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AN ANALYSIS OF COLLEGE-BASED NURSING STUDENTS' PERFORMANCE IN BIOLOGICAL NURSING SCIENCE

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in fulfilment of the requirements for the degree of Master of Science in Nursing

Johannesburg, 2013

DECLARATION

I, Cecilia Magauta Mohudi, declare that this research report is my own work. It is being submitted for the degree of Master of Science in Nursing, in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

……

Signature

……. day of …… 2013

DEDICATION

To the apple of my eye, my grandson, Karabo Ofentse
and to my Church

ABSTRACT

The study was conducted at the largest public sector nursing college in the Gauteng province. The South African Nursing Council (SANC) regulation, R425 paragraph (f) stipulates that Biological Nursing Science (BNS) shall be included in the curriculum taught in the four-year diploma nursing programme, leading to registration as a professional nurse. BNS is an ancillary subject in the four year diploma programme in nursing. However, SANC does not stipulate that Biology should be a prerequisite for entry into the nursing programme. Biology as a school subject is neither a prerequisite nor a selection criterion for entry into the four year diploma nursing programme. Since the selection criteria have been widened for entry into nursing, the funders of nursing education seem to consider Biology even less important than before. Hence, the entry criteria are based on the matric score that the applicant achieves following the consideration of symbols obtained in different subjects.

Poor performance in Biological Nursing Science (BNS) of students registered for the 4-year Diploma in Nursing is of grave concern to educators, students and funders of nursing education. A preview of nursing students' summative results in BNS over a two year period showed a drop in the overall pass rate from 89% to 50%. It was hypothesised that prior biology knowledge or lack thereof might be a reason why BNS is difficult for first and second level nursing students; there is, however, no evidence to support this. Hence, it was intended to establish the factors that contribute to or are related to the performance of students in BNS in their first and second years of the four year diploma in nursing. The purpose of the study was to analyse the performance in BNS 1 and BNS 2 of student nurses at a public nursing college.

In this study the sample comprised two groups of third and fourth year nursing students who have studied BNS 1 in their first year and BNS 2 in their second year of the programme (N=424); 312 (73.6%) agreed to participate; 175 were third year students and 137 fourth year students. A quantitative, survey research design was used. A retrospective record review and a questionnaire were used to collect data.. Students' academic records were used to obtain BNS 1 and BNS 2 tests and summative examination results. Students' admission records were used to obtain the socio-demographic data. A total of 364 records were reviewed and constituted the records sample (n=364).

Data were entered onto an Excel spread sheet. Descriptive and inferential statistics were used to analyse the data and to present the results. Chi square (X^2) was used to test for significant differences between study variables. The p-value was set at 0.05 level of significance.

The study found that age is the only demographic variable that influences BNS performance; with the age range between 17 to 50 years, older students have lower mean scores in BNS than younger students. The results showed that for every 1 year increase in age, a 0.28% mark decrease in the BNS 2 main examination mark could be expected.

The most popular subject choices in high school are Biology and Physics, however, only Physics was shown to have a significant positive influence on the performance of students in BNS examinations. Among the least chosen subjects are Business Studies and Business Economics which were also shown to have a positive effect on BNS performance. It may be concluded that the subjects Physics, Business studies and Business Economics enhance students' performance in BNS. On the contrary Biology, was shown not to have an effect on the performance of students in BNS ($p=0.15$). Previous Biology knowledge did not significantly influence lecture attendance and students' use of prescribed material but those who had studied Biology more than five years ago or not at all, were more inclined to use recommended material.

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TABLE OF CONTENTS

		Page
	Declaration……..	ii
	Dedication……..	iii
	Abstract……..	iv
	Acknowledgements	vi
	Table of Contents……..	vii
	List of Figures ……..	x
	List of Tables……..	xi
1.	**CHAPTER ONE: ORIENTATION TO THE STUDY**.....,.....	1
1.1	Introduction and Background ……..	1
1.2	Problem Statement……..	3
1.3	Significance of the Study ……..……..	4
1.4	Study Purpose……..	4
1.5	Objectives ……..……..	4
1.6	Definition of Variables ……..……..	5
1.7	Structure of the Research Report.....	6
1.8	Conclusion……..	7
2.	**CHAPTER TWO: LITERATURE REVIEW**……..	8
2.1	Introduction……..	8
2.2	Performance in Bioscience ……..	8
2.2.1	The Impact of Age and Type of Entry Qualifications.....	9
2.2.2	Gender and Academic/BNS Performance.....	9
2.2.3	The Relationship between Academic Performance and Entry Criteria……..	10
2.3	Problems in Teaching of Bioscience.....	12
2.4	Content and Depth of Bioscience Knowledge ……..	12
2.5	Need for Nurses to Study BNS……..……..	13
2.6	The Teaching of Bioscience to Nurses..... …….....	13
2.7	Conclusion……..	14
3.	**CHAPTER THREE: RESEARCH METHODS**.....	15
3.1	Introduction……..	15
3.2	Research Design ……..	15
3.3	Research Methods ……..	15
3.3.1	Population……..	16
3.3.2	Sample……..	16

		Page
3.4	Data Collection	16
3.4.1	Data Collection Technique	16
3.4.2	Data Collection Procedure	17
3.5	Data Analysis	18
3.6	Pilot Study	18
3.7	Ethical Considerations	18
3.8	Conclusion	19
4.	**CHAPTER FOUR: RESULTS**	21
4.1	Introduction	21
4.2	Approach to Data Analysis	21
4.3	Results	22
4.3.1	Sample Demographics	22
4.3.1.1	Age of the Sample	23
4.3.1.2	Sex of the Sample	23
4.3.1.3	Marital Status	23
4.3.1.4	Highest Qualification	24
4.3.1.5	Subject Choice	25
4.3.1.6	Previous Nursing Experience	26
4.3.1.7	Previous Biological Sciences Knowledge	27
4.3.2	BNS Results	28
4.3.2.1	BNS 1: Test and Examination Results	28
4.3.2.2	BNS 2: Test and Examination Results	31
4.3.2.3	Correlation between Year 1 and Year 2 BNS Examination Marks	34
4.3.3	BNS Course Attendance, Resources and Support	36
4.3.3.1	Attendance and BNS Lectures	36
4.3.3.2	Use of Prescribed Course Material	37
4.3.3.3	Use of Recommended Course Material	38
4.3.3.4	Use of Online Learning Resources	39
4.3.4	Rating of Lecturer Support	39
4.3.4.1	Lecturer Feedback	40
4.4	Conclusion	41
5.	**CHAPTER FIVE: DISCUSSION OF RESULTS, SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS**	42
5.1	Introduction	42
5.2	Summary	42
5.3	Discussion of Results	44

Page

5.3.1 Sample Demographics..... 44
5.3.2 Academic History and Experience..... 45
5.3.3 BNS Results..... 46
5.3.4 BNS Course Attendance, Resources and Support..... 47
5.4 Conclusion..... 49
5.5 Recommendations..... 50
5.6 Study Limitations..... 51
5.7 Closing Remarks..... 52

6. **REFERENCES**..... 53

Appendix 1 : Data Recording Sheet..... 57
Appendix 2 : Questionnaires..... 58
Appendix 3 : Permission to Conduct the Study Granted by the Gauteng Department of Health..... 60
Appendix 4 : Ethical Clearance from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand..... 63
Appendix 5 : The Approval of the Study by the Postgraduate Committee of the University of the Witwatersrand..... 64
Appendix 6 : Permission from the Principal of the College where the Study was Conducted..... 65
Appendix 7 : Information Sheet Issued to the Respondents before Completion of the Questionnaires..... 66

LIST OF FIGURES

			Page
Figure 4.1	:	Percentage of Students Who Studied Biology (n=312).....	27
Figure 4.2	:	Study of Biology and Use of Course Material by Sample (n=312).....	28
Figure 4.3	:	Correlation between BNS 1 Main Examination Mark and Test 1.....	29
Figure 4.4	:	Correlation between BNS 1 Main Examination Mark and Test 2.....	30
Figure 4.5	:	Correlation between BNS 1 Main Examination Mark and Test 3.....	30
Figure 4.6	:	Correlation between BNS 1 Main Examination Mark and Test Mean.....	31
Figure 4.7	:	Correlation between BNS 2 Main Examination Mark and Test 1.....	32
Figure 4.8	:	Correlation between BNS 2 Main Examination Mark and Test 2.....	33
Figure 4.9	:	Correlation between BNS 2 Main Examination Mark and Test 3.....	33
Figure 4.10	:	Correlation between BNS 2 Main Examination Marks and Test Mean.....	34
Figure 4.11	:	Correlation between BNS 1 and BNS 2 Main Examination Marks for the 2008 Cohort.....	35
Figure 4.12	:	Correlation between BNS 1 and BNS 2 Main Examination Marks for 2008/ 2009 Cohort.....	36
Figure 4.13	:	Student Attendance at BNS Lectures (n=312).....	37
Figure 4.14	:	Percentage of Students who Use Prescribed Course Material (n=312).....	37
Figure 4.15	:	Percentage of Students who Use Recommended Course Material (n=312)	38
Figure 4.16	:	Percentage of Students who Use Online Learning Resources (n=312).....	39
Figure 4.17	:	Students' Rating of Quality of Lecturer Support (n=300).....	40
Figure 4.18	:	Students' Rating of Lecturer Feedback (n=195).....	41

LIST OF TABLES

			Page
Table 4.1	:	Age Distribution of the Sample (n=364)…..…….....	23
Table 4.2	:	Distribution of Sex of the Sample (n=364).....	23
Table 4.3	:	Marital Status of the Sample (n=364).....	24
Table 4.4	:	Highest Qualification of Sample on Entry Level (n=364).....	24
Table 4.5	:	Significance of Subject Choice in Matric.....	26
Table 4.6	:	Previous Nursing Experience of the Sample (n=364).....	26
Table 4.7	:	Statistics and Frequency Distributions for the BNS 1 Tests and Examination (n=364).....	29
Table 4.8	:	Statistics and Frequency Distributions for the BNS 2 Tests and Examination (n=336).....	32

CHAPTER ONE

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Biological Nursing Science is an ancillary subject in the four year Diploma programme in Nursing offered at Nursing College in South Africa. It is an important subject that provides a good background and scientific basis for nursing practice. The literature suggests that good Biological knowledge is generally understood to lead to good patient care (Jordan and Reid, 1997; Jordan and Porter, 1999). According to van Rooyen, Dixon, Dixon and Well (2006), Bioscience is the underpinning subject for nursing practice, as it prepares the student nurse to provide safe, efficient and effective nursing care on completion of the course. According to Akinsanya (1987) and Casey (1996), Biological science is an important subject providing a scientific foundation for nursing practice.

Biological science also known as Bioscience is the underpinning subject for nursing practice, as it prepares the student nurse to provide safe, efficient and effective nursing care on completion of the course. However, in the nursing college under study, Biological Nursing Science (BNS) appears to be difficult and problematic for first and second year nursing students leading to poor performance and subsequent failure. This may lead to poor patient care making the institution legally liable for poor patient outcomes. Poor academic performance is disturbing and of grave concern to nurse educators and students alike and has serious consequences for patient care.

It is stipulated under section 6 sub-regulation (3) of the South African Nursing Council (SANC) regulation, R425 paragraph (f) that Biological Nursing Science (BNS) shall be included in the curriculum taught in the four-year Diploma programme of Nursing, leading to registration as a professional nurse. Sub-regulation (3) stipulates that the approach shall be the integration of the various fields of the study, particularly in their clinical approach. However, SANC does not stipulate that the subject Biology should be a prerequisite for entry into the nursing programme.

Biology as a high school subject is neither a prerequisite nor a selection criterion for entry into the four year nursing programme. Since the selection criteria have been widened for entry into nursing, the funders of nursing education seem to consider Biology even less important than before. Hence, the entry criteria are based on the score that the applicant achieves in relation to the symbols obtained in different subjects.

A range of academic and non-academic factors or reasons play a role in poor BNS performance. It is specifically hypothesised that prior Biology knowledge or lack thereof might be a reason why BNS is difficult for first and second year nursing students. There is, however, no evidence to support this statement. A study conducted by McKee (2002), in the Trinity College School of Nursing and Midwifery, in Dublin, Ireland, outlines the factors that are thought to make Biological science difficult; these include students' language acquaintance, acquaintance with the concepts or scientific way of thinking and an overloaded curriculum covered over a short period of time. McKee (2002) does, however, mention that these factors were not further explored in their study. These factors may or may not be similar in this study context.

In the nursing college under study BNS includes Biochemistry, Biophysics and Microbiology, taught in the first year of study and Anatomy and Physiology in the second year. BNS content requires 150 notional hours (15 credits) for mastery, as stipulated in the Gauteng Nursing Colleges curriculum (Curriculum 2003).

The first specific learning outcome stipulates that the learner will demonstrate knowledge and understanding of elementary Biochemistry and Biophysics in meeting the basic health needs and problems of the individual, in family, groups and community context. The associated assessment criteria stipulate that students will effectively integrate relevant scientific principles of Biochemistry and Biophysics in performing nursing procedures and meeting individual basic health needs.

According to the second specific learning outcome the learner will demonstrate knowledge of elementary Microbiology and Parasitology and its influences on health. The associated assessment criteria stipulate that the learner will successfully apply knowledge and skill of Microbiology and Parasitology in the prevention of disease and promotion of health.

According to the third specific learning outcome in the curriculum, the learner will demonstrate knowledge and understanding of the microscopic structure and functions of body systems. It follows that if students fail to achieve this learning outcome they are unable to apply Biosciences knowledge in the performance of nursing procedures, and in nursing actions to prevent disease and promote health. It is expected that with the knowledge and understanding of the microscopic structure and functions of the body, the student nurse will be able to provide safe efficient and effective patient care. The associated assessment criteria stipulate that, the learner will effectively apply knowledge of Anatomy and Physiology in managing health problems of the individual. The above

paragraphs fully support some scholarly articles quoted in this report, that biological science is the underpinning subject for nursing practice.

In the nursing college under study, BNS is presented over three teaching blocks within an academic year i.e. one week per block. The content is taught over 40 hours per week, spread between three to four lecturers. The timetable is organized in such a manner that study periods are included to allow the learners the opportunity to learn in between lectures. Formative assessment involves three tests, each worth 50 marks; 20% is made up of multiple choice questions (MCQ), marked at the MCQ centre at the affiliated university, and 30% structured questions marked by the course lecturers. The summative assessment consists of multiple choice questions (40%) and descriptive questions (60%) which are moderated by the university, with which the college has an affiliation agreement.

At the time of the study, the overall pass rate of student nurses in BNS was 49% in the main examination, 6% in the supplementary and 15% in the special examination. The pass rate is decreasing faster than expected, despite measures outside the normal classroom lessons, instituted to improve the pass rate. Hence, it was intended to establish what factors contribute to or are related to the performance of students in BNS in their first year and second years of the four year diploma in nursing programme.

1.2 PROBLEM STATEMENT

Poor performance in BNS of students registered for the four-year Diploma in Nursing is of grave concern to educators, students and funders of nursing education. A preview of nursing students' summative results in BNS show a drop in the overall pass rate from 89% to 50% over the past three to four years. The reason for this is not known. Possible contributory factors include: lack of Biology at school as it is not a requirement for entry into the nursing programme; inadequate use of resources and support, and poor use of prescribed and recommended study material.

It is hypothesized that there is an association between performance in BNS completed in the first and second year of study, and Biological science background on entry to the nursing programme and factors such as classroom attendance, learning patterns and mode of entry to nursing programme e.g. direct entry or Recognition of Prior Learning (RPL). This study addresses the following research questions:

- Is there a correlation between the performance in BNS 1 and BNS 2 for two cohorts of nursing students?

- Are socio-demographic variables (age, gender, marital status) related to BNS performance?

- How does previous Biology knowledge and experience influence students' learning patterns in BNS?

- How does Biology knowledge influence students' performance in BNS?

1.3 SIGNIFICANCE OF THE STUDY

The educational institution should strive to achieve a minimal acceptable pass rate of 75% in Biological Nursing Science in the first and second year of study in a four-year nursing programme. A mark of 75% mark is in line with the performance targets that the university sets for all courses, in order to maintain the required standards as an accredited Higher Education Institution.

This analysis was important to determine the factors that contribute and are significantly related to BNS performance. Knowing the contributory factors, alternative support and learning strategies can be developed and implemented. The findings may also be used to offer recommendations for possible changes in the presentation of the course content. Findings may also lead to changes in approaches to teaching and learning, and may increase students' motivation to continue doing their best.

1.4 STUDY PURPOSE

The overall purpose of the study was to analyse the performance in Biological Nursing Science of first and second year student nurses, registered in a 4-year nursing Diploma programme at a nursing college in the Gauteng province.

1.5 OBJECTIVES

The objectives of this study were to:

- Review and compare the formative and summative results in BNS of first and second year nursing students and determine the correlation between their BNS 1 and BNS 2 performance.

- Determine the relationship between socio- demographic factors (age, sex and marital status) and BNS results.

- Determine the relationship between subject choice in matric and students' performance in BNS.

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- Describe nursing students' learning patterns and, use of resources (recommended, prescribed and on-line), BNS course attendance lecture, lecturer support and feedback, and correlate these to their Biological knowledge and experience.

1.6 DEFINITION OF VARIABLES

- **Student nurse**: is a nurse who is in the first or second year of the four-year Diploma in Nursing at a public sector nursing college, and is registered with the South African Nursing Council as a student.

- **Biological Nursing Science**: According to the concise encyclopedia dictionary, it refers to; such knowledge or such a system concerned with the physical world and its phenomena: Natural science. For the purpose of this study it refers a subject consisting of Biochemistry, Biophysics, Microbiology, Anatomy and Physiology, taught in the first and second year of a four-year Diploma in nursing programme

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- **Learning pattern**: means a systematic approach to learning, integrating resources, time and opportunities. In this study it refers to use of prescribed course material, use of recommended course material, previous biological sciences knowledge, use of on-line learning resources, hours spent on biological science and tutorial attendance.

- **Classroom attendance**: refers to the presence of students for the duration of a lecture, tutorial and other scheduled classroom and laboratory activities, offered as part of the BNS course.

- **Suppor**t: For the purpose of this study it refers to the provision of remedial classes, one to one tutorials arranged for/ with students and being available when students need assistance. This includes the encouragement, motivation and referral to student counseling.

- **Nursing college**: means a post-secondary educational public sector institution that offers professional nursing education at basic and post-basic level where such nursing education has been approved in terms of the Nursing Act No 50 of 1978 as amended by Nursing Act No 33 0f 2005. The college is associated to a university as legally required to moderate and approve examinations to ensure maintenance of set standards.

- **Assessment:** A structured process for gathering evidence and making judgment about an individual's performance in relation to registered national unit standards. It comprises formative and summative assessment.

- **Formative assessment**: Assessment that takes place during the process of teaching and learning and which has its purpose the progressive development of learners' abilities.
- **Summative assessment**: An assessment undertaken to make a judgment about achievement. This is carried out at the end of the programme by means of a final examination, supplementary examination and a special examination, where indicated.

1.7 STRUCTURE OF THE RESEARCH REPORT

This report will follow a systematic structure comprising five chapters as follows:

- Chapter one covers the introduction and background of the study. Problem statement, significance of the study, study purpose, objectives of the study and definition of variables.

- Chapter two covers a review of the literature relevant to this study.

- Chapter three explains the research methods employed.

- Chapter four describes and illustrates the findings of the study. A discussion of the findings and implications thereof follows in chapter five.

- Chapter five concludes the report, which includes a discussion of the findings, limitations, conclusions, recommendations and closing remarks.

The references and annexure for the study are included at the end of the research report.

1.8 **CONCLUSION**

In this chapter, the background and introduction of the study was presented. Biological science is an ancillary subject taught in the 4-year diploma in nursing as directed by the South African Nursing Council (statutory body) under Regulation 425. In the college under study this subject appears to be problematic for the first and second year student nurses. Their performance has been noted to deteriorate especially during the formative assessment, which impacts negatively on the summative results. Hence, the study was conducted to determine the factors contributing to the poor performance of students in this nursing college. The study set out to address research questions based on demographic variables, previous biology experience, classroom attendance, learning patterns and support by lecturers, to find out whether these variables play a role in the performance of nursing students in BNS.

The following chapter focuses on the literature review.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The aim of the literature review was to determine what scholars know and what scholars recommend to be studied in relation to Biological science as a subject taught in a nursing programme and nursing students' performance in this area. The review determined discourse regarding factors that contribute and relate to Biological Nursing Science (BNS) performance in the first and second year of study.

BNS is a subject taught in the four-year Diploma Nursing programme as laid down by South African Nursing Council (SANC) in Regulation R425, sub regulation 3 paragraph (f) 1985. Generally, Biological science is a Bioscience that generally comprises Anatomy, Physiology and Chemistry. It is important as these subjects prepare nurses to understand normal and altered body functions, and to give effective care. In this chapter, the researcher gives a scholarly overview regarding performance in Bioscience and factors contributing effectively to the performance of nursing students in Biological science as stipulated by the scholars nationally and internationally. The most relevant information that contributes to the research problem will be discussed in this chapter.

2.2 PERFORMANCE IN BIOSCIENCE

According to several studies, first year student nurses' performance in Biological science is generally poor, due to various reasons including age (maturity), sex or gender and lack of Biological knowledge prior to entry. A study done in the Trinity College, Dublin, by McKee (2000) indicates that Biological science is taught in the first 18 months of the diploma nursing course and that it is not required for entry into the programme. A study done in New Zealand by the Otago Polytechnic School of Nursing in Dunedin by van Rooyen, et. al. (2006) reports that the Otago Polytechnic School of Nursing requires Bioscience as part of entry criteria, as it was assumed that it would ensure students' success in Biological and Physical science. According to Wharrad, Allock and Chapple (1994) and Jordan and Porter (1999), BNS appears to be of great difficulty for many nursing students.

In this study context biological science is taught in the first and second year of the four year diploma nursing programme, and, as mentioned in chapter one there is evidence of a drop in the overall pass rate in BNS from 89% to 50% and the reason is not known. In Trinity

College, Ireland Biological science covers Chemistry, Biochemistry, Genetics, Anatomy, Physiology, Microbiology, Nutrition, and Pharmacology and Pathophysiology. More time is spent on anatomy and physiology. The results revealed that there is relationship between previous Biology experience and performance in first year Biological science, and that other contributory factors played a role in the performance. The contributory factors are thought to include, how often a student uses the prescribed course material, family and financial responsibilities. The latter two were not explored in this study. However, the use of recommended and prescribed course material, and on-line resources were tested for their relationship with BNS performance.

2.2.1 **The Impact of Age and Type of Entry Qualifications**

The age of entry into nursing, which is mainly determined by whether candidates are directly from high school or not, is thought to play a role in BNS success. In a study done in England by Ofori (2000) the impact of age and type of entry qualifications in Psychology, Sociological and Biological on nursing module assessments, were explored .The study population was drawn from 222 students embarking on the pre-registration diploma in nursing programme at a university in the North West of England. The study was purely exploratory and inductive, and formed part of an ongoing wider study. According to Ofori (2000) experiential research examining specific knowledge fields and their impact on performance of students are rare in the field of nursing. In this regard Ofori (2000) reports that studies based on the association between age group differences and achievement in nursing courses is inadequate. Ofori (2000) further states that higher grades were achieved in the biological module assessment as compared to other modules. Possibly the results account for or confirms the impact of age and entry qualifications in the field of Biological science in nursing. Their research further found that older participants' performance was better compared to younger ones. The researcher however stated that the assessment format used for the Psychological and Sociological module assesses students' critical thinking skills. It is imperative to encourage critical thinking skill in the presentation and questioning methods used in our teaching as educators so as to improve on students' performance.

2.2.2 **Gender and Academic/BNS Performance**

The significance of gender on academic performance has become topical as more females enter higher education. A study done in Karachi, at the Aga Khan University Hospital, by Akpata (2012), examined students' knowledge of microbiology for course content improvement. In this institution Microbiology is included in Biological science course, and it

is compulsory for the nursing programme. He used an anonymous questionnaire to collect data from 330 (n=330) nursing students and 14 (n=14) faculty members. Descriptive statistics were used to analyse data. The findings showed that female students perform better than male students and that nurses in a degree programme have higher mean scores than those in a diploma programme.

In the United Kingdom (UK) there are no minimum requirements for mathematics to enter a nursing programme (Harvey, Murphy, Lake, Jenkins, Cavanna, and Tait, 2010). However, these researchers were interested in the performance of male vs female students in the absence of mathematics. The findings of their study showed that male students performed better than female students. Based on these results it can be concluded that the variable of gender is significant in the academic performance of nursing students. Although not specific to BNS, however, competence in fluid and drug calculations is generally an important expectation/requirement for nursing students to be able to calculate fluids and drugs correctly in the care for their clients. However, competence in fluid and drug calculations is adversely affected by a lack of mathematical ability (Harvey et al., 2010) and should be considered in nursing curriculum or as entry criterion. The notion that, the variable of gender is significant in the academic performance of students is supported in literature by other researchers like (Neri, 2007; Ali 2008, Abdallah, Al-Shatti, Al-Awadi and Al-Hammad, 2012).

2.2.3 **The Relationship between Academic Performance and Entry Criteria**

In a study done in New Zealand by the Otago Polytechnic School of Nursing in Dunedin van Rooyen, Dixon, Dixon and Wells (2006) explored the relationship between academic performance and entry criteria in the first and second bioscience papers. Bioscience was a requirement for entry in this school of nursing. Data were collected from 619 academic records of the 1994-2002 graduates from the degree programme, divided into two groups, an under-20 age group (n=323) and a 20 years and over group (n=296). The sample consisted of 579 females and 40 males. Their results showed that there is association between entry qualifications and students' performance. van Rooyen et al. (2006) also found that second year Bioscience performance was predicted by first year performance, and that age was a valuable analyst of grades. van Rooyen et al. (2006) findings coincide with the findings of Ofori (2000) regarding the age of students.

In New Zealand, Bioscience encompasses an integration of Anatomy, Physiology, Microbiology, Genetics, Pathophysiology and Pharmacology. Historically, the Otago Polytechnic School of nursing had always required bioscience as entry criteria since it was assumed that it would ensure students' success in biological and physical science. However, the Nursing Council of New Zealand does not require Bioscience as part of entry criteria. So the Otago Polytechnic School of nursing continues to require Bioscience as entry criteria for the success and reputation of the institution because it proves to be effective.

At the nursing college under study Biological science is not an entry requirement as it is not stipulated by the South African Nursing Council (SANC), the statutory body that oversees the education and training of nurses. The Gauteng Central Selection Committee, responsible also for selecting nursing students does not require Biological science as entry criteria either. The most important subject that they must have is English.

Selection for admission to the four year diploma in nursing programme follows 3 phases: Phase 1: Consideration of points achieved, based on the type of senior certificate. Phase 2: Assessment phase (assessment test) Phase 3: Interviews, which are the final phase of the selection process. The first two phases are done by the Departments of Labour and the final phase is done by the nursing colleges in Gauteng Province.

According to research reports generally, Biological science is difficult for first year student nurses. Similarly, in this college performance has deteriorated in recent years thereby causing concern to nurse educators and students alike. Previously individual nursing colleges used different curriculum, developed by the particular college and approved by the South African Nursing Council. Presently the four Gauteng nursing colleges use a common nursing curriculum i.e. Curriculum 2003, developed by the four colleges and approved by SANC. The nursing education division of the Department of Health, which is the main funder of nursing education too, has expressed concern. Factors not included in previous research include classroom attendance and learning pattern, the use of resources and the mode of entry i.e. directly from school or mature learners or experienced learners. These factors are reported as anecdotes by students in their appeals when failing or performing poorly. There is thus uncertainty as to what could be the contributory factors or reasons for reported poor performance in Biological Nursing Science.

2.3 PROBLEMS IN TEACHING OF BIOSCIENCE

Much as the present study was not based on teaching of Bioscience per se, it is important to discuss this issue as it might be contributing to poor performance in Bioscience directly or indirectly.

Gresty and Cotton (2003) report on the findings of a study done by Nicoll and Butler (1996) which identified some problems in the teaching of Bioscience. These are: poor resources for Biology and time given for the study of Biological science was insufficient. According to Gresty and Cotton (2003) these factors cause a great deal of anxiety among students due to poor understanding of the subject. The aim of the study therefore was to develop an online resource to help preregistration nursing students to improve on their Biosciences knowledge and understanding.

Results of the student needs analysis revealed that 54% (n=101) students noted that their understanding of biology is below average before commencing the course. Four percent (n=4) indicated that their understanding of biology is “good”. One student perceived their prior knowledge was very good and two students rated their understanding as zero.

Some students felt that they could not cope without extra help in all subjects and that biology was difficult. These findings support those in a study done by Wharrad et al. (1994), Nicoll and Butler (1996), and Jordan and Porter (1999), where participants state that studying biology is the most difficult part of the nursing programme, and causes apprehension amongst nursing students.

In the college where the current study was undertaken there is no specific computer programme designed for teaching Biological science, and is considered a challenge for the Gauteng nursing colleges and the funders’ of the nurse training. There are, however, several computer stations for students without the internet and other on-line resources. This poses a concern because students cannot access the internet and other on-line resources at their learning facility.

2.4 CONTENT AND DEPTH OF BIOSCIENCE KNOWLEDGE

The depth and scope of bioscience content is neither standardised nor agreed upon by academics. More specifically, content varies because of the different institutions offering nursing programmes (Akpata, 2012). It is thus the reason for further work and research. Jordan, Davies and Green (1999) in their study done in a large UK Department of Nursing,

report that several scholars recommend that further research be done to investigate the suitability of content and depth of Bioscience knowledge required by nurses. The study was conducted to assess the opinions of pre-registration students and lecturers of the teaching and learning of bioscience in relation to other subjects in the curriculum.

The population comprised all four cohorts of preregistration students (n=339) and lecturers (n=37) to whom questionnaires were distributed. The questionnaire items produced a combination of data for both quantitative and qualitative analysis. Kruskal-Wallis one way analysis was used to analyse the students' reports of Biological science being difficult. The students felt that Biological science is more difficult than other subjects. Biological science content is immensely frustrating and the main cause of nervousness. Teaching time for the subject is not realistic according to the lecturers. Some authors (Akpata, 2012; Reynolds, 2006), found that certain components of Bioscience such as Microbiology; require more emphasis in a nursing curriculum.

2.5 NEED FOR NURSES TO STUDY BNS

Although the current study is based on the performance of student nurses in Biological science, it is however necessary to consider whether nurses should study Biosciences or not. Jordan (1994), in a study done in the University College in the UK engaged in the discussions based on whether nurses should study Biosciences or not. In the discussion paper the author upholds that Bioscience knowledge is useful when applied in clinical care. Bioscience forms the basis for patient care. Therefore nurses should study Bioscience. The author postulates that the application of Bioscience knowledge in patient care areas is hindered by several factors. These factors are medically inclined, viz. nurses adhere or follow doctors' orders (dependent functions) when caring for the patients. They are inadvertently induced by a physician or diagnostic procedure, or the medical fraternity is exclusively in control or dominate the service. This situation is prevalent in contemporary hospital environments as nurses play a subservient role in their caring for patients. This illustrates that nurses may be inclined not to use their Bioscience knowledge when they follow doctors' orders.

2.6 THE TEACHING OF BIOSCIENCE TO NURSES

Although the current study is based on the performance of student nurses in biological science, it is also necessary to consider who is best qualified to teach Bioscience to nurses. Although not proven, this may directly or indirectly be a contributory factor to the performance of nursing students in biological science. An article by Casey (1996) questions

who is suitable to teach Bioscience, and whether it should be nurse educators or specialist Bioscience lecturers. Casey (1996) is of the opinion that Bioscience taught by specialist science lecturers could not lead to the expected relationship or association to nursing practice, implying that someone with a nursing qualification is best suited to do so.

The qualifications of nurse educators are also under scrutiny. Other questions relate to the concerns of scholars as to how Bioscience is to be taught as well as to how to ensure that students do actually learn Bioscience. Biological science is the foundation of nursing practice, and lack thereof is therefore an obstacle to the holistic approach to patient care.

In this study context the approach to teaching bioscience to students is that of a partnership, whereby a bioscience specialist teaches BNS and the nurse educator emphasises the relevance to nursing in planning and implementing i.e. correlating theory into practice. In general, BNS is taught by registered nurses who are also qualified as nurse educators/tutors.

Jordan et al. (1999) is of the same idea that the amount of bioscience to be taught to student nurses is of concern, and refer to this as “the bioscience question”. In the UK, due to nursing colleges moving into Higher Education Institutions and changes as a result of the Project 2000, i.e. each institution has its own curriculum and different assessment criteria, there is significant uncertainty in the quantity of the content, intensity and teaching methods in nursing education across the different institutions.

2.7 CONCLUSION

Quality issues related to BNS performance are dogged by questions of prior Bioscience knowledge, content and level of teaching, who teaches BNS and the characteristics of students who learn BNS.

In this chapter the literature was reviewed so as to inform the prospective study of these issues. The chapter gave an overview of scholars reports related to the questions and objectives of the study, related to the performance of first and second year nursing students. It presented a literature search, from previous research reports, books dictionaries, the internet, including literature from SANC the statutory body overseeing training of nurses. The following chapter focuses on the design and research methods.

CHAPTER THREE

RESEARCH METHODS

3.1 INTRODUCTION

Scholarly articles report that Biological Nursing Science (BNS) appears to be a difficult subject for the first and second year nursing students. In the college under study BNS is taught in the first and second year of a 4-year Nursing Diploma programme according to a set curriculum. The performance in BNS of the first and second year student nurses has deteriorated over the past four years. The factors contributing to poor performance are not known. Hence, the intention to investigate the possible factors contributing to poor performance. This chapter focuses on the research design and methods adopted to answer the research questions. The pilot study as well as the ethical considerations are discussed in this chapter.

3.2 RESEARCH DESIGN

A quantitative, descriptive survey design was used to collect data. Quantitative research resides in a logical positivism research paradigm; it incorporates deductive reasoning and analyzes numeric information through statistical procedures. In this study categorical numerical data e.g. number of students who studied Biology in high school were collected and analyzed to answer the study questions. Hence, a quantitative approach was appropriate for this study.

A survey is a technique in which questionnaires, records or personal interviews are used to gather data about an identified problem (Burns and Grove, 2005) A survey is designed to obtain information about the prevalence, distribution, and interrelations of variables within a population; data are usually gathered through self reporting (Polit, 2008). In this study, accurate data about the characteristics of particular subjects were collected from students' records and a questionnaire and analyzed to answer the research questions.

3.3 RESEARCH METHODS

According to Burns and Grove (2005) research methods refer to the population, sampling and sampling method, data collection, validity and reliability, and data analysis. For the purpose of this study these are described bellow.

3.3.1 **Population**

A population is the entire group of persons or objects that is of interest to the researcher that meets the criteria which the researcher is interested in studying (Brink, 2008). In this study, the population comprised two cohorts of third and fourth year nursing students who have studied BNS in their first and second year of the 4-year Nursing Diploma programme (N=424); 223 were third year students and 201 was fourth year students. Since the researcher was directly involved in first year of the nursing programme, data were collected from these students in their third and fourth year of study to avoid potential ethical conflict.

3.3.2 **Sample**

No specific sampling method was used for the survey; students were invited to participate in the study. A total number of 384 agreed to participate and constituted the study sample (n=384). 312 students completed the questionnaires and returned them; resulting in a response rate of 81.25%. Of these 175 were third year students and 137 were fourth year students. Students' admission and academic records (N=424), were reviewed to obtain the socio-demographic data. Only 364 records were considered for the study because they were complete. The records sample (n=364) comprised 167 third year and 197 fourth year. See table 4.7 and 4.1 records. Academic records were used to obtain BNS test and examination results.

3.4 **DATA COLLECTION**

Two methods of data collection namely, a retrospective record review and a self-administered questionnaire were used to collect data. All data were recorded and entered onto an Excel spread sheet.

3.4.1 **Data Collection Tools**

Student records included: 1) Admission records, which were used to obtain the socio-demographic data; and 2) Academic records which were used to obtain tests and end-of-year (summative) results of BNS 1 and BNS 2 (Appendix 1).

Students' admission records were located in the students' files and were obtained from the Student Affairs Department of the college. Data from these records included:

- Highest standard passed i.e. matric or non matric
- When and how this was obtained.
- Subjects done at school
- Previous Biology experience, age and gender
- Marital status
- Student type and entry criteria.

Students' academic records provided the results of three BNS tests and summative examination of the first (BNS 1) and second (BNS 2) year of study. Student records consisted of those of class 2007 (first year) and 2008 (second year), and class 2008 (first year) and 2009 (second year). The latter was in the third year of study and the former was in the fourth year of study at the time of data collection.

A self-administered questionnaire, comprising nine (9) items was used to obtain demographic data as reported by the participants (Appendix 2). Completed questionnaires (n=312) served as consent to participate.

A literature review of recent sources was done to find out what research had been done in the area of performance of first and second year nursing students in BNS. Factors that were recognized confirmed the novice researcher's assumptions about possible factors contributing to poor performance in BNS. The questionnaire was constructed to incorporate the demographic following data: age, gender, marital status, highest qualification, subjects done at school, previous biology experiences, mode of entry, marital status, position in family, students' classroom attendance and learning patterns, support offered to students by lecturers and mode of entry to nursing related to biological nursing science results? From the literature factors thought to influence academic performance in BNS were identified and extracted. These formed the basis of content areas for the questionnaire; however, content validity was not statistically tested for the purpose of this study.

3.4.2 **Data Collection Procedure**

Questionnaires were distributed in the classroom setting to students who volunteered to participate in the study. Completed questionnaires served as consent to participate. Completed questionnaires were inserted in envelopes provided by the researcher and placed in boxes. Admission and academic records were reviewed once to twice a week by monthly over a period of two years. Scheduled times to access the records were arranged with Student Affairs Department, where the records were stored.

3.5 DATA ANALYSIS

Data were analysed using SAS Software, version 9.3 for Windows, statistical package was used to analyse the data. Descriptive and inferential statistics were used to analyse the data and to present the results.

Descriptive statistics were specifically used to analyse the data and present the findings in the form of frequencies, means and standard deviations. Tables, scatter plots, bar diagrams and other graphs were used to illustrate the study findings. Chi square tests were used to test for differences between groups and variables; the significance level was set at $p<0.05$. The degree of association between variables was tested using Pearson's r, Cramer's V and Phi coefficient. For a 2x2 data matrix of dichotomous variables the Phi coefficient was calculated. Where the data matrix was unequal in terms of number of rows and columns (2x3 or 3x5) Cramer's V was used to test the strength of association between variables. A more detailed approach to data analysis can be found in Chapter four.

3.6 PILOT STUDY

A preliminary study was done prior to the main study. The purpose was to investigate the feasibility of the intended study and to identify possible flaws in the instrument for data collection i.e. questionnaire, and to test whether questions were understood by the students. Twenty third year students (n=20) completed the questionnaires and returned them; neither the results nor the participants formed part of the main study. No changes or additions were indicated as a result of the pilot study.

3.7 ETHICAL CONSIDERATIONS

The conduct of nursing research requires not only expertise and diligence but also honesty and integrity (Burns and Grove, 2005). The following ethical rules and principles were considered:

- Permission to conduct the study was sought from and granted by the Gauteng Department of Health (Appendix 3).

- Ethical clearance was applied for and obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (Appendix 4). The committee scrutinized the research proposal, made comments and recommendations. Corrections were done as indicated and approval granted.

The Postgraduate Committee of the University of the Witwatersrand assessed the research proposal and approved the study (Appendix 5).

Permission was sought from the principal of the college where the study was conducted and approval obtained (Appendix 6). Verbal permission was also sought and obtained from the Head of Student Affairs department at the nursing college to access the records of students.

Autonomy, privacy and anonymity of participants were ensured. No names appeared on the questionnaire and data were not linked to students' academic performance in Biological Nursing Science. Questionnaires were kept safely by the researcher. Completed questionnaires served as consent to participate. The individual identities of the participants were not linked to the information provided. This is done to ensure confidentiality of the participants.

An information sheet (Appendix 7) was issued to the students before completion of the questionnaires. The information sheet explained that participation is entirely voluntary and that participants are free to decline the invitation altogether or to withdraw at any time without having to give any explanation. They were assured that their non-participation or withdrawal from the study would be without any consequence to them.

Autonomy, privacy and anonymity of participants were ensured. No names appeared on the questionnaire and data were not linked to students' academic performance in Biological Nursing Science. Questionnaires were kept safely by the researcher in a lock-up cabinet. Completed questionnaires served as consent to participate. The individual identities of the participants were not linked to the information provided. This was done to ensure confidentiality and privacy.

3.8 **CONCLUSION**

In this chapter the research methodology and research design were explained, including the data collection methods used. A retrospective record review, demographic questionnaire and a self administered questionnaire were used. Consenting participants completed a self- administered questionnaire.

The research setting was the nursing college in the Gauteng province where the students' performance in BNS was noted to deteriorate over a period of four years and became a topic of investigation. Statistical analysis of data and the results of the study will be discussed in chapter four.

CHAPTER FOUR

RESULTS

4.1 INTRODUCTION

This chapter focuses on the analysis of data and the findings of the study. Factors that contribute to and are significantly related to Biological Nursing Science (BNS) performance in the first and second year of study were analysed to determine their influence on student performance in the subject. In this chapter the results of the study will be reported on and presented graphically according to the instrument items as follows: age; gender; marital status; highest qualification; previous nursing experience; test marks; examination results; student type; admission/ entry criteria and subjects done in high school. BNS subject evaluation results are presented and how students rate the support and feedback given by lecturers, their use of course material and lecture attendance. The 2007 and 2008 cohorts were the fourth year and third year of study respectively at the time of this study and who had studied BNS in their first and second year of the 4-year nursing diploma.

4.2 APPROACH TO DATA ANALYSIS

All data were recorded or entered onto an MS Excel spread sheet. Thereafter data were entered on a special spread sheet designed by a statistician who was consulted during data analysis. SAS Software, version 9.3 for Windows, statistical package was used to analyse the data. Descriptive and inferential statistics were used to analyse the data and to present the results. Chi square (X^2) was used to test for significant differences between study variables. The p-value was set at 0.05 level of significance.

Tests for significant relationships between categorical variables were carried out using Pearson's X^2 test at the 95% confidence level. Fisher's exact test was used in the case of 2x2 tables, or where the requirements for Pearson's X^2 test could not be met. The strength of the associations between categorical variables was determined by Cramer's V and the Phi coefficient was used in the case of 2x2 tables; 95% confidence level was used throughout, unless specified otherwise. The absolute values of these coefficients were interpreted as follows:

0.50 and above	- high/strong association
0.30 to 0.49	- moderate association
0.10 to 0.29	- weak associations
below 0.10	- little if any association

Correlations were interpreted as follows:

- 0.50 and above high/strong association
- 0.30 to 0.49 moderate association
- 0.10 to 0.29 weak associations
- below 0.10 little if any association (de Vaus, 2002)

Pearson's r was used for normally distributed numerical data e.g. BNS test scores. Correlations were interpreted as follows:

- 0.90 – 1.00: Very high (very good) correlation
- 0.70 – 0.89: High (good) correlation
- 0.50 – 0.69: Moderate correlation
- 0.30 – 0.49: Low (weak) correlation
- 0.00 – 0.29: No correlation to very low (weak)

4.3 RESULTS

4.3.1 Sample Demographics

The study population consisted of all third and fourth year nursing students who had studied BNS in their first and second year of the 4-year Diploma in nursing programme (N=424) at a nursing college; 384 agreed to participate but 312 (81.25%) completed the questionnaire and constituted the study sample.

The sample of student records reviewed amounted to 364 (85.8% of sample), which represents the proportion of student records that were complete.

4.3.1.1 **Age of the sample**

The mean age in years for third and fourth year students was 26.4 (SD=6.6) and 27 (SD=7) respectively. The fourth year students had a wider age range as indicated by a higher SD than third year students. The effect of age on examination performance was significant (p=0.001); the result predicted that for every 1 year increase in age, a 0.28 mark decrease in BNS 2 main examination could be expected. The age distribution of the records sample is presented in Table 4.1.

Table 4.1: Age Distribution of the Sample (n=364)

	Analysis Variable: Age Distribution							
Year	**n**	**Minimum**	**Maximum**	**Median**	**IQR**		**Mean**	**Std Dev**
Third Year (Class 2008)	197	18	55	25	22	30	26.4	6.6
Fourth Year (Class 2007)	167	17	50	26	22	30	27.0	7.0

4.3.1.2 **Sex of the sample**

Third year students (class 2008) made up 54.1% (n=197) of the sample and fourth year (class 2007) students 45.9% (n=167). Females were in the majority; (84.1%; n=306); male students comprised 15.9% (n=58) of the total sample. See table 4.2. The predicted mean BNS 2 main examination marks were slightly higher for males (68.4±28.5) than for females (66.3±28.5). However, the effect of sex was not significant (p=0.076):

Table 4.2: Distribution of Sex of the Sample (n=364)

	Third year		**Fourth year**		**Total**
	Frequency	**%**	**Frequency**	**%**	
Females	164	45.1	142	39.0	**306 (84.1%)**
Males	33	56.9	25	43.1	**58 (15.9%)**
Total	**197**	54.1	**167**	45.9	**100**

4.3.1.3 **Marital status**

The majority (83.2%; n=164) of the students reported being single. Almost a quarter (n=44; 24.3%) reported being married and 2.5% (n=5) of students had been either divorced or

widowed (Table 4.3). The effect of marital status on BNS 2 examination performance was significant (p=0.002): the predicted mean for the BNS 2 main examination marks were lower for widowed students (51.7±29.7) than for single (72.5±28.3), married (73.2±28.6) or divorced (72.0±30.1) students.

Table 4.3: Marital Status of the Sample (n=364)

	Fourth Year		Third Year	
	Frequency	**%**	**Frequency**	**%**
Single	164	83.2	151	90.4
Married	28	14.2	16	9.6
Divorced	2	1.0	0	00
Widowed	3	1.5	0	00
Total	**197**	**100**	**167**	**100**

4.3.1.4 **Highest qualification**

A National Senior Certificate is a requirement for entry into a nursing diploma programme. Almost all students (n=361; 99.2%) had obtained a senior certificate; less than 1% (n=3) had national certificates from N1 to N6. By definition N1 and N2 are foundation courses in preparation for entry to higher courses; N3 is equivalent to a senior certificate and N6 is higher than senior certificate that is, a diploma level. Table 4.4 shows the distribution of the highest qualification of students at entry to the nursing programme. There was no significant association between highest qualifications obtained and the cohort (Fisher's exact test; p=0.84).

Table 4.4: Highest Qualification of Sample on Entry Level (n=364)

Highest Qualification	**Fourth Year**		**Third Year**	
	Frequency	**%**	**Frequency**	**%**
N1	1	0.5	0	00
N2	2	1.0	0	00
N3	1	0.5	0	00
National Certificate N6	0	0	1	0.6
Senior Certificate	193	98.0	166	99.4
Total	**197**	**100**	**167**	**100**

4.3.1.5 **Subject choice**

The most commonly studied subjects in matric were Biology and Physics, with 81% of students (n=253) having studied Biology and just over half (52.8%) having studied Physics. Only 1.1% of students (n=4) had studied Mathematics in matric. The least popular subjects were Electronics and Mercantile Law both at 0.3%. Presumably, by year 2, the Biology knowledge gained in year 1 supersedes the effect of any Biology knowledge that may have been gained while at school. The effect of having studied Biology at school was marginally significant (p=0.068) in BNS 1. The mean predicted year 1 main BNS examination marks were slightly higher for those who had studied Biology (35.9±35.4) than for those who had not (32.0±33.5). Overall, the effect of having studied Biology at school was not significant (p=0.14).

The effect of having studied Physics at school was significant (p=0.025); the mean BNS 2 main examination marks were higher for those who had studied this subject (69.4±29.7) than for those who had not (65.3±27.3). The effect of having studied Business Studies in matric was also significant (p=0.019); the mean BNS 2 main examination marks were higher than those who had studied this subject (70.9±30.9) than for those who had not (63.8±26.6).The effect of having studied Business Economics at school was also significant (p=0.043); the mean BNS 2 main examination marks were higher for those who had studied this subject (69.8±29.8) than for those who had not (64.9±27.2).

Table 4.5 shows the subject choices of study participants and their significance in relation to BNS performance.

Table 4.5: Significance of Subject Choice in Matric

Subject	% of Students who Studied Subject	Number of Students	P-Value for Association between Y1 Cohorts
Biology	81.0	295	0.14
Physics	52.8	192	0.025
Geography	13.7	50	0.36
Business Economics	7.7	28	0.043
Business studies	5.8	21	0.019
Economics	5.5	20	1.00
Accounting	2.2	8	1.00
History	2.2	8	0.30
Home Economics	1.9	7	0.13
Agriculture	1.7	6	0.69
Mathematics	1.1	4	1.00
Engineering	0.8	3	0.60
House craft	0.6	2	1.00
Science	0.6	2	0.50
Welding	0.6	2	0.50
Electronics	0.3	1	1.00
Mercantile Law	0.3	1	1.00

4.3.1.6 **Previous nursing experience**

The majority of students (84.9%; n=309) had no previous nursing experience; 15.1% (n=55) had nursing experience ranging from Auxiliary nursing (13.2%; n=48) to home nursing (0.3%; n=1). See table 4.6.

In each case, approximately 85% of the students were direct entries from matric, with 15% (n=55) being mature students. All the direct entry students were matriculants who had had no previous nursing experience, while the mature and RPL students all had previous nursing experience. There was no significant association between previous nursing experience and the cohort (Fisher's exact test; p=0.21).

Table 4.6: Previous Nursing Experience of the Sample (n=364)

Previous Nursing Experience	Fourth and Third Year	
	Frequency	%
None	309	84.9
Auxiliary nursing	48	13.2
Enrolled nursing	6	1.6
Home nursing	1	0.3
Total	364	100%

4.3.1.7 **Previous biological sciences knowledge**

The proportion of students who studied Biology more than five years prior to admission into the course was in the majority (n=161; 51.6%) compared to those who studied Biology less than five years (n=88; 28.21%); 20% (n=63) did not study Biology at all prior to entry into nursing. See figures 4.1 and 4.2. There was no significant association between previous Biological sciences knowledge and students' attendance at BNS lectures. (Fisher's exact test; p=0.34). There was no significant association between previous Biological sciences knowledge and the frequency of use of prescribed course material (Pearson's X^2 test; p=0.39).

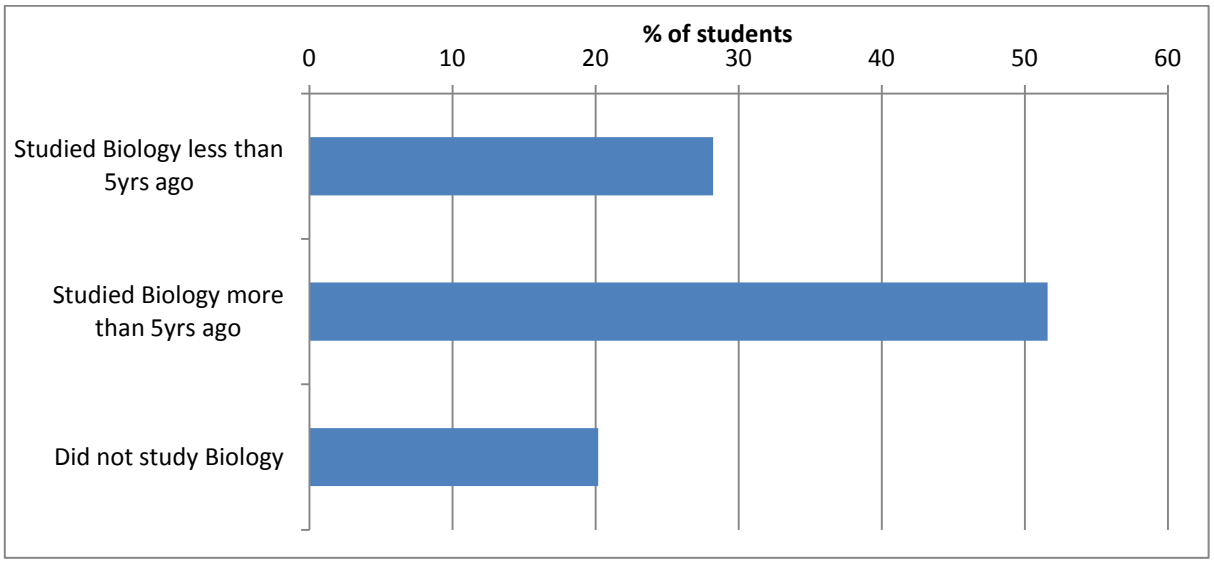


Figure 4.1: Percentage of Students Who Studied Biology (n=312)

There was a significant but weak association between previous Biology knowledge and recommended course material and frequency of use (Pearson's X^2 test; p=0.048; Cramer's V=0.16). Within the groups who studied Biology more than five years ago and those who did not study Biology, a higher proportion of students used the recommended materials always/ often/sometimes than students in the group who studied Biology less than five years ago. Figure 4.2 illustrates the use of recommended course material by students according to whether they have studied Biology or not.

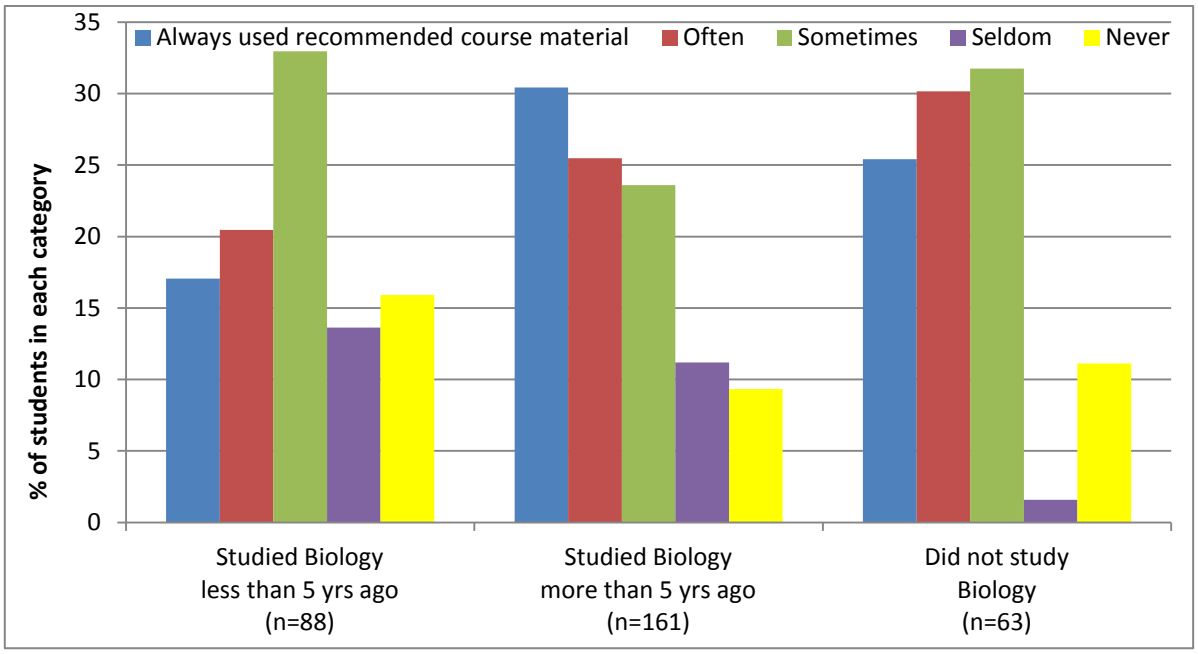


Figure 4.2: Study of Biology and Use of Course Material by Sample (n=312)

4.3.2 BNS Results

4.3.2.1 BNS 1: Test and examination results

A total of 364 students' BNS 1 results were analysed. The performance of the 2008 cohort (3rd year) was far better during the BNS 1 tests when compared to the 2007 cohort (62.0% versus 51.8%). However, the BNS 1 results show an improved significance (>40%) over the three class tests for both groups. The pass rates for the main BNS examinations were 86.1% and 58.1% for the third and fourth year students respectively. The fourth year students showed a poor performance (examination mean = 50.8%) with more than half 51.4% failing the supplementary examination, permitting entry into the special examination (n=36). Of the third year students (n=25) who wrote the supplementary examination, seven failed (28%) and wrote the special examination, indicating a slightly better performance than the fourth year cohort. Table 4.7 reflects the composite results of the sample in BNS tests (n=3) and examinations (main, supplementary and special) in year 1, i.e. BNS 1.

Table 4.7: Statistics and Frequency Distributions for the BNS 1 Tests and Examination (n=364)

Y1_Class	N Obs	Variable	N	Minimum	Maximum	Median	IQR		Mean	Std Dev
Third Year (Class 2008)	197	Y1_T1	197	22	89	61	53	68	60.5	11.4
		Y1_T2	197	34	87	62	54	69	61.0	11.4
		Y1_T3	197	23	90	66	58	72	64.5	11.1
		Y1_main	197	26	80	59	54	66	59.5	9.5
		Y1_supp	25	33	66	52	45	59	51.6	8.9
		Y1_special Exam	7	26	45	34	32	40	35.0	6.1
Fourth Year (Class 2007)	167	Y1_T1	167	17	86	52	44	60	50.7	12.4
		Y1_T2	167	17	85	50	43	58	50.8	12.3
		Y1_T3	167	26	88	54	46	62	54.0	12.1
		Y1_main	167	22	79	52	46	57	50.8	9.6
		Y1_supp	70	22	63	46	39	51	44.8	9.1
		Y1_special Exam	36	23	66	50	43	53.5	47.9	9.4

The correlations between the BNS 1 main examination and test marks are illustrated by means of scatter plots below (Figures 4.3 to 4.6). There were appreciable positive correlations between the main examination mark and test 1 ($r=0.61$; $p<0.0001$), test 2 ($r=0.66$; $p<0.0001$), test 3 ($r=0.61$; $p<0.0001$) and the overall test mean ($r=0.80$; $p<0.0001$) which was the highest.

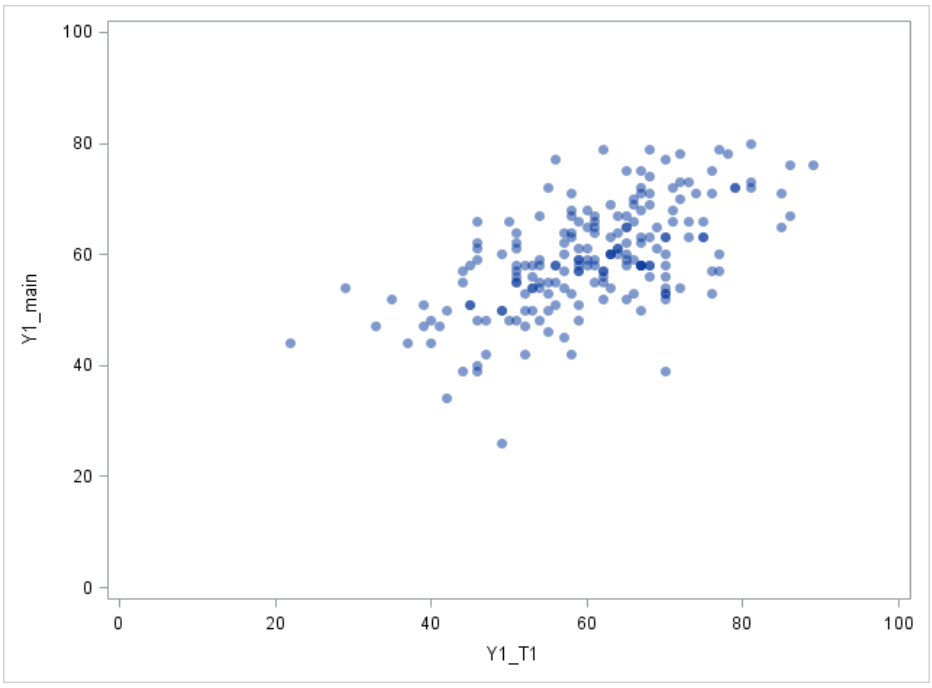


Figure 4.3: Correlation between BNS 1 Main Examination Mark and Test 1

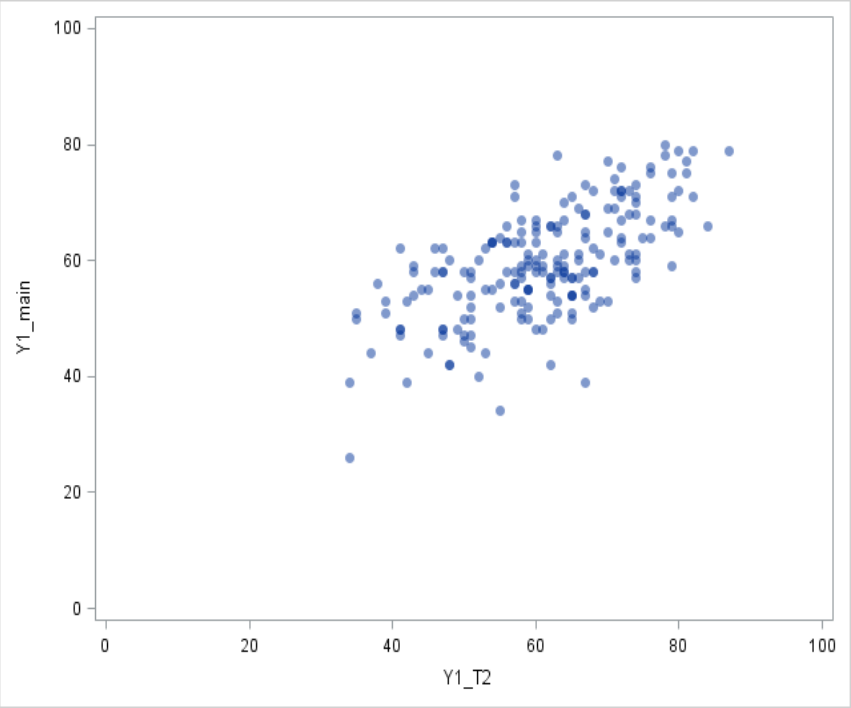


Figure 4.4: Correlation between BNS 1 Main Examination Mark and Test 2

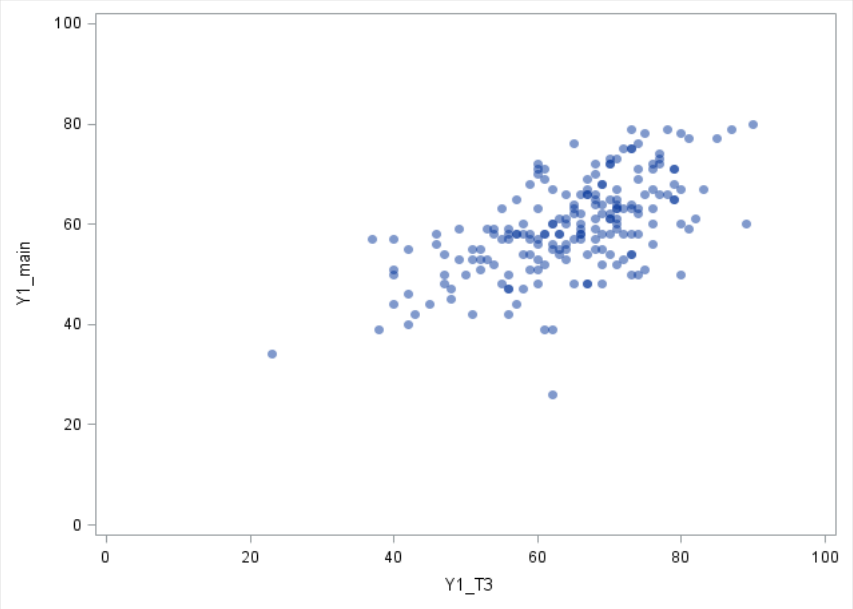


Figure 4.5: Correlation between BNS 1 Main Examination Mark and Test 3

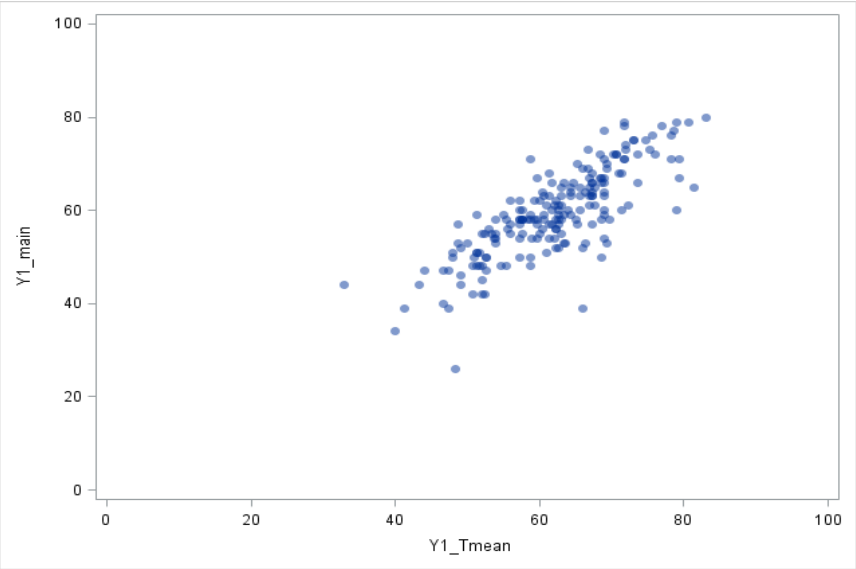


Figure 4.6: Correlation between BNS 1 Main Examination Mark and Test Mean

4.3.2.2 BNS 2: Test and examination results

A total of 336 students' BNS 2 results were analysed; 187 for the 2008 cohort and 149 for the 2007 cohort. Overall BNS 2 performance is lower for both groups in their tests as compared to BNS 1 reflected in their tests means (55.3% and 52.9%) respectively. Similarly, the BNS 2 examination results reflected a lower mean performance for both groups (52.1% and 49.8%) as compared to BNS 1 examination results. The pass rates for the main examinations were 65.2% and 59.5% for third (2008) and fourth year (2007) students respectively; 65 third year students (34.8%) and 60 fourth year students (40.3%) wrote supplementary examinations. Of these students 23.1% (n=15) and 36.7% (n=22) failed and sat for the special examination. These results show a marginal improvement on the BNS 1 supplementary examinations.

Table 4.8 reflects the composite results of the sample in BNS tests (n=3) and examinations (main, supplementary and special) examinations in year 2.

Table 4.8: Statistics and Frequency Distributions for the BNS 2 Tests and Examinations (n=336)

Y2_class_g	Variable	N	Minimum	Maximum	Median	IQR		Mean	Std Dev
Third Year (Class 2008)	Y2_T1	187	18	80	49	41	58	49.0	12.3
	Y2_T2	187	18	83	60	52	68	59.3	11.9
	Y2_T3	187	4	82	59	50	67	57.7	13.4
	Y2_main	187	24	75	52	45	60	52.1	10.3
	Y2_supp	65	22	68	51	45	57	50.0	10.1
	Y2_special	15	29	66	48	44	57	49.5	9.8
Fourth Year (Class 2007)	Y2_T1	149	20	92	50	42	61	51.8	13.5
	Y2_T2	149	23	77	53	44	60	52.1	11.1
	Y2_T3	149	23	81	55	47	63	54.8	12.4
	Y2_main	149	29	85	50	42	57	49.8	9.9
	Y2_supp	60	19	66	49	39	51.5	46.1	8.3
	Y2_special	22	33	62	53	50	57	52.0	7.2

In BNS 2 there were appreciable positive correlations between the main examination mark and test 1 (r=0.74; p<0.0001), test 2 (r=0.76; p<0.0001) test 3 (r=0.78; p<0.0001) and the test mean (r=0.88; p<0.0001) figure 4.14. The correlations are illustrated by means of scatter plots below in figures 4.7 - 4.10

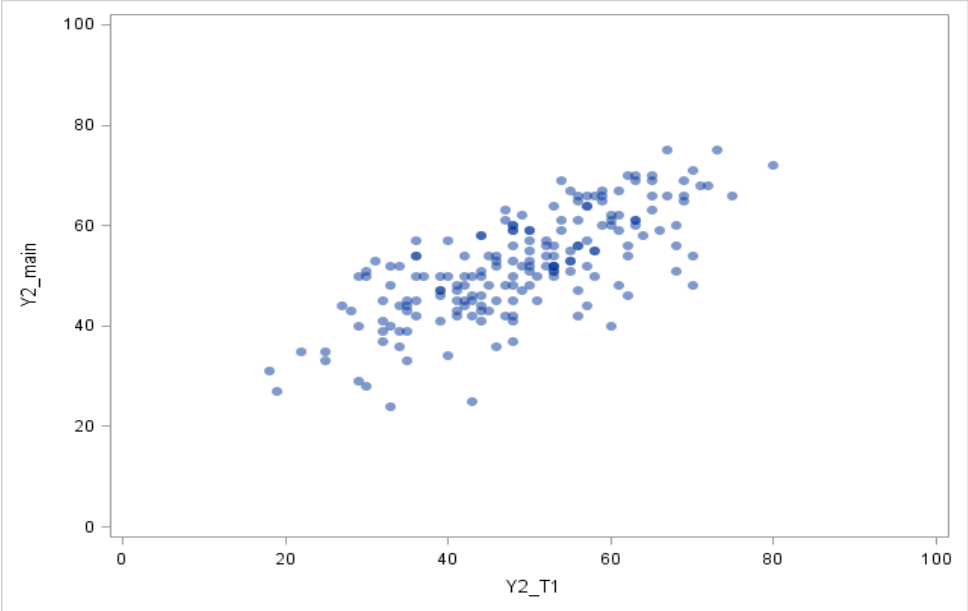


Figure 4.7: Correlation Between BNS 2 Main Examination Mark and Test 1

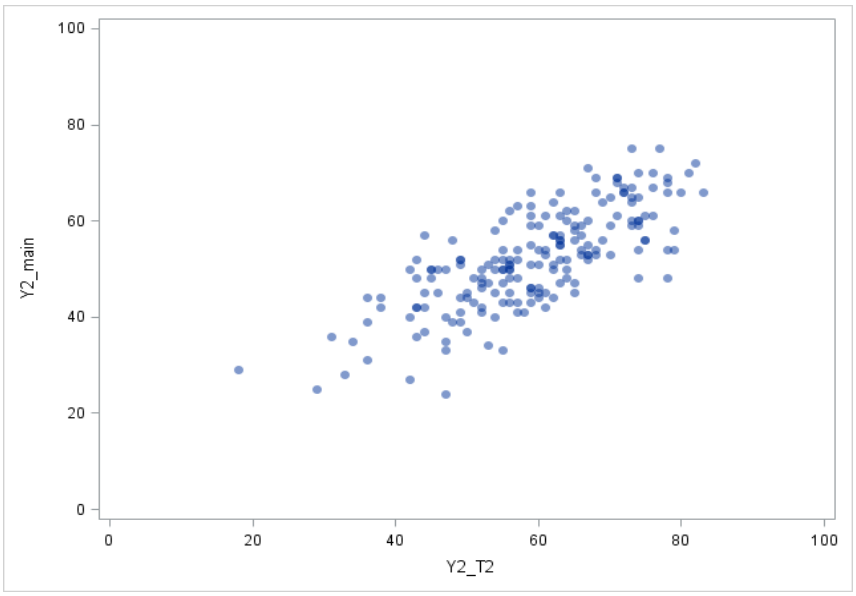


Figure 4.8: Correlation between BNS 2 Main Examination Mark and Test 2

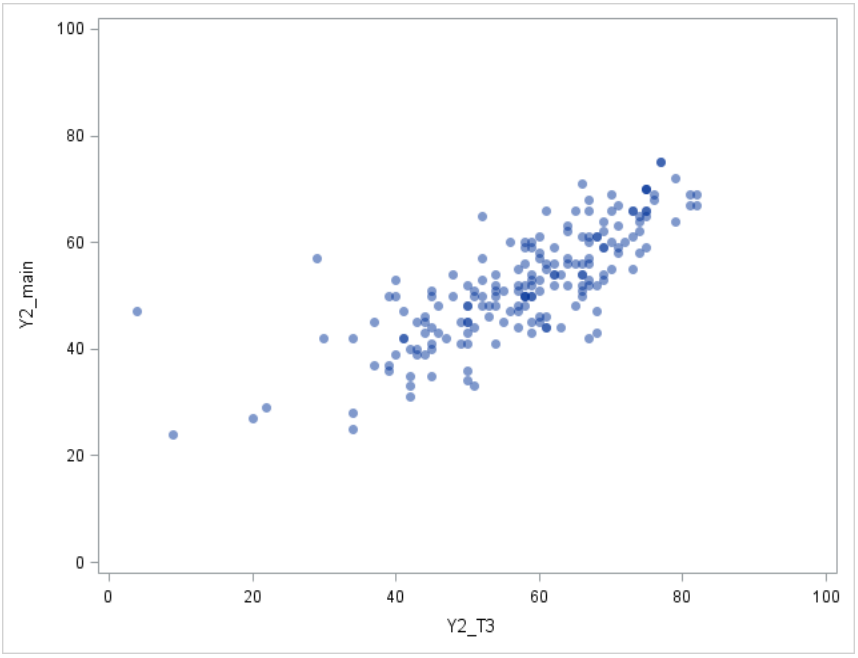


Figure 4.9: Correlation between BNS 2 Main Examination Mark and Test 3

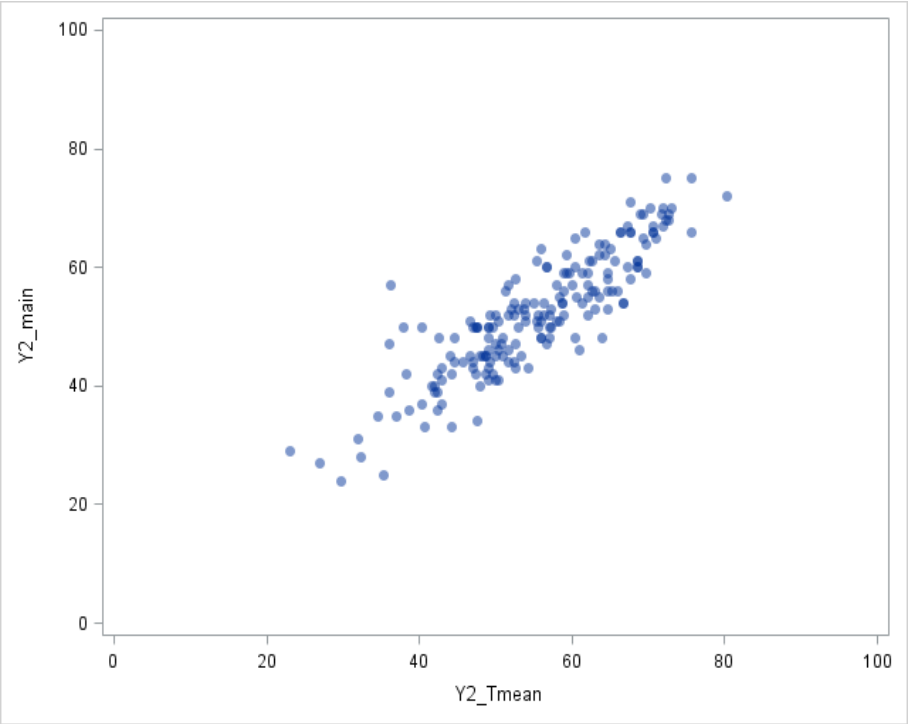


Figure 4.10: Correlation between BNS 2 Main Examination Marks and Test Mean

4.3.2.3 Correlation between BNS 1 and BNS 2 examination marks

Class 2008:

A cohort analysis was done to determine whether students' performance in BNS 1 influences their performance in BNS 2 in the subsequent year of study. Correlation statistics (r) is presented for the 2008 and 2007 cohorts. This analysis includes the students who wrote BNS 1 in the first year, i.e. in 2008 and BNS 2 examination in 2009. There is a significant positive correlation between the main BNS 1 and 2 examination marks of students in this cohort ($r=0.61$; $p<0.0001$) Figure 4.11 illustrates this correlation.

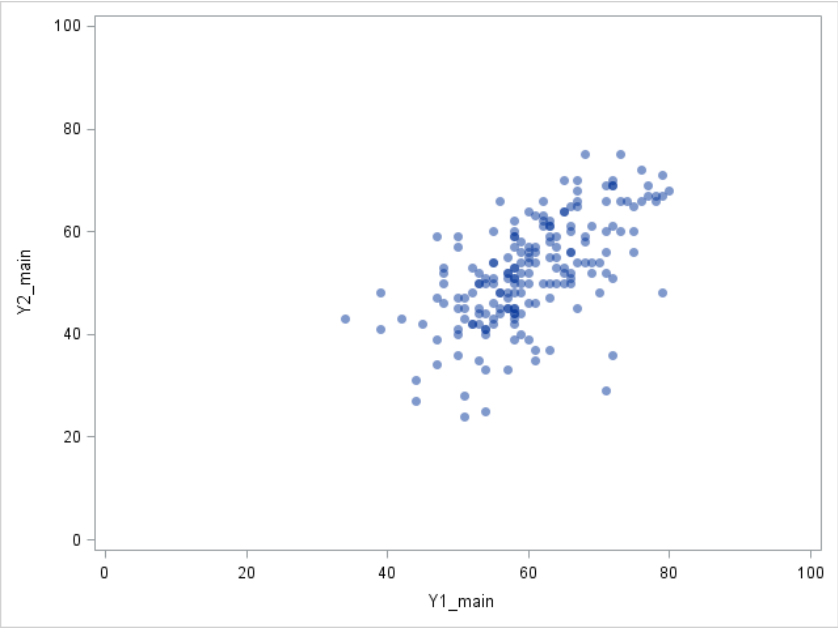


Figure 4.11: Correlation between BNS 1 and BNS 2 Main Examination Marks for the 2008 Cohort

Class 2007:

This analysis included students who wrote BNS 1 exam in 2007 whilst in their first year of study on BNS 2 in the second year i.e. 2008. There was a high positive correlation between the main BNS examination marks in year 1 and year 2 ($r=0.65$). The effect of the year 1 main examination marks was statistically significant ($p<0.0001$) since higher BNS 1 main examination marks were positively correlated with higher BNS 2 main examination marks. This model predicts that for every 1 mark increase in the BNS 1 main examination result, a 0.77 mark increase in BNS 2 main examination mark could be expected. Figure 4.12 illustrates this correlation.

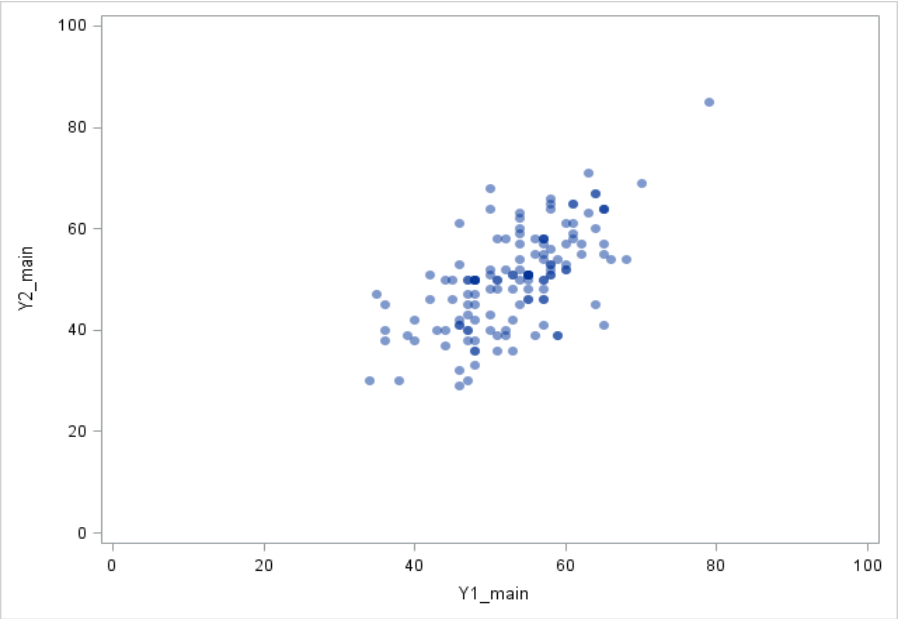


Figure 4.12: Correlation between BNS 1 and BNS 2 Main Examination Marks for 2008/2009 Cohort

4.3.3 BNS Course Attendance, Resources and Support

In this section, students were issued with a questionnaire and were asked about their learning pattern by indicating their attendance at BNS lectures, the use of learning resources and support given by lecturers. A total number of 384 students agreed to participate and constituted the study sample; 312 students completed the questionnaires resulting in a response rate of 81.25%; 175 were third year students and 137 were fourth year students. This survey was anonymous, and as such results cannot be directly linked to individual students' demographic, academic history or academic performance data.

4.3.3.1 Attendance at BNS lectures

There were various options that students could choose from to indicate their attendance pattern at BNS lectures. See Figure 4.13. Only 10% of students (n=32) reported a 100% lecture attendance; the majority of students (n=274; 87.8%) stated that they seldom missed a lecture, while under 2% of students (n=5) reported that they missed some lectures or missed lectures regularly.

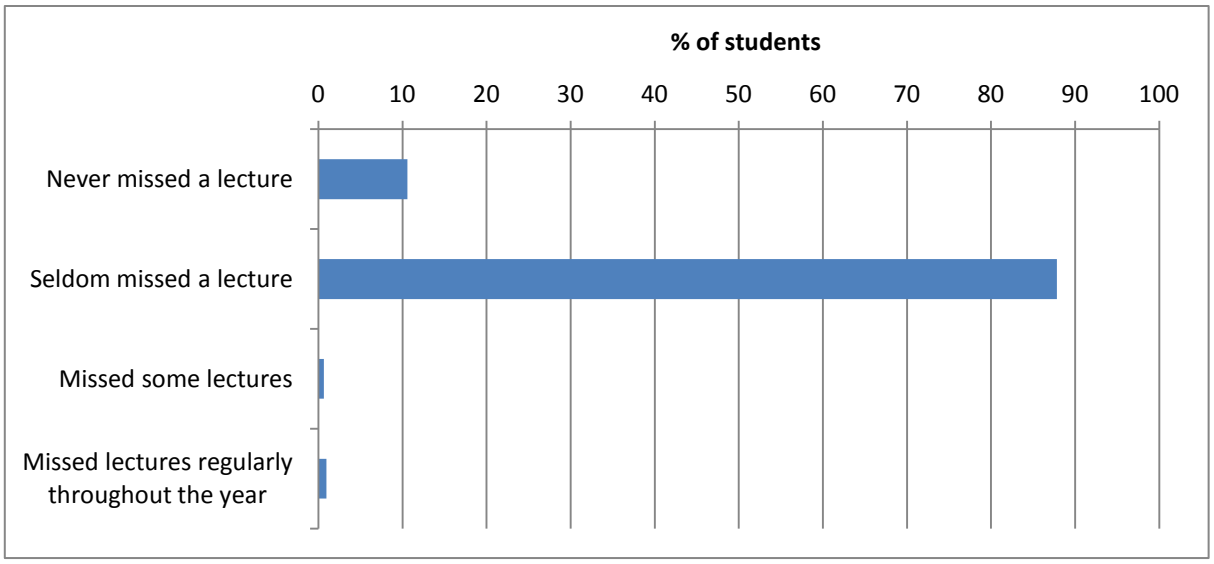


Figure 4.13: Student Attendance at BNS Lectures (n=312)

4.3.3.2 Use of prescribed course material

The majority of students (n=250; 80.1%) reportedly always used prescribed course material, and 6.1% (n=19) sometimes or seldom used prescribed course material Figure 4.14 illustrates the percentage of students who use prescribed course material for BNS. There was no significant association between attendance at BNS lectures and frequency of use of prescribed course material (Fisher's exact test: p=0.22).

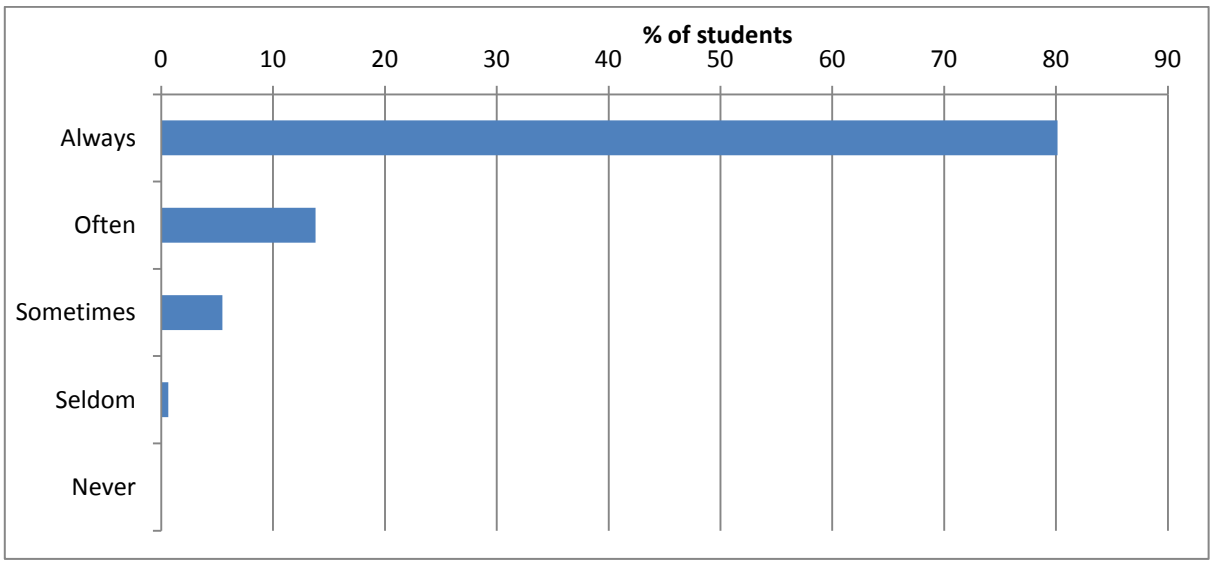


Figure 4.14: Percentage of Students who Use Prescribed Course Material (n=312)

4.3.3.3 Use of recommended course material

The sample was evenly split between those students who use recommended course material (50.6%) and those who do so infrequently or not at all (49.4%). Recommended course material for BNS are always or often used by just over half of the students (50.6%; n=158); 21.4% (n=67) seldom or never used recommended course material, (Figure 4.15). There was a significant but weak association between attendance at BNS lectures and frequency of use of recommended course material (Fisher's exact test: p=0.048; Phi coefficient=0.20). Amongst those students who never missed a lecture (n=32), there was a higher proportion who always/often used recommended course material compared to the group who stated they seldom missed a lecture.

There was a significant but weak association between previous Biology knowledge and frequency of use of recommended course material (Pearson's X^2 test; p=0.048; Cramer's V=0.16). Within the groups who studied Biology more than five years ago and who did not study Biology, a higher proportion of students used the recommended materials always/ often/sometimes than students in the group who studied Biology less than five years ago. Figure 4.15 illustrates the use of recommended course material by students according to whether they have studied Biology or not.

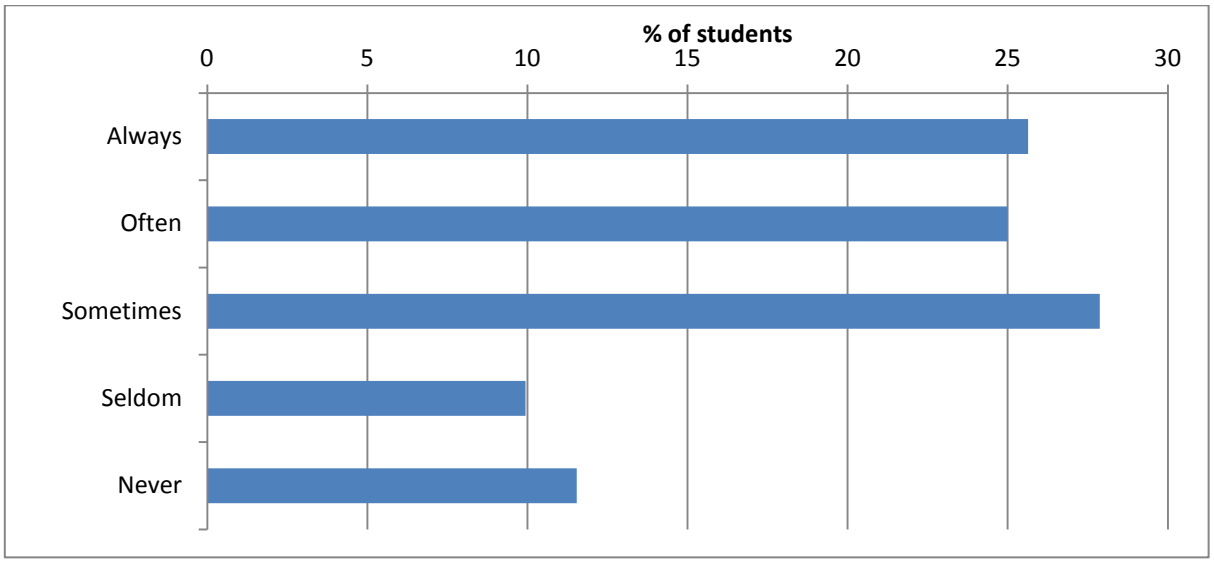


Figure 4.15: Percentage of Students who Use Recommended Course Material (n=312)

4.3.3.4 Use of online learning resources

Only 171 students (55%) responded to this question. Less than half of the students (37.5%; n=117) reported that they use online resources ranging between “often” and “sometimes”. However, most students, (45.2%; n=141) never use online learning resources (see Figure 4.16).

When questioned about their most frequently performed on online activity, close to 70% of students (n=119%) reported using Google search engine.

There was no significant association between the frequency of use of online learning resources and the attendance at BNS lectures (Fisher’s exact test; p=0.19).There was no significant association between the frequency of the use of online learning resources and the frequency of use of prescribed course material (Fisher’s exact test; p=0.32) and recommended course material (Pearson’s X^2 test; p=0.75). Figure 4.16 illustrates the percentage of students who use online learning resources.

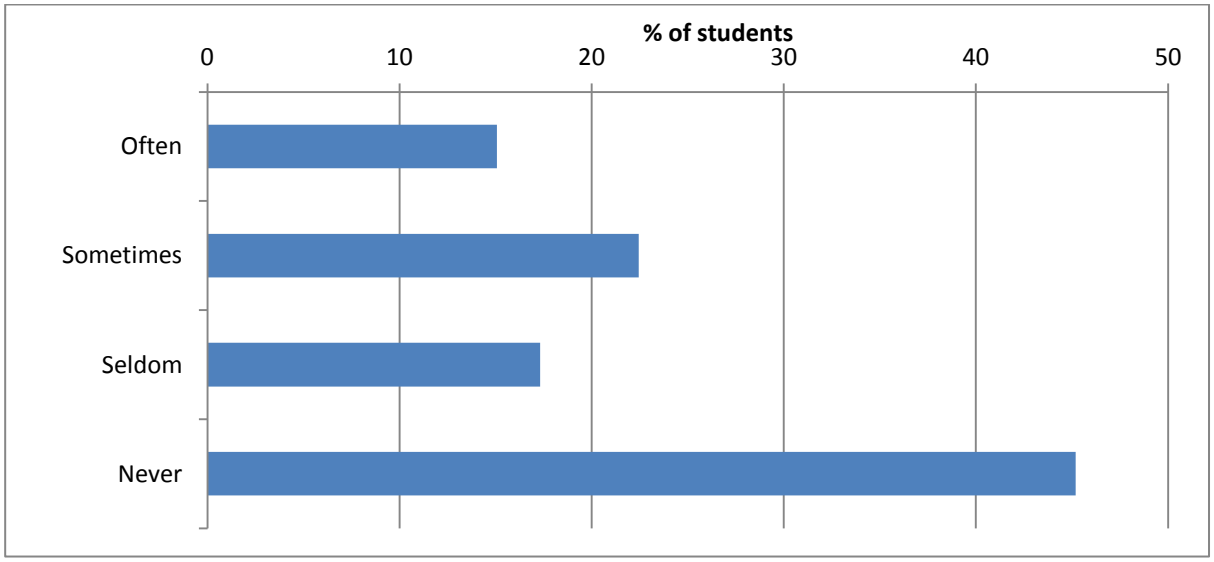


Figure 4.16: Percentage of Students who Use Online Learning Resources (n=171)

4.3.4 Rating of Lecturer Support

When asked to rate the degree of lecturer support, 300 students (96.15%) confirmed that lecturers do support students; 3.85% (n=12) responded that lecturers do not support students**.** Most students (46.8%; n=110) rated lecturers support as “very good” to “excellent” while 22.1% (n=66) thought support was “fair”. There was no significant

association between whether or not students felt that support had been offered and BNS lecture attendance (p=0.093), frequency of use of prescribed course materials (p=0.86), frequency of use of recommended course material (p=0.90), frequency of use of online learning resources (p=0.32) or previous Biological sciences knowledge (p=0.93).

Figure 4.17 illustrates students' ratings of the quality of lecturer support in BNS.

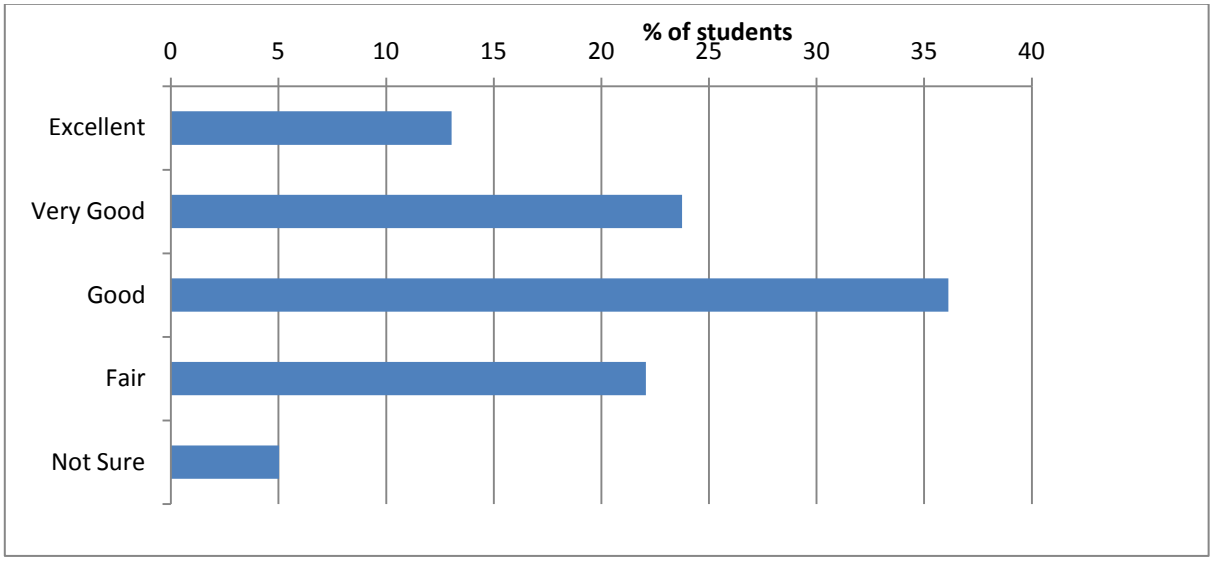


Figure 4.17: Students' Rating of Quality of Lecturer Support (n=300)

4.3.4.1 Lecturer feedback

Students were asked to rate the quality of lecturer feedback during teaching blocks. The majority (62.5%; n=195) indicated that feedback is given to students by lecturers; 37.5% (n=116) responded that lecturers do not give feedback to students. The quality of feedback was rated as good to fair by 36.4% (n=71) and 9.1% (n=27) respectively; 11.1% of students felt that lecturers feedback was excellent. There was no significant association between whether or not students felt that feedback had been given and BNS lecture attendance (p=0.72), frequency of use of prescribed course materials (p=0.45), frequency of use of online learning resources (p=0.42) or previous Biological sciences knowledge (p=0.38). Figure 4.18 illustrates students' ratings of the quality of lecturer feedback.

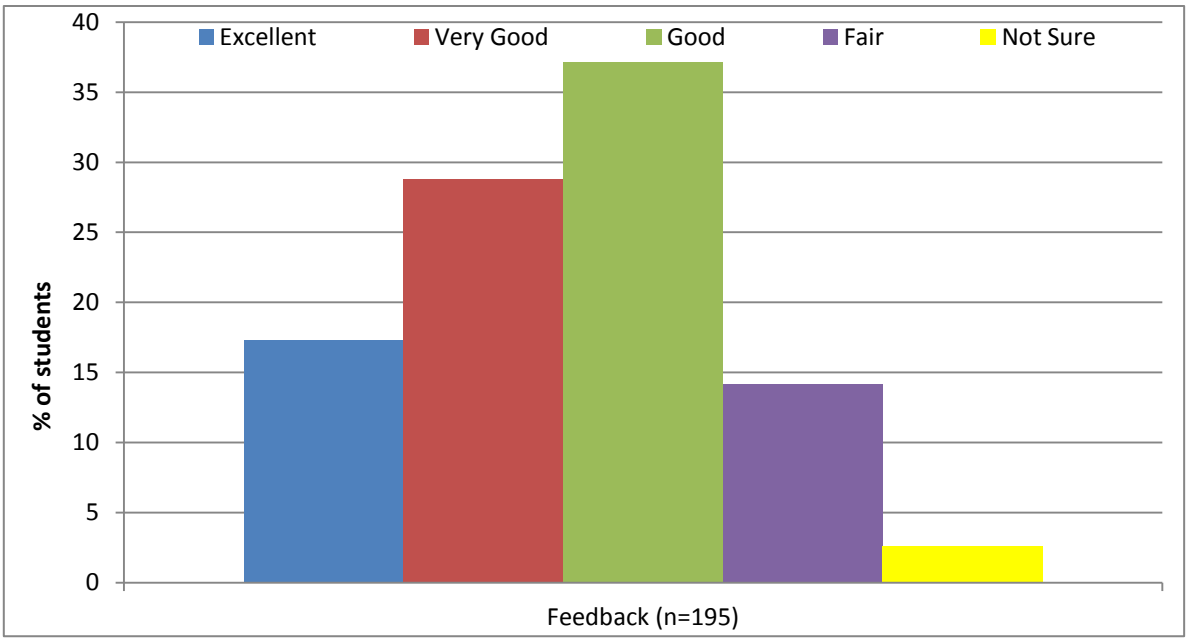


Figure 4.18: Students Rating of Lecturer Feedback (n=195)

4.4 CONCLUSION

In this chapter statistical analysis of data and the results of the study were presented. The results of the study were reported on and presented graphically according to the instrument. Descriptive and inferential statistics were used to analyse the data and to present the results. Results were presented in relation to BNS 1 and BNS 2 performance for the two cohorts of students. Demographic and academic variables that potentially impact BNS performance were identified and presented. The significance of these results will be discussed in chapter five, followed by the conclusions drawn, recommendations made, the limitations of the study and closing remarks.

CHAPTER FIVE

DISCUSSION OF RESULTS, SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

5.1 INTRODUCTION

The results of this study were presented in the previous chapter. The results presented gives a picture of the performance of the first and second year nursing students in BNS. In this chapter the findings of the study are discussed in the light of student nurses' performance in Biological Nursing Science (BNS) at the college under study. The chapter also includes a summary, the conclusions drawn, recommendations made and the limitations of the study and closing remarks. A brief summary precedes the discussion of the results.

5.2 SUMMARY

Data were collected from two cohorts of college-based nursing students who have completed their first (year 1) and second (year 2) year of study in the 4-year Diploma in Nursing (n=312). For ethical reasons data on student's BNS 1 and 2 performance were collected when these students were in the third and fourth year of study. The records sample (n=364) comprised records of students in their third year (n=167) and fourth year (n=197) of study. The subject BNS is presented at both first year (BNS 1) and second year (BNS 2) of the course and the following assessments related to BNS are conducted in each year of study:

- Three tests per cohort, one at the end of each block
- A main examination mark for each cohort
- A supplementary examination marks for students who failed the main examination.
- A special examination for students who fail the supplementary examination AND who pass General Nursing Science (GNS 100) and Fundamental Nursing Science (FNS 100).

The marks of these assessments were used in this study to determine students' BNS performance in year 1 (BNS 1) and year 2 (BNS 2).

The following covariates were obtained from student records:

- Demographics: Age, gender, marital status
- Highest qualification (matriculation)
- Previous nursing experience
- Student type (mature or direct entry)
- Admission criterion (old senior certificate / new National Senior Certificate)
- Subjects studied in matric.

In addition, the students completed a survey regarding their experiences of the BNS course and their learning/studying habits. This survey was anonymous, and thus results could not be directly linked to individual students' demographic, academic history or academic performance data.

The following research questions were posed:

- Is there a correlation between the performance in BNS 1 and BNS 2 for two cohorts of nursing students?

- Are socio-demographic variables (age, gender, marital status) related to BNS performance?

- How does Biology knowledge and experience influence students' learning patterns in BNS?

- Does previous Biology knowledge affect students' performance in BNS?

In relation to the questions, the study objectives were set as follows:

- Review and compare the formative and summative results in BNS of first and second year nursing students and determine the correlation between their BNS 1 and BNS 2 performance.

- Determine the relationship between socio-demographic (factors age, sex and marital status) and BNS results.

- Determine the relationship between subject choice in matric and BNS performance.

- Describe nursing students' learning patterns and use of resources (recommended, prescribed and on-line), BNS course attendance, lecturer support and feedback, and correlate these to their Biological knowledge and experience.

The results of the study will be discussed below according to the following categories: sample demographics, educational background and experience, BNS results, BNS course attendance, and lecturer support and feedback.

5.3 DISCUSSION OF RESULTS

5.3 1 Sample Demographics

The cohorts of the study are the third year students in 2008 and fourth year in 2007 students who studied BNS in their first and second year of study. The records sample (n=364) comprised academic records of students in their third year (n=167) and fourth year (n=197) of study. 312 students completed the questionnaires and returned them (n=312); resulting in a response rate of 81.25%. Of these 175 were third year students and 137 were fourth year students.

The combined mean age in years for third and fourth year students was 26.7 years in a range between 17 to 50 years. Females were in the majority (84.1%; n=306); and close to a quarter (24.3%) of students reported being married. The literature indicates that in the United Kingdom (UK) the mean age of students is 30 years (Carter, 2009). In the United States of America (USA) mean age of students has risen to 31 years (Olin, 2011) from a mean of 24 in 1985. These high means are partly due to nurses studying a diploma first before enrolling at a university for a degree in nursing; 30% of nurses in England qualify for a degree (Carter, 2009).

The effect of age on BNS performance was significant (p=0.001). The result predicted that for every 1 year increase in age, a 0.28 mark decrease in the BNS 2 main examination mark could be expected. The effect of age was also significant on students' performance in BNS 1 in that for every one year in age a decline in BNS 1 main examination mark could be expected. The results of a study done by van Rooyen, et al. (2006) differ from the findings of this study. Their findings showed that with an increase in age a higher performance in the Bioscience can be expected. Ofori (2000) supports the fact that age in general influences performance in that older students' performance was better compared to young ones. The results of the study done in Pakistan by Ali (2008) suggest that age was important only in the last year of study in a nursing programme.

The literature suggests that mature students (>26 years) achieve better average marks in their courses than younger students (20-25 years) and that they perform significant better only in their final year of study in general nursing programme (McCarey, Barr and Rattray, 2007; Ali, 2008; Ofori, 2000). It is important to note that, internationally, mature students would have had some nursing experience and study before entry into a degree. Since >90% of this study's sample were direct entries into nursing, who had no prior experience, it may be concluded that the mean age is higher than the global average.

Sex of the sample and marital status, overall, had no significant effect on students' performance in BNS. The exception is widowed students (<2% of sample) whose result in the BNS 2 examination was significant lower than other students (p=0.002). Male students in this study had a slight better mean performance in BNS 1 than their female counterparts (68.4%) but this difference was not statistically significant. However, differences in performance between male and female students are described in the literature (Akpata, 2012; Abdallah et al. 2012; Ali, 2008). Although not specific to BNS, Ali (2008) supports the notion that females perform better than male students in a nursing programme

More specifically, a Kuwait study of nurses' microbiology knowledge by Akpata (2012) shows that females perform better than males and that nurses in a degree programme have higher mean scores in than those in a diploma programme. The former was also found by Ali (2008) suggesting that overall, the variable of gender is significant in the beginning and final year of study in a group of nursing students.

5.3.2 **Academic History and Experience**

Almost all students (99%) had obtained a National Senior Certificate to gain admission to nursing. The difference in qualifications of the sample was not significant (p=0.84). The majority (84.9%) has no prior nursing experience, which was found not to be statistically significant in relation to those who had nursing experience (15.1%). With reference to subjects studied at high school (matric), the majority (81%) of the students studied Biology and 52.8% studied Physics. Between these two subjects, Physics has a significant association with BNS examination results in a nursing diploma programme (p=0.025), whereas Biology does not (p=0.15). According to McKee (2002) pre-Biological knowledge impact positively on the performance in Biological science. Considering Physics as a subject, the performance could also be associated with the familiarity with the science language, familiarity with the scientific concepts or the scientific way of thinking (McKee, 2002). Hence, these students perform better than their non-physics counterparts. Pre-existing knowledge of Biology combined with Chemistry, a Natural Science in the same

usage as Physics, prove to be beneficial to the performance of first year students, Biology alone does not impact BNS performance (Bone, Elisa, Reid, and Robert, 2011).

Presumably, by year 2, Biology knowledge gained in year 1 of a nursing diploma supersedes the effect of any Biology knowledge that may have been gained while at school. This result does not support the hypothesis that there is an association between performance in BNS completed in the first and second year of study and Biological science background on entry to the nursing programme. Van Rooyen et al. (2006) support the hypothesis of this study; they reported that there is a relationship between year 1 and year 2 Bioscience examination performance and that first year predicted performance in second year. When examining a composite of science knowledge across the school years, there is no association between the general science knowledge acquired in primary school and Biology learned at secondary school (Mukhwana, 2013). This is attributed to the complexicity of the level at which Physics, Biology and Chemistry is pitched at in secondary school.

The subjects Business Studies and Business Economics were chosen by a small proportion of students in this study and were shown to have a significant influence on BNS performance ($p=0.019$ and $p=0.043$ respectively). Presumably the nature of these subjects, encourage critical thinking and prepare students for higher level courses. Mathematics is generally not required for entry into a nursing diploma programme. Hence, only 1.1% of this study's sample studied mathematics in matric. This is no different in the UK where there are no minimum requirements for mathematics to enter a nursing programme (Harvey, Murphy, Lake, Jenkins, Cavanna and Tait, 2010). However, competence in fluid and drug calculations is adversely affected by a lack of mathematical ability (Harvey et al., 2010) and should be considered in nursing curriculum or as entry criterion.

5.3.3 **BNS Results**

The combined mean BNS main examination scores were low for year 1 (55%) and year 2 (50.9%). Similarly the test means for BNS 1 and BNS 2 were low at 56.9% and 54.1% respectively. There was a strong positive correlation between the test means and the main examination marks in both the first ($r=0.80$; $p<0.0001$) and second ($r=0.88$; $p=<0.0001$) year of BNS study. Furthermore, the findings show a positive correlation between the main examination marks in BNS 1 ($r=0.61$) and BNS 2 ($r=0.65$), relating to the first objective of the study. The results predicted that for every 1 mark increase in year 1 main examination result, a 0.77 mark increase in the year 2 main exam mark could be expected. A study by van Rooyen et al. (2006) found that there is a relationship between year 1 and year 2 in

Bioscience examination marks and that first year predicted performance in second year of study. The effect of the BNS 1 main examination marks was highly significant ($p<0.0001$).

5.3.4 BNS Course Attendance, Resources and Support

Course attendance: is of concern in that only 10% of students reported a 100% lecture attendance during the first two years of BNS study. The vast majority of students had missed lectures with 87%; (n=274) reporting that they seldom missed a lecture. Lecture attendance, in general, have a positive influence on academic performance in a range of disciplines. Studies in nursing (McCarey et al., 2007; Horton, Wiederman and Saint, 2012), economics (Neri and Meloche, 2007), engineering (Nyamapfene, 2010) and in medicine (Daud and Javaid, 2012; Hidayat et al., 2012), show that poor lecture attendance result in poor academic performance in a moderate to high degree.

In studies where lecture attendance was found to be poorly correlated to academic outcomes, students used supplementary aids such as lecture recordings (Horton et al. 2012) or adopt learning styles that help them best manage subject content (Kottasz, 2005). In university, student non-appearance during lectures has many different reasons (Leufer and Cleary-Holdforth, 2010). Neri and Meloche (2007) postulate that one of the reasons for non-attendance is longer travelling distances, which have negative bearing on academic performance. They recommend that the relationship between lecture attendance and academic success be investigated. In this study, the reasons for non-attendance were not determined and will form part of the recommendations of the study.

Use of prescribed and recommended course material:

Prescribed course material is an important resource for student learning; 80% (n=250) of the students stated that they always used the prescribed course material. No students indicated that they never use the prescribed course material. There was no significant association between attendance at BNS lectures and frequency of use of prescribed course material (Phi coefficient = 0.12). It is common practice in nursing for students to also use recommended course material in order to encourage evidence informed practice and to increase their theoretical BNS knowledge to enhance best experiential performance. A report by Adeoye and Popoola (2011) supports the above statement, by showing that library learning resources facilitate teaching and learning. Only 51% (n=158) of the students in this study indicated that they always or often used recommended course materials, while 22% (n=67) stated that they seldom or never use these materials. Use of study material is beneficial (Mukhuwa, 2013) and expected of students who lack foundational or prior knowledge of a subject. Similarly, lecture attendance may or may not influence students

searching for information form recommended sources. There was a significant association between attendance at BNS lectures and frequency of use of recommended course material (p=0.048; Phi coefficient = 0.20).

On further analysis of pre-knowledge of Biology, students were divided into three categories. Viz. those that studied Biology less than five years ago, those that studied biology more than five years ago and those that did not study Biology. There was a significant association between the frequency of the use of recommended course material and previous Biological sciences knowledge (X^2 test; p=0.048; Cramer's V=0.16). According to results of the study done in Kenya by Mukhwana (2013) there is relationship between accessibility of reading material and achievement of the students. Within the groups who studied Biology more than five years ago (30%) and those who did not study Biology (25%) a high proportion of students reported that they used the recommended materials. This may be attributed to their need to meet the knowledge gap between what they know about Biology and what they would require to pass BNS. It could be concluded that students without adequate pre-knowledge of Biology realize its importance and therefore the need for intense studying of this subject. The findings of the Pakistani study by Ali (2008) support the findings of this study that participants with prior knowledge of science achieved higher than their peers who do not have prior knowledge.

Support by and feedback from lecturers:

It is commonly understood that student support enhances student understanding of subject content with an improvement in their general performance. A vast majority (96%) of students felt that support had been offered by lecturers. Most students rated lecturer support as "very good" to "excellent". This study did not explore the reasons for non attendance, however, Kottasz (2005) is of the view that students' motivation levels, health status and employment commitments are some of the main reasons not attending lectures and for them needing lecturers' support. These students often seek more support from their lecturers to help them catch-up and learn the content missed. These insights help to illuminate the findings of this study in that not only do the BNS students seek lecturer support but that they also appreciate the quality of support provided.

Feedback on performance is integral to learning. Although the majority (60%) reportedly received feedback on their BNS performance, concern should be expressed about the remaining 40% who did not receive feedback. In this study feedback prompted students to do better by accessing recommended resources and course material for BNS as evidenced by a statistically significant result (p=0.022). The association between receiving feedback and motivating students is well described in the literature (Lai, 2011; Wilbert, Grosche and

Gerdes, 2010; Martin, 2002); feedback provides the student with knowledge of their result and what needs to be done to sustain good performance and improve weak performance.

There was, however, a significant association between whether or not students felt that feedback had been given and the frequency of use of recommended course materials ($p=0.022$; Cramer's $V=0.19$). There was also a marginally significant association between whether or not students felt that feedback had been given and whether or not they felt that lecturers had offered support ($p=0.063$; Phi coefficient = 0.12).

5.4 CONCLUSION

The study found that age is the only demographic variable that influences BNS performance; with the age range between 17 to 50 years, older students have lower mean scores than younger. The results showed that for every 1 year increase in age, a 0.28% mark decrease in the BNS 2 main examination mark could be expected. Although the mean performance of males was slightly higher than female students the difference was not significant ($p=0.076$). The findings address the second objective whether socio-demographic variables are related to BNS results.

The most popular subject choices are Biology and Physics, however only Physics was shown to have a significant positive influence on the performance of students in BNS examinations. This is evidenced by achievement of higher examination marks as compared to those that did not study these subjects at school. Among the least chosen subjects are Business studies and Business Economics which were also shown to have a positive effect on BNS performance. It may be concluded that the subjects Physics, Business studies and Business Economics enhance students' performance in BNS. On the contrary the subject of concern viz. Biology, has proven not to have an effect on the performance of students in BNS ($p=0.15$). Presumably, by year 2, the Biology knowledge gained in year 1 supersedes the effect of any Biology knowledge which may have been gained while at school. These findings address the third objective of the study.

Test means for both BNS 1 and BNS 2 were low with a strong positive correlation to the main examinations ($r=0.80$ and $r=0.88$) respectively. The effect of the year 1 main examination marks was highly significant ($p<0.0001$); the results have showed that higher BNS 1 main examination marks were correlated with higher BNS 2 main examination marks. This result is the same for the 2008 cohort ($r=0.61$); $p<0.0001$) and the 2007 cohort ($r=0.65$; $p<0.0001$). These findings address the first objective of the study.

Students' learning patterns in BNS are characterized by variable classroom attendance by the majority with only 10% of students reporting 100% attendance. It is further characterized by consistent use of prescribed course material by 80% of students and moderate use of recommended course material; the use of on-line resources is poor as indicated by 85% who never, seldom or sometimes use on-line resources. Lecturers support is highly rated and reported as being available by 96% of students. Feedback, however, is not provided regularly as experienced by more than a third of the sample, but when given, feedback was rated as good to excellent by the majority. There was no association between attendance, the degree of support and Biology knowledge. It may be concluded that students' state of Biology knowledge do not influence the amount of support they need or their need for lecture attendance. On the contrary there was a significant association between use of recommended course material and previous Biology knowledge. It may be concluded that students who had no previous Biology knowledge and those who studied Biology more than five years ago were more inclined to use resources more widely to improve their understanding of BNS. These findings relate to the fourth study objective.

5.5 RECOMMENDATIONS

The following recommendations are made for nursing education, college management and future research.

Nursing Education

- Strengthen and ensure that feedback on performance is given to students throughout the teaching and learning period in the nursing college.

- Make students aware of the importance of and encourage culture of classroom attendance so as to improve on motivation levels.

- Continue good practice in recommending additional resources and course material. Recommended course material should be reviewed annually to keep students interested and motivated to continue using them.

Management

- Support for students by lecturers must be improved and monitored by management from the time of inception of the programme to the end of the nursing programme.

- Review and improve IT facilities and infrastructure to motivate students to use the IT and on-line learning resources.

- Based on the findings of this study Physics be considered as criterion for admission into the nursing programme.

Research

- A similar study is proposed considering variables such as teaching strategies and learning styles of students in relation to BNS.

- Since 90% of students reported non-attendance of varying degrees, the reasons for non attendance of lectures must be explored in future research.

- This study should be extended to other nursing colleges in Gauteng as poor student performance is also a problem in other colleges during the study of BNS.

5.6 STUDY LIMITATIONS

- Some records were missing from student files making it difficult for the researcher to access important information. This also lead to the delay in data collection as the researcher had to peruse through far more records than the expected number of records in order to reach the acceptable size of the sample. Hence, the discrepancy between the participant sample (n=312) and the records sample (n=364).

- The absence of a comprehensive student data base delayed the progress of data collection further because the researcher had to manually search for and peruse the records of the students.

- Results from subgroup analysis where there were smaller samples e.g. widowed students, subject choice, use of prescribed and recommended course material previous Biological sciences knowledge etc. may have influenced the significance of the results. These must be thus interpreted with caution with regard to their statistical significance.

- The results of the study are generalizable only to nursing colleges with similar curriculum and contextual characteristics.

5.7 CLOSING REMARKS

Biological Nursing Science in a nursing curriculum forms the foundation for the integration of basic sciences integration into nursing practice. However, performance in this subject has been generally poor and widely criticised by academics, managers and funders.

This study provided insight into the several factors that influence students' performance in BNS. Although no causal relationships have been established the results illuminate both academic and non-academic factors related to BNS performance, which have not been known prior to this study.

REFERENCES

Abdallah S.A., Al-Shatti L., Al-Awadi B., Al-Hammad N. 2012. Disinfectants use awareness among college of nurses in some healthcare settings, Kuwait. Middle-East Journal of Scientific Research 12(7): 964-969.

Adeoye M.O. and Popoola S.O. 2011.Teaching effectiveness, availability, accessibility, and use of library and information resources among teaching staff of schools of nursing in Osun and Oyo State, Nigeria. Library Philosophy and Practice (ejournal). Paper 525.
http://digitalcommons.unl.edu/libphilprac/525

Akpata T.V. 2012. Assessing student nurses' knowledge of Microbiology for course content improvement. Karachi. Middle East Journal of Nursing (January): 3-8.

Ali P.A. 2008. Admission criteria and subsequent academic performance of general nursing diploma students. Journal of Pakistan Medical Association 58(3): 128-132.
http://ecommons.aku.edu/pakistan_fhs_son/11

Ali P.A., Gavino M.I.B. and Memon A.A. 2007. Predictors of academic performance in the first year of basic nursing diploma programme in Sindh Pakistan. Journal of Pakistan Medical Association 57(4): 202-204. http://www.jpma.org.pk/full_article_text.php?article_id=1075

Andrew S. 1998. Self-efficacy as a predictor of academic performance in science. Journal of Advanced Nursing 27(3): 596-603.

Bone E.K. and Reid R.J. 2011. Prior learning in Biology at high school does not predict performance in the first year. Australia, Routledge. Higher Education Research and Development 30(6): 709-724. http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?

Brink H. 2008. Fundamentals of research methodology for health care professionals. 2nd edition. Cape Town: Juta and Company. pp123.

Burns N. and Groove S.K. 2005. The practice of nursing research. conduct, critique and utilization. 5th edition. Philadelphia: Elsevier Saunders.

Campbell J. and Leathard H. 2000. Nurses' knowledge of Biological and related science. Journal of Research in Nursing 5(5): 372-380.

Caon M. and Treagust D. 1993. Why do some nursing student's find their science courses difficult. Journal of Nursing Education 32(6): 255-259.

Casey G. 1996. Analysis of Akinsanya's model of bionursing. Journal of Advanced Nursing 23(6): 1065-1070.

Chaffey College Institutional Research. 2008. Correlation of Biology Course Performance to Nursing Course Performance. Spring Semester. August
http:www.chaffeyedu/research/IR_PDF_Files/Research_Briefs/Academic_Success/0809-correlation-biology-to-nursing.pdf

Choi-Kwon S., Song K.J., An G.J., Choe M.A. 2002. How Korean RNs evaluate their undergraduate education in the Biosciences. Journal of Nursing Education 41(7): 317-320.

Cholowski K. and Chan L.K.S. 2001. Prior knowledge in student and experienced nurses' clinical problem solving. Australian Journal of Educational and Developmental Psychology 1: 10-21.

Clancy J., McVicar A., Bird D. 2000. Getting it right? An exploration of issues relating to the biological sciences in nurse education and nursing practice. British Journal of Advanced Nursing 32(6): 1522-1532.

Concise Encyclopedia Dictionary – Encyclopedia Britannica.

Craig P.L., Gordon J.J., Clark R.M., Langendyk V. 2004. Prior academic background and student performance in assessment in a graduate entry programme. Medical Education 38(11): 1164-1168.

Curriculum. 2003. Gauteng nursing college's curriculum.

Davies S., Murphy F., Jordan S. 2000. Bioscience in the pre-registration curriculum: finding the right teaching strategy. Nurse Education Today 20(2): 123-135.

Delport C.S.L., Strydom H., Fouche C.B., de Vos A.S. 2009. Research at grassroots. 3rd edition. Pretoria, South Africa: Van Schaik publishers. pp194.

De Vaus D. 2002. Surveys in social research (Social Research Today) 5th edition by. Publisher: Routledge.

Gresty K.A. and Cotton D.R.E. 2003. Supporting biosciences in the nursing curriculum: development and evaluation. Journal of Advanced Nursing 44(4): 339-349.

Harvey S., Murphy F., Lake R., Jenkins L., Cavanna A, Tait M. 2010. Diagnosing the problem: Using a tool to identify pre-registration nursing students' mathematical ability. Nurse Education in Practice 10(3): 119-125.

Hidayat L., Vansal S., Kim E., Sullivan M., Salbu R. 2012. Pharmacy student absenteeism and academic performance. New York. American Journal of Pharmaceutical Education 76(1): 8.

Horton D.M., Wiederman S.D., Saint D.A. 2012. Assessment outcome is weakly correlated with lecture attendance: influence of learning style and use of alternative materials. Advances in Physiology Education 36(2): 108-115.

Hutton B.M. 1998. Do school qualifications predict competence in nursing calculations? Nurse Education Today 18(1): 25-31.

Jordan S. and Reid K. 1997.The biological sciences in nursing: an empirical paper reporting on the applications of physiology to nursing care. Wales. Journal of Advanced Nursing 26(1): 169-179.

Jordan S., Davies S., Green B. 1999.The bioscience in the pre-registration nursing curriculum: staff and students perceptions of difficulties and relevance. Nurse Education Today 19(3): 215-226.

Jordan S. 1994. Should nurses be studying bioscience? A discussion paper. Nurse Education Today 14(6): 417-426.

Kaveevivitchai C., Chuengkriankrai B., Luecha Y., Thanooruk R., Panijpan B., Ruenwongsa P. 2008. Enhancing nursing students' skills in vital signs assessment by using multimedia computer – assisted learning with integrated content of anatomy and physiology. Nurse Education Today 29(1): 65-72.

Lai E.R. 2011. Motivation: A literature review. Pearson.
http://www.pearsonassessments.com/hai/images/tmrs/motivation_review_final.pdf

Lang T. and Moulton P. 2009. North Dakota nursing needs study: Student survey results. Centre for Rural Health, University of North Dakota, September.

Larcombe J. and Dick J. 2003. Who is best qualified to teach bioscience to nurses? Nursing Standard 51(17): 38-44.

Leufer T. and Cleary-Holdforth J. 2010. Reflections on the experience of mandating lecture attendance in one school of nursing in the Republic of Ireland. The All Ireland Journal of Teaching and Learning in Higher Education 2(1):18.1-18.14
URL:http://ojs.aishe.org/index.php/sishe-j/article/view/18

Martin A.J. 2002. Motivation and academic resilience: Developing a model for student enhancement. Australian Journal of Education 46(1): 34-49.

McKee G. 2002. Why is biological science difficult for first year nursing students? Nurse Education Today 22(3): 251-257.

McCarey M., Barr T., Rattray J. 2007. Predictors of academic performance in a cohort of pre-registration nursing students. United Kingdom. Nurse Education Today 27(4): 357-364.

McVicar A. and Clancy J. 2001. The bioscience and Fitness for Practice: a time for review? British Journal of Nursing 10(21): 1415-20.

Mitchell B.S., McCrorie P., Sedgwick P. 2004. Student attitudes towards anatomy teaching and learning in a multi-professional context. Medical Education 38(7): 737-748.

Mukhwana W.J. 2013.The role of student – related factors in the performance of Biology subject in secondary schools in Eldoret Municipality, Kenya. Journal of Emerging Trends in Educational Research and Policy Studies 4(1): 64-73.

Neri F. and Meloche Y. 2007. The impact of lecture attendance on academic performance in a large first year economics course. Australia. Social Science Research Network. Electronically available at: http://ssrn.com/abstract=975573.

Nicoll L. and Butler M. 1996. The study of biology as a cause of anxiety in student nurses undertaking the common foundation programme. Journal of Advanced Nursing 24(3): 615-624.

Nyamapfene A. 2010. Does Class attendance still matter? United Kingdom. Journal of the Higher Education Academy Engineering Subject Centre 5(1): 64-74.

Ofori R. 2000. Age and 'type' of domain specific entry qualifications as predictors of student nurses' performance in biological, social and behavioural sciences in nursing assessments. Nurse Education Today 20(4): 298-310

Ofori R. and Charlton J. 2002. A path model of factors influencing the academic performance of nursing students. Journal of Advanced Nursing 38(5): 507-515.

Polit D.F. and Beck C.T. 2008. Generating and assessing evidence for nursing practice. 8th edition. Lippincott, New York. pp323.

Reynolds J. 2006. The importance of microbiology to nursing students. Focus Microbiology Education 2(2): 7-9.

Salamonson Y., Andrew S., Everett B. 2009. Academic engagement and disengagement as predictors of performance in pathophysiology among nursing students. Contemporary Nurse 32(1-2): 123-132.

SAS. Citation: SAS Institute Inc., SAS Software, version 9.3 for Windows, Cary, NC, USA: SAS Institute Inc. (2002-2010).

South African Qualifications Authority (SAQA): 2005.

South African Nursing Council – regulation R2598 (Scope of practice of registered nurses) Pretoria: Government Printers.

South African Nursing Council – regulation R425 – regulations relating to the approval of and the minimum requirements for the education and training of a nurse. Pretoria: Government Printer.

Nursing Act No 33 of 2005 as amended, Pretoria: Government Printer.

Tanner K. and Allen D. 2004. Approaches to biology teaching and learning: Learning styles and the problem of instructional selection – engaging all students in science courses. Cell Biology Education 3(4):197-201.

Thatcher A. Fridjhon P., Cockcroft K. 2007. The relationship between lecture attendance and academic performance in an undergraduate psychology class. South African Journal of Psychology 37(3): 656-660

Trnobranski PH. 1996. Biological sciences in Project 2000: and exploration of status. Journal of Advanced Nursing 23(6): 1071-1079.

van Rooyen P., Dixon A., Dixon G., Wells C. 2006. Entry criteria as predictor of performance in an undergraduate nursing degree programme. Nurse Education Today 26(7): 593-600.

Wharrad J., Allock N., Chappel M. 1994. A survey of the teaching and learning of biological sciences on undergraduate nursing courses. Nurse Education Today 14(6): 436-442.

Wilbert J., Grosche M., Gerdes H. 2010. Effects of evaluation feedback on rate of learning and task motivation: An analogue experiment. Learning disabilities: A Contemporary Journal 8(2): 43-52.

APPENDIX 1

- **DATA RECORDING SHEET**

Table 2: Data collection instrument

Please, indicate your response with an "X"

		frequency	percentage
Admission records:			
- Age	<20 20 – 30 31 – 40 41 – 50 51 – 55		
- Gender	Male Female		
- Marital status	Single Married Divorced Widowed		
- Highest qualification	National Matriculation		
- Previous nursing experience	Yes or no If yes specify	Yes / No	
Test marks:	<10% 20% 40% 60% 80% 100%		
Examination results:	<40% 41 – 55% 56 – 65% 66 – 75% 76 – 85% >86%		
Student type:	Mature (RPL) Direct entry		
Admission/Entry criteria:	Old Senior Certificate New National Senior certificate		
Subjects done in school:			

APPENDIX 2

- **QUESTIONNAIRE**

Course evaluation questions used to determine study patterns, attendance in class, use of the prescribed course material, use of recommended course material , previous biological sciences knowledge, use of on-line learning resources

Please circle the most appropriate answer in each question:

1. Which of the following best describes your attendance at Biological Nursing Science lectures.
   A. Seldom missed a lecture
   B. Missed several lectures in the year
   C. Missed lectures regularly throughout the year
   D. Missed some lectures every week
   E. Missed more than 50% of lectures in the year

2. How often did you use the prescribed course material?
   A. Always
   B. Often
   C. Sometimes
   D. Seldom
   E. Never

3. How often did you use recommended course material in the past year?
   A. Always
   B. Often
   C. Sometimes
   D. Seldom
   E. Never

4. How often do you use on-line learning resources, for example internet
   A. Often
   B. Sometimes
   C. Seldom
   D. Never

5. Give examples of on-line multimedia materials used

   _____

   _____

6. Indicate your previous biological sciences knowledge
   A. Did not study Biology in Matriculation/National certificate
   B. studied Biology more than 5 years ago
   C. Studied biology less than 5 years ago

7. Do lecturers offer any support throughout the block and when need arises
   Yes or No

8. If yes, in your opinion how would you rate the support
   A. Fair
   B. Good
   C. Very good
   D. Excellent
   E. Not sure

9. Do you receive feedback based on inputs given at the end of block, e.g. Tutorials
   Yes or No
   Briefly explain your response _____

   _____

   _____

APPENDIX 3

- **PERMISSION TO CONDUCT THE STUDY GRANTED BY THE GAUTENG DEPARTMENT OF HEALTH**

CONDITIONS OF APPROVAL OF RESEARCH CONDUCTED BY POST GRADUATE STUDENTS IN GAUTENG DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT(GDoH & SD)

GAUTENG PROVINCIAL GOVERNMENT

GAUTENG DEPARTMENT OF HEALTH AND SOCIAL DEVELOPMENT (GDOH & SD)

POLICY, PLANNING AND RESEARCH

Enquiries: Sue le Roux

Tel: +2711 355 3362/3212

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CONTACT DETAILS OF THE RESEARCHER	
Date	29/03/2010
Tel number	011 932 1242
Fax number	None
Email	cmohudi@gmail.com
Researcher /Principal investigator (PI)	Cecilia Magauta Mohudi
Supervisor	
Institution	Wits Nursing Department
Research title	An analysis of college based student's performance in Biological Nursing Science (BNS) in their year and second year of the 4-year Diploma in nursing course.

Approval is hereby granted by the Gauteng Department of Health for the above research project to be conducted. Approval is limited to compliance with the following terms and conditions:

1. All principles pertaining to ethics of research are observed and adhered to by all involved in the research project. Of key importance are the issues pertaining to research on human subjects as contained in the Declaration of Helsinki (1964, amended in 1983) and the constitution of the Republic of South Africa, respect for:
   - Human dignity;
   - Autonomy;
   - Informed consent;
   - Vulnerable persons;
   - Confidentiality;
   - Lack of harm;
   - Maximum benefit;
   - and justice
2. The GDoH is indemnified from any form of liability arising from or as a consequence of the process or outcomes of this research;
3. Researchers commit to providing the GDoH with periodic progress and a final report; short term projects are expected to submit progress reports on a more frequent basis and all reports

must be submitted to the Director: Policy, Planning and Research of the GDoH;

4. The Principal Investigator shall promptly inform the above mentioned office of changes of contact details or physical address of the researching individual, organisation or team;
5. The Principal Investigator shall inform the above office and make arrangements to discuss their findings with GDoH prior to dissemination;
6. The Principal Investigator shall promptly inform the above mentioned office of any adverse situation which may be a health hazard to any of the participants;
7. The Principal Investigator shall request in writing authorization by the Director: Policy, Planning and Research of the GDoH for any intended changes of any form to the original and approved research proposal;
8. If for any reason the research is discontinued, the Principal Investigator must inform the above mentioned office of the reasons for such discontinuation;
9. A formal research report upon completion should be submitted to the Director: Policy, Planning and Research of the GDoH with recommendations and implications for GDoH.

AGREEMENT BETWEEN THE GAUTENG DEPARTMENT OF HEALTH (GDoH) AND THE RESEARCHER

Ms. S le Roux

Director: Policy, Planning and Research

Date: 31/03/2010

Cecilia Magauta Mohudi

Research/Academic Institution WITS NURSING EDUCATION DEPARTMENT

Date: 06/04/2010

APPENDIX 4

- **ETHICAL CLEARANCE**

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Mrs Cecilia M Mohudi

CLEARANCE CERTIFICATE	**M10110**
PROJECT	An analysis of College-Based Nursing Students' Performance in Biological Nursing Science
INVESTIGATORS	Mrs Cecilia M Mohudi.
DEPARTMENT	Department of Nursing Education
DATE CONSIDERED	29/01/2010
DECISION OF THE COMMITTEE*	

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Prof J Bruce

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

APPENDIX 5

- **APPROVAL OF THE STUDY BY THE POSTGRADUATE COMMITTEE**

Faculty of Health Sciences
Medical School, 7 York Road, Parktown, 2193
Fax: (011) 717-2119
Tel: (011) 717-2745

Reference: Ms Tania Van Leeve
E-mail: tania.vanleeve@wits.ac.za
10 December 2009
Person No: 9406569R
PAG

Mrs CM Mohudi
848 Tladi
P O Kwa-Xuma
1868
South Africa

Dear Mrs Mohudi

Master of Science in Nursing: Approval of Title

We have pleasure in advising that your proposal entitled "*An analysis of college-based nursing students' performance in biological science*" has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

APPENDIX 6

- **PERMISSION FROM THE PRINCIPAL COLLEGE**

GAUTENG DEPARTMENT OF HEALTH AND
SOCIAL DEVELOPMENT
CHRIS HANI BARAGWANATH NURSING COLLEGE

Private Bag X 05
Bertsham
2013

Tel: (011) 983-3000
Fax: (011) 983-3091

11/08/2010

Mrs S Peters
Principal: Chris Hani Baragwanath Nursing College
Private Bag X05
BERTSHAM
2013

For Attention: Ms CM Mohudi
Lecturer
Bonalesedi Campus

RE: PERMISSION TO ACCESS STUDENT RECORDS

Correspondence dated 10/08/2010 bears reference.

Permission is granted for you to access student records, on condition that the ethical principle of confidentiality is maintained throughout the process.

A copy of our research findings must also be submitted to the institution of completion.

Kind Regards

.....
Mrs S Peters
(Principal)

CHRIS HANI BARAGWANATH
NURSING COLLEGE
2010 -08- 11
PRIVATE BAG X05
BERTSHAM 2013

cc: Ms E Radebe
Ms Z Behane

APPENDIX 7

- **INFORMATION SHEET**

Dear prospective participant,

My name is Cecilia Magauta Mohudi. I am a nurse educator employed at the Bonalesedi campus of the Chris Hani Nursing College and currently studying towards a Masters degree in Nursing in the Department of Nursing Education of the University of the Witwatersrand. I am required to do a research, as part of my learning programme, under the guidance of an experienced researcher, who will act as research mentor. In my proposed study I intend to analyze performance in Biological Nursing Science in their first and second year of study. As a senior nursing student, having completed Biological Nursing Science in the first and second year of the 4-year Diploma in nursing, you are considered the best person to be included in the study.

I therefore invite you to participate in the study. Your participation would be entirely voluntary and you are free to decline the invitation altogether or to stop at any time without having to give any explanation. With the permission of the principal and the Gauteng Department of Health your records will be reviewed to obtain data. Your Biological Nursing Science tests, summative examination results and biographic information on entry into the nursing programme.

If you agree to participate you will be required to complete a self administered questionnaire about studying this course, therefore you need not sign the consent form. It will take 10 to 15 minutes to complete the questionnaire. Only my supervisor and I will have access to the data. A statistician who is not affiliated to the nursing college will be involved in analyzing the data. Numbers and codes will be used throughout the study to ensure confidentiality and anonymity (no names). You will not benefit personally from the study but future nursing students may benefit depending on the outcomes/results of the intended study.

Thank you for taking the time to consider participating. Should you need more information feel free to contact me at the numbers given below.

Yours sincerely,
Cecilia Magauta Mohudi.
Telephone: 011 932 1242 (h); 011 696 8332 (w)
Cell phone: 078 251 3006
Email: cmohudi@gmail.com