis rejected the null hypothesis (Table 4.14). These results imply the acceptance of the hypothesis which indicates that ethnicity is a significant predictor of academic performance by second-year nursing students in both nursing and science modules. Figures 4.17 and 4.18 indicate contrary results from previous studies. These two figures revealed unexpected findings that the minority ethnical groups outperformed their majority counterpart. However, given the history of the country, white student were more privileged and more advantaged regarding their schooling and the way they were raised. This influence could contribute considerably towards the outcome of student success and performance. In contrast, black students were less privileged and in many cases attended under-resourced schools. The context has not changed much as the majority of black students still come from low-income and under-resourced communities, bearing in mind the university's mission to serve the less privileged.

5.2.3.4 Life sciences

The predictive power of high school life science grade revealed mixed findings in previous studies. Symes et al. (2005) found a significant correlation between life science grades and nursing student performance as well as their success in nursing programmes. Likewise, in the study conducted by Aldens (2008), life science grade was found to be a significant predictor of nursing student performance. In the present study, high school life science grades ranged from 3 to 7 according to UMALUSI, with a mode of 5 and a median of 5. The mean was calculated and found to be 4.9 with a standard deviation of 0.9. A moderately positive significant correlation was found between life science and physical sciences (0.545; $p < 0.01$), high school mathematics

(0.392; p <0.01), admission points (0.613; p <0.01), first-year nursing grade (0.432; p <0.01), first-year science grade (0.513; p < 0.01) second-year science grade (0.418; p <0.01) and second-year nursing grade (0.335; p <0.01). However, the results of the stepwise regression excluded this variable from significant predictors of second-year nursing as well as science modules. Although the predictive power of high school life science grade was found to be insignificant for performance of second-year nursing students, this variable may still be found significant in predicting student performance in the NBT grade and general performance of first-year nursing students.

5.2.3.5   Physical science

Few studies were found that tested high school physical science and related high school subjects such as chemistry. Hayes (2005) found that nursing students with a background of physical science outperformed those without a background of physical science. The high school physical science grades ranged from 1 to 7 with a mode of 4 and median of 4. The mean for high school life science was found to be 3.6 with a standard deviation of 1.2. The high school physical science grade was missing for 70 (31%) students, probably because this was not one of the subjects they took in high school. A moderately positive significant relationship was found between physical science and life science (0.545; p <0.01), high school mathematics (0.392; p <0.01), admission points (0.609; p <0.01), first-year nursing grade (0.396; p <0.01), first-year science grade (0.595; p <0.01), second-year nursing grade (0.370; p <0.01) and second-year science grade (0.448; p <0.01). In the present study, stepwise regression excluded high school physical science as a significant predictor of performance in the second year of the BNurs

programme. As for life science grade, based on the correlation significance with other variables in the study, physical science may still be important in predicting performance of nursing students at other levels of undergraduate nursing programmes.

5.2.3.6 Life orientation

The variable of life orientation is less researched as there is no clear evidence indicating the predictive power of this variable and other closely related variables such as social science on the performance of nursing students. Life orientation revealed disappointing correlations among other predictor variables and outcome variables (see Appendix H). The grade for this subject ranged between 3 and 7 with a mode of 6 and a median of 6. The median of 6 was calculated with a standard deviation of 0.9. Grades for all 226 (100%) students were obtained. The results of the stepwise regression excluded this variable from significant predictors of second-year nursing as well as science modules. There is therefore no significant relationship between student grade in life orientation and their performance in the second year of the BNurs programme.

5.2.3.7 High school mathematics grade

Previous studies such as those by Brennan, Best, and Small (1996) and Hayes (2005) found that mathematics was significantly correlated (p <0.01) to nursing modules, pharmacology and science modules such as physics. However, in the present study, mathematics was excluded in the stepwise regression, which implies that, for this study, sample mathematics was not a significant predictor of performance in second-year nursing as well as science modules. High school mathematics grades ranged from 3 to 7 with a mode of 3 and the median of 4. The mean of 3.8 was calculated with a standard deviation of 0.9. A moderately positive significant relationship was found between mathematics and physical science (0.355; p <0.01), admission

points (0.638; p <0.01) NBT 499; p <0.01), first-year nursing grade (0.446; p <0.01), first-year science grade (0.522; p <0.01), second-year nursing grade (0.437; p <0.01) and second-year science grade (0.497; p <0.01). As with life science and physical science grades, the correlations matrix indicates that mathematics may still be a significant predictor of performance in other levels of undergraduate nursing programmes and therefore the predictive power of high school mathematics must not be underestimated.

5.2.3.8 Admission points

University admission points were calculated by grading all grade 12 subjects according to their weight. The admission points of the students ranged between 29 and 58 with a median of 37 and a mode of 36. The mean 'average' was calculated and found to be 37.8 with a standard deviation of 5.2. Previous studies analysing the predictive power of students' high school average grade found mixed results. The literature revealed that students' cumulative grade point average (GPA) was a significant predictor of performance in undergraduate nursing programmes (Campbell & Dickson, 1996; Byrd, Garza, & Nieswiadomy, 1999). However, the recent findings by Alden (2008) reported that cumulative GPA is insignificant in predicting performance and success in nursing programmes. The present study found an insignificant relationship between admission points and performance and throughput of second-year nursing students. A moderately positive significant relationship was found between admission points and life science (0.613; p <0.001), physical science (0.609; p <0.001), mathematics (0.638; p <0.001), NBT grade (0.561; p <0.001), first-year nursing grade (0.439; p <0.001), first-year science grade (0.397; p <0.001), second-year nursing grade (0. 437; p <0.001) and second-year science (0.428; p <0.001). Owing to the level of correlation between admission points and both predictor and outcome variables,

admission points can still hold significant predictive power for performance and throughput at other levels of BNurs Programmes.

5.2.4 Additional analysis of variables

Additional analysis of variables included the variables that were not included in the hypothesis testing.

5.2.4.1 English as second language (ESL)

ESL is one of the variables included in the present study as a control predictor variable to provide a complete analysis of the data. Of the 226 participants in the study, 26.99% (n=61) represented students who are English speaking, and 73.01% (n=165) represented students who speak other languages such as Afrikaans, Setswana, IsiXhosa, isiZulu and Sotho. Femea, Gaines, Brathwaite and Abdur-Rahman (1995) found that students with English as their second language at an English-medium university tend to score low grades in nursing models when using T-test analysis. Furthermore, Arathuzik and Aber (1998) investigated the academic and non-academic factors that are predictive of academic performance in a public nursing school and found English as a significant predictor of performance among nursing students. However, in the present study, stepwise regression showed that English is a non-significant predictor of second-year nursing student performance in nursing modules as well as in science modules. The researcher, however, admits that using T-test analysis to analyse the predictive power of this predictor variable might have revealed different results.

5.2.4.2 Place of residence

The number of students included in the research sample who lived in a university residence at the time of their second-year BNurs programme was 23 (10.18%); the rest of the participants (*n*=203; 82%) did not live in a university residence. No significant relationship was found between this predictor variable and the performance of second-year nursing students in nursing modules as well as science modules. There is therefore no significant relationship between student residence and their performance in the second year of study.

5.2.4.3 Throughput (success)

Of the total sample of the study, 118 (52.21%) participants experienced difficulties in their second year of study and were unsuccessful. This outcome may be because some students were not able to write their exams as a result of not meeting the entry-to-examination requirements, or being sick or absent for other reasons. Another reason that might have led to these students being unsuccessful in their second-year BNurs might be that they performed unsatisfactorily in other modules which were prescribed at this level and which were not included in the present study, for example psychology. A total of 47.79% (*n*=108) of the sample experienced less difficulties and were successful in completing the second year of study at their first attempt. The North Carolina Center for Nursing (2006) reported that the average throughput rate of 74.8% for nursing students has been recorded in studies conducted in the United States. However, as with performance, it is difficult to compare throughputs as researchers in other studies have operationalised various scales for measuring throughput and success.

In the present study, Pearson's *r* correlation and Spearman's *rho* correlations between the outcome variable of throughput/success and other variables involved in the study were

performed. A moderate correlation was observed between throughput and life science (0.364; p <0.001), physical science (0.450; p <0.001), mathematics (0.340; p <0.001), admission points (0.327; p <0.001), first-year nursing grade (0.526; p <0.001), first-year science grade (0.653; p <0.001), second-year nursing grade (0.607; p <0.001) and second-year science grade (0.697; p <0.001). Furthermore, a stepwise regression was performed with throughput as an outcome variable and all other study variables as independent predictor variables. This type of regression was performed to identify the variable or the combination of variables that have the strongest predictive value for success for nursing students. Interestingly, this analysis excluded all other variables except first-year science grade (0.477; p <0.001) and second-year science grade (0.289; p <0.05) with R^2 (0.521); therefore these results indicate that the first-year and second-year science modules are the strongest predictors of success in the second year of the Bachelor of Nursing programme.
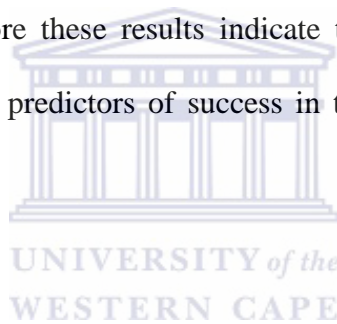
5.3   STUDY LIMITATIONS

The study was conducted with only a limited sample from one university. The sample of the study included only 226 students, which may limit generalisability of the results to the rest of the university or other universities. The study included only students with NSC as defined by UMALUSI, the quality assurer for basic education, which therefore implies that all other students who completed their high school outside South Africa and those who completed high school before the year 2008 (when NCS was implemented) were excluded. This criterion may also explain the low standard deviation (1.4) and minimal variations among the participants' age.

Data relating to students' previous qualifications obtained could not be found and therefore this variable was excluded from the analysis.

5.4 CONCLUSION

The aim of the research study was to examine the relationship between demographic (age, gender, ethnicity) and academic (life sciences, physical sciences, life orientation, maths, admission points, NBT, first-year nursing grade, first-year science grade) variables, and the academic performance (second-year nursing grade, second-year science grade) of second-year nursing students at UWC. The significant predictors for this study were found to be the cognitive characteristics of the students.

The NURS (2013) model provides relevant framework for understanding the complex process of nursing student retention and success. The study tested the parts of the NURS model as defined by Jeffreys (2013) in Chapter 2. The cognitive predictor variable in this study is representative of the prior educational experiences in the NURS (2013) model. Therefore the finding of the present study supports the importance of previous academic achievements on current performance.

The present study draws attention for nurse educators towards the students who may possibly be at risk of unsatisfactory academic performance. This objective allows nurse educators to be proactive in implementing remedial action as early as possible to ensure that throughput is not compromised.

5.5   RECOMMENDATIONS

5.5.1 Recommendations for further research

The performance of nursing students in nursing and science modules is a diverse topic that needs further investigation at other nursing institutions at various levels of undergraduate programmes. Similar studies should be conducted regularly to accommodate the changing profile of nursing students in the classroom. Since the nursing curriculum changes as the need arises, the opportunity exists to repeat the study. In the study, the outcome variable of academic performance was measured by obtaining the average scores obtained in nursing modules as well as in science modules. Using the mean scores for the outcome variable can be statistically viewed as compromising the variability of the outcome variable. For further investigation, researchers should therefore consider separating outcome variables to assess the predictive power of the predictor variables on performance of each and every module offered in the undergraduate nursing programme. The study included only two non-cognitive predictors; future studies might include more of the non-cognitive predictors as little is known about the predictive power of these predictor variables. It would be interesting for future research to allow examining of teaching strategies implemented by nurse educators in the classroom and how this influences students' academic performance.

5.5.2 Recommendations for selection to the BNurs programme

The following high school subjects have shown a significant (p <0.01) correlation with second-year grade in nursing modules: mathematics (0.437), life science (0.335), physical science

(0.370) as well as the second-year science modules of life science (0.418) physical science (0.448) and mathematics (0.491).

The independent predictor variables that demonstrated the strongest correlation with second-year nursing modules were first-year science modules (0.679, $p <0.01$) and first-year nursing modules (0.662, $p <0.01$). Furthermore, the independent predictor variables that demonstrated the strongest correlation with second-year science modules were high school physical science (0.424, $p <0.01$), high school mathematics (0.415, $p <0.01$) and first-year science modules (0.765, $p <0.01$).

Based on the above findings, the following school-leaving subjects are highly recommended for selection for the Bachelor of Nursing programme: mathematics, life science and physical science. The correlational analysis showed that the first-year grade (nursing as well as science grade) is highly correlated to second-year grades (nursing as well as science grades); this implies that performance in the second year is highly dependent on first-year performance.

5.5.3 Recommendations for education

Students with low grades in mathematics, life sciences and physical sciences should be considered for the foundation/extended programme or, if admitted to the mainstream programme, should be monitored closely and given the necessary support in the subjects in which they are at risk of performing unsatisfactorily. As with students with low grades in the above-mentioned school-leaving subjects, students with low first-year grades should be given the necessary support. This support will enable students who are at risk of unsatisfactory academic performance to meet the minimum requirements.

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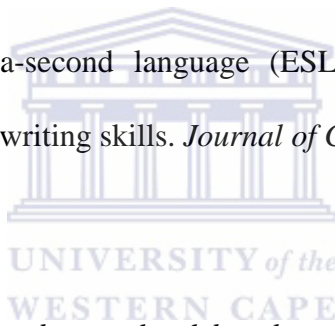
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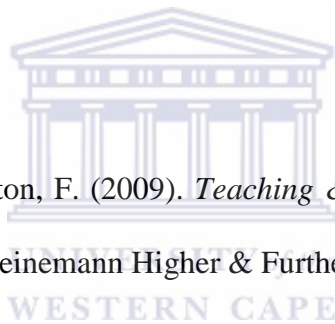
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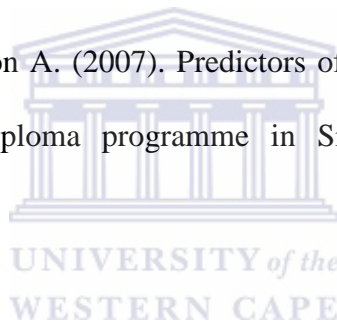
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Appendix A

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959, Fax: 27 21-959

E-mail:

DATA COLLECTION CHECK LIST

Grades and related codes

Grades	Level	Description
0% – 29%	1	unsatisfactory performance
30% – 39%	2	Elementary performance
40% – 49%	3	Adequate performance
50% – 59%	4	Moderate performance
60% – 69%	5	Substantial performance
70% – 79%	6	Meritorious performance
80% – 100%	7	Outstanding performance

Year of 2nd level of study ………………………………………….. ☐

Final 2nd year average grade…………………………………………… ☐

Final 2nd year average grade for science modules……………………… ☐

Final 2nd year average grade for nursing modules……………………… ☐

1. DEMOGRAPHIC INFORMATION

AGE (at 2nd year of study)…………………………………………… [　　　]

GENDER…………………………………………………………... | FEMALE | MALE |

ETHNICITY…………………………………………………………

WHITE	COLOURD	AFRICAN	INDIAN	OTHER

2. NON-COGNITIVE INFORMATION

English as a second language (ESL): …………………….…… | YES | NO |

Living on residence or at home: ……………………………...…… | YES | NO |

COGNITIVE INFORMATION

Final year high school grade: ……………………………………………… [　　　]

High school life orientation or social science grade: ……………………… [　　　]

High school biology/physiology/anatomy grade: ………………………… [　　　]

High school chemistry/physical/natural science grade ………………….… [　　　]

High school mathematics grade……………………………………….…… [　　　]

The National Benchmark Test grade……………………………………… [　　　]

Aggregate grade in first year……………………………………………… [　　　]

Previous Nursing certificates, Diploma or Degree……………………… | YES | NO |

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959, Fax: 27 21-959

E-mail:

REQUEST FOR PERMISSION

I **Katlego Mthimunye** (3406922) student registered for M Nursing (Education) at the University of the Western Cape will be conducting a research study focusing on the predictors of high academic performance and throughput among second year nursing students at the University of the Western Cape. My target population will be all nursing students registered at University of the Western Cape for the second year B Nursing programme for the year 2012 to 2013. I will be requiring student's data from the Student Administrative System Integrated the information needed is stated on the check list attached for your attention.

All data will be kept safe and in a secure area to maintain and uphold confidentiality. Student identification details will not be needed thus anonymity will be maintained throughout the study. Furthermore all results from Student Administration system integrated that will be used will therefore be reported in aggregate to minimize the potential identification any individual or specific organization.

With the above mentioned I would like to request permission to access the data as stated in the check list to complete the study successfully. Thank you for taking the time to attend to this letter and looking forward to your response.

Signature of Researcher: KNT MTHIMUNYE ....**Date:** 17/11/2014

Thank you for your cooperation

18

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 3482, Fax: 27 21-959
E-mail: katlegomthimunye@icloud.com

CONSENT FORM

Title of research project

Predictors of academic performance and throughput among second year nursing students at a University in the Western Cape.

The study has been described to me and my questions about the study have been answered. I understand that the identity of the participating individuals will not be disclosed.

Registrar ………………………………..

Registrar's signature……………………………….

Witness……………………………………….

Date………………………

Should you have any questions regarding this study, please contact the study coordinator

Study coordinator: Mr. Katlego Mthimunye

University of the Western Cape

Private Bag X17, Belville 7535

Telephone: (021)959-3482

Email: katlegomthimunye@icloud.com

Appendix D

UNIVERSITY *of the*
WESTERN CAPE

OFFICE OF THE REGISTRAR

30 January 2015

Mr. K Mthimunye St No 3406922
Department of Nursing
Faculty of Community and Health Sciences

Dear Mr. K Mthimunye

PERMISSION TO CONDUCT RESEARCH AT UWC

Predictors of academic performance and throughput among second year nursing students at a University of the Western Cape

Thank you for complying with our requirements for obtaining permission to do research at the University of the Western Cape.

I hereby grant permission for Mr Mthimunye to access the following data elements of the Nursing students who were on level 2 in 2012/13 as well as these students Level 1 information.

AGE, GENDER, ETHNICITY, ENGLISH HIGH SCHOOL BIOLOGY/ PHYSIOLOGY/ GRADE HIGH SCHOOL CHEMISTRY/PHYSICAL/NATURAL SCIENCE GRADE HIGH SCHOOL LIFE ORIENTATION/ SOCIAL SCIENCE GRADE HIGH SCHOOL MATHEMATICS GRADE FINAL YEAR HIGH SCHOOL GRADE NURSING CERTIFICATES, DIPLOMA NATIONAL BENCHMARK TEST GRADE FINAL 1ST YEAR GRADE, PLACE OF RESIDENCE

A place of quality,
a place to grow, from hope
to action through knowledge

I recommend that the following data elements:

2ND YEAR AVERAGE GRADE FOR NURSING MODULES
(PERFORMANCE)   2ND YEAR AVERAGE GRADE FOR SCIENCE
MODULES (PERFORMANCE) 2ND YEAR AVERAGE GRADE
(PERFORMANCE)

be downloaded from MAS as the module average has been calculated in MAS.

I wish you every success with the completion of the study.

Yours sincerely

Prof J. J. Cornelissen
Acting REGISTRAR

APPENDIX E:

UNIVERSITY OF THE WESTERN CAPE
SCHOOL OF NURSING

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-9592274, Fax: 27 21-9592271
E-mail: kjooste@uwc.ac.za

PERMISSION LETTER

3 February 2015

Mr K. Mthimunye (3406922)

Title of Research Project: Predictors of academic performance and throughput among second year nursing students at a University of the Western Cape

You are granted permission to conduct your study at the School of Nursing.

You have to arrange the data collection with Mrs N Africa for a convenient time. During this phase you have to adhere to the ethical principles outlined in your study.

I wish you success with your studies.

Prof K Jooste
Director
School of Nursing

APPENDIX F:

OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH DEVELOPMENT

UNIVERSITY *of the*
WESTERN CAPE

14 November 2014

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape approved the methodology and ethics of the following research project by:
Mr K Mthimunye (School of Nursing)

Research Project:	Predictors of academic performance and throughput among second year nursing students at a University of the Western Cape.
Registration no:	14/9/38

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

A place of quality,
a place to grow, from hope
to action through knowledge

APPENDIX G

Pearson Correlations Matrix of Study Variables

		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGHPUT (success)
Age	Pearson Correlation	1	-.280**	-.056	-.027	-.113	-.050	-.059	.069	-.117	-.228*	.121	.060	.041	-.022	.074	-.012
	Sig. (2-tailed)		.000	.401	.684	.092	.538	.381	.394	.078	.020	.069	.372	.536	.746	.275	.859
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
Gender	Pearson Correlation	-.280**	1	-.269**	.220**	.029	.006	.059	.098	.182**	.262**	.041	-.038	-.005	.136*	.041	-.020
	Sig. (2-tailed)	.000		.000	.001	.661	.938	.377	.226	.006	.007	.543	.573	.938	.041	.547	.766
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
Ethnicity	Pearson Correlation	-.056	-.269**	1	-.528**	-.212**	-.213**	-.179**	-.346**	-.458**	-.462**	-.401**	-.352**	-.003	-.411**	-.357**	-.191**
	Sig. (2-tailed)	.401	.000		.000	.001	.008	.007	.000	.000	.000	.000	.000	.962	.000	.000	.004
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
ESL	Pearson Correlation	-.027	.220**	-.528**	1	.100	.098	-.003	.073	.145*	.310**	.326**	.206**	-.106	.229**	.152*	.017
	Sig. (2-tailed)	.684	.001	.000		.134	.222	.959	.371	.029	.001	.000	.002	.113	.001	.024	.800
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
Life Sciences	Pearson Correlation	-.113	.029	-.212**	.100	1	.545**	.193**	.392**	.613**	.304**	.432**	.513**	.081	.335**	.418**	.353**
	Sig. (2-tailed)	.092	.661	.001	.134		.000	.004	.000	.000	.002	.000	.000	.226	.000	.000	.000
	N	225	225	225	225	225	156	225	153	225	103	225	225	225	224	221	225

		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGHPUT (succsess)
Physical Sciences	**Pearson Correlation**	-.050	.006	-.213**	.098	.545**	1	.103	.486**	.609**	.236	.396**	.595**	-.040	.370**	.448**	.449**
	Sig. (2-tailed)	.538	.938	.008	.222	.000		.199	.000	.000	.061	.000	.000	.620	.000	.000	.000
	N	156	156	156	156	156	156	156	135	156	64	156	156	156	155	154	156
Life Orientation	**Pearson Correlation**	-.059	.059	-.179**	-.003	.193**	.103	1	.161*	.330**	.036	.179**	.133*	.203**	.210**	.117	.120
	Sig. (2-tailed)	.381	.377	.007	.959	.004	.199		.046	.000	.716	.007	.046	.002	.002	.082	.071
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
Maths	**Pearson Correlation**	.069	.098	-.346**	.073	.392**	.486**	.161*	1	.638**	.499**	.446**	.522**	.111	.437**	.491**	.320**
	Sig. (2-tailed)	.394	.226	.000	.371	.000	.000	.046		.000	.000	.000	.000	.169	.000	.000	.000
	N	154	154	154	154	153	135	154	154	154	66	154	154	154	153	153	154
Points Received	**Pearson Correlation**	-.117	.182**	-.458**	.145*	.613**	.609**	.330**	.638**	1	.561**	.439**	.397**	.092	.437**	.428**	.323**
	Sig. (2-tailed)	.078	.006	.000	.029	.000	.000	.000	.000		.000	.000	.000	.170	.000	.000	.000
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
NBT	**Pearson Correlation**	-.228*	.262**	-.462**	.310**	.304**	.236	.036	.499**	.561**	1	.224*	.313**	-.028	.383**	.358**	.131
	Sig. (2-tailed)	.020	.007	.000	.001	.002	.061	.716	.000	.000		.022	.001	.779	.000	.000	.186
	N	104	104	104	104	103	64	104	66	104	111	104	104	104	103	101	104

		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGHPUT (succsess)
1ST YR NURSING GRADE	Pearson Correlation	.121	.041	-.401**	.326**	.432**	.396**	.179**	.446**	.439**	.224*	1	.700**	.028	.677**	.627**	.526**
	Sig. (2-tailed)	.069	.543	.000	.000	.000	.000	.007	.000	.000	.022		.000	.681	.000	.000	.000
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
1ST YR SCIENCE GRADE	Pearson Correlation	.060	-.038	-.352**	.206**	.513**	.595**	.133*	.522**	.397**	.313**	.700**	1	-.015	.679**	.765**	.653**
	Sig. (2-tailed)	.372	.573	.000	.002	.000	.000	.046	.000	.000	.001	.000		.820	.000	.000	.000
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
PLACE OF RES	Pearson Correlation	.041	-.005	-.003	-.106	.081	-.040	.203**	.111	.092	-.028	.028	-.015	1	-.018	-.046	-.029
	Sig. (2-tailed)	.536	.938	.962	.113	.226	.620	.002	.169	.170	.779	.681	.820		.791	.493	.664
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
2ND YEAR NURSING MODULES	Pearson Correlation	-.022	.136*	-.411**	.229**	.335**	.370**	.210**	.437**	.437**	.383**	.677**	.679**	-.018	1	.759**	.607**
	Sig. (2-tailed)	.746	.041	.000	.001	.000	.000	.002	.000	.000	.000	.000	.000	.791		.000	.000
	N	225	225	225	225	224	155	225	153	225	103	225	225	225	225	221	225
2ND YEAR SCIENCE MODULES	Pearson Correlation	.074	.041	-.357**	.152*	.418**	.448**	.117	.491**	.428**	.358**	.627**	.765**	-.046	.759**	1	.697**
	Sig. (2-tailed)	.275	.547	.000	.024	.000	.000	.082	.000	.000	.000	.000	.000	.493	.000		.000
	N	222	222	222	222	221	154	222	153	222	101	222	222	222	221	222	222

		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGHPUT (success)
THROUGHPUT (success)	Pearson Correlation	-.012	-.020	-.191**	.017	.353**	.449**	.120	.320**	.323**	.131	.526**	.653**	-.029	.607**	.697**	1
	Sig. (2-tailed)	.859	.766	.004	.800	.000	.000	.071	.000	.000	.186	.000	.000	.664	.000	.000	
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Cronbachs Alpha = 0.799989   Standardized Cronbachs Alpha = 0.849693

APPENDIX H

Spearman's *rho* Correlations

		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGH PUT (success)
Age	Correlation Coefficient	1.000	-.311**	.115	-.070	-.124	-.105	-.049	-.017	-.231**	-.255**	.099	-.024	.077	-.022	.003	-.067
	Sig. (2-tailed)	.	.000	.085	.294	.063	.193	.468	.832	.000	.009	.137	.725	.250	.738	.966	.318
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
Gender	Correlation Coefficient	-.311**	1.000	-.286**	.220**	.027	.014	.043	.091	.192**	.284**	.008	-.056	-.005	.130	.022	-.020
	Sig. (2-tailed)	.000	.	.000	.001	.692	.866	.516	.261	.004	.004	.907	.404	.938	.052	.745	.766
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
Ethnicity	Correlation Coefficient	.115	-.286**	1.000	-.583**	-.199**	-.168*	-.196**	-.255**	-.420**	-.471**	-.378**	-.277**	.003	-.393**	-.266**	-.151*
	Sig. (2-tailed)	.085	.000	.	.000	.003	.037	.003	.001	.000	.000	.000	.000	.961	.000	.000	.023
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
ESL	Correlation Coefficient	-.070	.220**	-.583**	1.000	.097	.104	.000	.047	.136*	.297**	.312**	.195**	-.106	.209**	.146*	.017
	Sig. (2-tailed)	.294	.001	.000	.	.148	.197	.996	.562	.041	.002	.000	.003	.113	.002	.030	.800
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226

|		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGH PUT (success)
Life Sciences	Correlation Coefficient	-.124	.027	-.199**	.097	1.000	.523**	.199**	.350**	.586**	.255**	.384**	.485**	.092	.302**	.391**	.364**
	Sig. (2-tailed)	.063	.692	.003	.148	.	.000	.003	.000	.000	.009	.000	.000	.167	.000	.000	.000
	N	225	225	225	225	225	156	225	153	225	103	225	225	225	224	221	225
Physical Sciences	Correlation Coefficient	-.105	.014	-.168*	.104	.523**	1.000	.116	.436**	.562**	.103	.385**	.565**	-.050	.315**	.424**	.450**
	Sig. (2-tailed)	.193	.866	.037	.197	.000	.	.150	.000	.000	.419	.000	.000	.537	.000	.000	.000
	N	156	156	156	156	156	156	156	135	156	64	156	156	156	155	154	156
Life Orientation	Correlation Coefficient	-.049	.043	-.196**	.000	.199**	.116	1.000	.134	.341**	.081	.150*	.116	.210**	.198**	.080	.109
	Sig. (2-tailed)	.468	.516	.003	.996	.003	.150	.	.097	.000	.413	.024	.083	.001	.003	.233	.101
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
Maths	Correlation Coefficient	-.017	.091	-.255**	.047	.350**	.436**	.134	1.000	.581**	.402**	.374**	.480**	.156	.364**	.415**	.340**
	Sig. (2-tailed)	.832	.261	.001	.562	.000	.000	.097	.	.000	.001	.000	.000	.053	.000	.000	.000
	N	154	154	154	154	153	135	154	154	154	66	154	154	154	153	153	154
Points Received	Correlation Coefficient	-.231**	.192**	-.420**	.136*	.586**	.562**	.341**	.581**	1.000	.492**	.385**	.339**	.129	.349**	.336**	.327**
	Sig. (2-tailed)	.000	.004	.000	.041	.000	.000	.000	.000	.	.000	.000	.000	.052	.000	.000	.000
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226

		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGH PUT (success)
NBT	Correlation Coefficient	-.255**	.284**	-.471**	.297**	.255**	.103	.081	.402**	.492**	1.000	.226*	.287**	-.040	.352**	.342**	.151
	Sig. (2-tailed)	.009	.004	.000	.002	.009	.419	.413	.001	.000	.	.021	.003	.686	.000	.000	.125
	N	104	104	104	104	103	64	104	66	104	111	104	104	104	103	101	104
1ST YR NURSING GRADE	Correlation Coefficient	.099	.008	-.378**	.312**	.384**	.385**	.150*	.374**	.385**	.226*	1.000	.669**	.031	.662**	.597**	.540**
	Sig. (2-tailed)	.137	.907	.000	.000	.000	.000	.024	.000	.000	.021	.	.000	.642	.000	.000	.000
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
1ST YR SCIENCE GRADE	Correlation Coefficient	-.024	-.056	-.277**	.195**	.485**	.565**	.116	.480**	.339**	.287**	.669**	1.000	.000	.639**	.757**	.665**
	Sig. (2-tailed)	.725	.404	.000	.003	.000	.000	.083	.000	.000	.003	.000	.	.997	.000	.000	.000
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
PLACE OF RES	Correlation Coefficient	.077	-.005	.003	-.106	.092	-.050	.210**	.156	.129	-.040	.031	.000	1.000	.008	-.056	-.029
	Sig. (2-tailed)	.250	.938	.961	.113	.167	.537	.001	.053	.052	.686	.642	.997	.	.903	.408	.664
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226
2ND YEAR NURSING MODULES	Correlation Coefficient	-.022	.130	-.393**	.209**	.302**	.315**	.198**	.364**	.349**	.352**	.662**	.639**	.008	1.000	.723**	.610**
	Sig. (2-tailed)	.738	.052	.000	.002	.000	.000	.003	.000	.000	.000	.000	.000	.903	.	.000	.000
	N	225	225	225	225	224	155	225	153	225	103	225	225	225	225	221	225

		Age	Gender	Ethnicity	ESL	Life Sciences	Physical Sciences	Life Orientation	Maths	Points Received	NBT	1ST YR NURSING GRADE	1ST YR SCIENCE GRADE	PLACE OF RES	2ND YR NURSING MODULE	2ND YR SCIENCE MODULE	THROUGH PUT (success)
2ND YEAR SCIENCE MODULES	Correlation Coefficient	.003	.022	-.266**	.146*	.391**	.424**	.080	.415**	.336**	.342**	.597**	.757**	-.056	.723**	1.000	.771**
	Sig. (2-tailed)	.966	.745	.000	.030	.000	.000	.233	.000	.000	.000	.000	.000	.408	.000	.	.000
	N	222	222	222	222	221	154	222	153	222	101	222	222	222	221	222	222
THROUGHPUT (success)	Correlation Coefficient	-.067	-.020	-.151*	.017	.364**	.450**	.109	.340**	.327**	.151	.540**	.665**	-.029	.610**	.771**	1.000
	Sig. (2-tailed)	.318	.766	.023	.800	.000	.000	.101	.000	.000	.125	.000	.000	.664	.000	.000	.
	N	226	226	226	226	225	156	226	154	226	104	226	226	226	225	222	226

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Cronbachs Alpha = 0.799989   Standardized Cronbachs Alpha = 0.849693
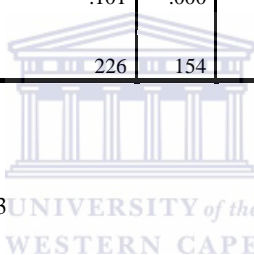
APPENDIX I

<div align="right">

601 Deauville
20 Ednam Road
Rondebosch
7700
12 May 2015

</div>

Mr Katlego Mthimunye

Dear Mr Mthimunye

Mini-thesis titled: Predictors of academic performance and throughput among second-year nursing students at a university in the Western Cape

I declare that I have read and edited the above document from the viewpoint of grammar, syntax, idiom and punctuation according to the norms of British English, which is the style followed in South Africa, and the style and format generally used by academic and scientific publications.

I have worked for many years, and continue to work, as a sub-editor and copy editor for a number of professional South African academic and health-sciences journals.

Yours sincerely

Robert Matzdorff
mobile 084 582 0460