

Factors influencing academic performance in biological sciences among students in a nursing education institution in the Eastern Cape Province: An appreciative inquiry approach

F. TOM¹, I. COETZEE² AND T. HEYNS²

¹*Department of Nursing Science, University of Fort Hare, East London, South Africa*

²*Department of Nursing Science, University of Pretoria, South Africa;*

E-mail: fundiswa.tom@impilo.ecprov.gov.za or nelson.tom@safetyec.gov.za

Abstract

Nursing education institutions are responsible for quality education and training and are professionally accountable for nursing programmes of high academic standards. The majority of first and second year nursing students following the comprehensive four year nursing programme at a specific nursing education institution were academically unsuccessful in the subject biological science. The aim of the study was to explore and describe the factors influencing the academic performance of nursing students registered for the biological science subject at the specific nursing education institution. A qualitative, contextual, exploratory and descriptive design was used. Utilising an appreciative inquiry approach as a positive evaluation process, 429 nursing students participated in the study. Data were collected utilising self-reported appreciative interview schedule, field notes and reflective diary. The findings of the content analysis process revealed factors influencing the academic performance in biological science. The main factors identified were biological science content, characteristics of educators, educational strategies, resources and biological science assessments. The recommendations were suggested to involve stakeholders, namely nursing education institution management, nurse educators, nursing students and Eastern Cape Department of Health to actively play their various towards the positive academic performance of nursing students in the biological sciences nursing education institutions.

Keywords: Appreciative inquiry, biological science, four year nursing programme, nursing student and nursing education institution.

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Introduction

The comprehensive four year nursing programme offered at the specific nursing education institution (NEI) leads to registration as a nurse (General, Psychiatric and Community) and Midwife (South African Nursing Council (SANC) 1985). One of the subjects offered as part of the comprehensive four year nursing

programme is biological science; it includes anatomy, physiology, chemistry, biophysics, microbiology and parasitology. Biological science equips the nursing students with knowledge to understand the normal structure of the human body, its functioning, the relevant chemical and biophysical aspects of the body, and the aspects of the micro-organisms and parasites that could affect the human body (SANC Guide, 1994).

Biological science was explored as it is offered on first as well as second year level of the four year comprehensive programme. If a nursing student does not successfully complete this subject, the subject can be repeated once at first or second year level (NEI Curriculum, 2005). The training contract of nursing students stipulates that if the student's second attempt to pass the subject is unsuccessful, the student's studies would be terminated (NEI Policy, 2007).

According to Muwanga-Zake (2010) shortage of educators, especially trained ones, in combination with inadequate resources have always been regarded as contributing factors influencing academic performance in biological science. Even in the NEI in the Eastern Cape (EC) a province in South Africa, the unsatisfactory academic performance in biological science was always attributed to a shortage of nurse educators and resources. This view is challenged in that the most understaffed and under resourced campus, had the best academic performance in biological science: 96% of the first year nursing students and 78% of the second year nursing students passed this subject successfully. The divergence between the authors' view and the high percentages of the most under resourced campus prompted the researchers to conduct this study.

The majority of first and second year nursing students (30% and 37% respectively) following the comprehensive four year nursing programme at a specific NEI, were academically unsuccessful in biological science (NEI results, 2010). In view of the fact that the nursing students are obliged by the NEI policy to discontinue their studies if they fail biological science for the second time (NEI Policy, 2007), nursing student numbers declined significantly when their studies are terminated, thus contributing to the shortage of qualified nurses countrywide. The research question posed was: What are the factors influencing the academic performance of students' registered for biological science subject? The objective of the study was to explore and describe the factors influencing the academic performance of nursing students registered for the subject biological science at a nursing education institution in the Eastern Cape, South Africa.

Methodology

A qualitative, contextual, exploratory and descriptive design was used. The population was all the second year nursing students in the comprehensive four year nursing programme registered for biological science at the specific NEI in

the EC. Second year students were selected on the basis of having completed biological science at first year level and registered for the subject on second year level at the time.

The research protocol was reviewed and approved by the Departmental Master's Degree Committee, the School of Health Care Sciences: Research and Postgraduate Committee as well the Research Ethics Committee of the Faculty of Health Science at the University of Pretoria. The EC DoH and the NEI granted permission to conduct the study.

The data were collected personally at each of the five campuses of the NEI, the same procedure were followed at each campus. Participant leaflets and informed consent forms were handed out to all the students present in class after an explanation of the study process. The participants were assured that information provided by the participants would be strictly confidential and it would not be presented or dealt with in a recognisable form.

A consecutive sample of 429 students completed the self-reported interview schedule. Content analysis which is a form of textual analysis (Schwandt, 2001) was applied. The strategies for judging quality in qualitative research such as transferability, dependability, credibility and confirmability were utilised (Polit & Beck, 2008).

Results

The questions asked in the self-reported interview schedule were guided by the 4-D cycle of AI.

Discovering the best of “what is”

The following question was asked: Reflecting back on your four year programme what was your most satisfying/peak experience with regard to biological science? The themes, categories and sub-categories of *discovering* which emerged are presented in Table 1.

Content

Biological science was perceived to be the basis of knowledge for those who want to become professionals in the health and medical professions. Some nursing students regarded biological science content as straightforward, practical and easy to understand. The content of biological science was viewed positively by the nursing students as it increased their knowledge regarding the structure and functioning of the human body. They indicated that through biological

science, understanding of what is normal is learnt and understanding of the abnormal is promoted in subjects like general nursing science and pharmacology.

Table 1: Summary of themes, categories and sub-categories of “Discovering”

Themes	Categories	Sub-categories
Content	Increased knowledge base	<ul style="list-style-type: none"> ● Normal body is different systems ● Functions of the normal body ● Understanding of interrelated subjects
	Improved skills Link with previous knowledge	<ul style="list-style-type: none"> ● School subject ● First year biological science
Nurse educator characteristics	Dedicated, supportive and passionate educators.	
Study strategies	Use of drawings Fun Group activities Hard work	
Resources	Prescribed books Study guide	
Assessments	Formative assessments	<ul style="list-style-type: none"> ● Application test ● Quiz tests ● Assignments
	Summative assessments	<ul style="list-style-type: none"> ● Passing first year biological science

Some nursing students indicated that biological science knowledge enhanced their patient care functions through applying it in nursing practice. It thus improved their skills. They were positive about linking biological science to their previous knowledge (school subjects and first year biological science) as this linkage promoted a better understanding of biological science.

Nurse educator characteristics

Some nursing students indicated that there were characteristics of their nurse educators that were impacting positively on their biological science performance. They portrayed their nurse educators as dedicated, supportive and passionate.

Study strategies

The students indicated that study strategies like use of drawings, fun, group activities, and hard work impacted positively on their biological science performance.

Resources

Some nursing students indicated that using the prescribed books and study guides during studying improved their biological science performance. The use of a clear, simple, understandable and straight forward prescribed book with drawings and examples yielded good biological science results for some nursing students. There were nursing students who felt that the biological science study guide was helpful in guiding them towards understanding biological science.

Assessments

The nursing students indicated that formative assessments like application test, quiz test and assignments had a positive influence towards their biological science performance. The nursing students described the application test as easy, enjoyable, and exciting and it improved their year marks. It is a biological science practical formative assessment which is also called a ‘viva’. The nursing students are provided with a written test to which they must respond orally by identifying structures.

The nursing students of the most under resourced campus explained a quiz test as a test that they wrote after completion of every chapter. They communicated that the setting of short quiz tests encouraged studying; writing this test after every chapter facilitated self-study of all the work covered in class every day. Assignments were regarded by the nursing students as promoting a better understanding of biological science. These nursing students indicated that assignments also assisted them to obtain higher year marks.

The nursing students also indicated their happiness and satisfaction for having passed their first year biological science summative assessments.

Dreaming “what could be”

The following question was asked: What are your wishes for the subject biological science? (Table 2).

Table 2: Summary of the themes, categories and sub-categories of “dreaming”

Themes	Categories	Sub-categories
Educational resources	Practical application opportunities Applicable learning resources	<ul style="list-style-type: none"> • Biological science laboratory • Computer laboratory • Visual aids – videos/posters • One understandable text book • Resources • Library facilities

Educational resources

The nursing students wished for a variety of educational resources that could enhance their understanding of biological science. These were educational resources that could promote the practical application of the content of biological science. The nursing students wished for a biological science laboratory where they could actually see the biological science structures.

The nursing students also wished for various learning resources that could promote the application of biological science knowledge namely, computer laboratory, visual aids like videos and posters, one understandable textbook, other resources, and library facilities.

Increased (100%) pass rate

The nursing students wished to dedicate themselves in studying biological science so as to achieve an increased pass rate up to 100%. Designing “what ought to be” The following question was asked: What is your vision for the subject biological science? (Table 3).

Table 3: Summary of the themes, categories and sub-categories of “Designing”

Themes	Categories	Sub-categories
Programme structure	Workload reduction	<ul style="list-style-type: none"> • Semester course • Two or three examination papers • Increase number of years • Major subject
Change attitudes	Students	<ul style="list-style-type: none"> • Positivity • Dedication • Enjoy and love biological science
	Educators	<ul style="list-style-type: none"> • Dedication • Knowledgeable • No criticism
Assessments	Improved setting Scope for examinations	

Programme structure

The nursing students’ vision involved some re-arrangement of the biological science content for purposes of reducing its workload so that it is manageable. The workload reduction strategies suggested by the nursing students included making biological science a semester course, to have biological science divided into two or three papers, increasing the number of study years for biological science and making biological science a major subject or be integrated into one of the existing major subjects of the four year comprehensive programme.

Change attitudes

The vision of the nursing students was a change of attitude towards biological science by both the students and the educators. The nursing students indicated that biological science should not be ‘feared’ but should be viewed in a positive manner. The students had to be positive, dedicated, enjoy and love biological science. The nursing students’ vision was to be taught by dedicated, knowledgeable educators who do not criticise them or indicate that they would be excluded from the course if their results are not satisfactory.

Assessments

The nursing students’ vision was the improvement of the standard of setting biological science. It was also the nursing students’ vision to be given scope for the examinations as they believed this would improve their biological science performance.

Delivering ‘what will be’

The following question was asked: If you could make any recommendations or suggestions from a student’s point of view to improve the outcomes in the subject biological sciences what will it be? (Table 4).

Table 4: Summary of the themes, categories and sub-categories of “Delivering”

Themes	Categories	Sub-categories
Management responsibility	Provision of resources	<ul style="list-style-type: none"> • Nurse educators • More material resources
	Revise admission criteria	<ul style="list-style-type: none"> • Admit young nursing students
	Infrastructure	<ul style="list-style-type: none"> • Suitable environment • Nurses’ home residences
Nurse educators’ responsibilities	Competent nurse educators	
Students’ responsibilities	Self-study	
Programme organisation	Balance content with time	<ul style="list-style-type: none"> • More periods (morning periods) • Extra remedial classes
	Assessment methods	<ul style="list-style-type: none"> • Study guide layout • More formative assessment opportunities • Reasonable examination questions

Management responsibility

Some nursing students' recommendation for improving the performance in biological science involved certain responsibilities that must be taken by the NEI management. Their recommendation involved provision of resources in the form of more nurse educators and more material resources. One nursing student recommended the revision of the admission criteria at the NEI by admitting young nursing students. Some nursing students recommended that some infrastructural issues should be attended to by management like the provision of a suitable learning environment in the form of classrooms and the provision of nurses' residences.

Nurse educators' responsibilities

The nursing students recommended a number of aspects that were organised under the theme 'Nurse educators' responsibilities'. The recommendations were thus grouped together under one category, namely, 'Competent nurse educators'. According to the nursing students, competent nurse educators should facilitate biological science in a more visual manner, that is, by including more laboratory experiences and making use of visual aids like videos.

Students' responsibilities

Some recommendations that emerged from the nursing students were grouped under the theme 'Students' responsibilities'. The focal point of these responsibilities revolved around students dedicating themselves to their studies by doing self-study. The self-study recommendation focused on nursing students doing their own revision of biological science for their performance to improve.

Programme organization

The purpose of 'Programme organisation' was to reduce the workload of biological science. The nursing students recommended that the time for presenting the biological science content should be balanced with the amount of content presented. Regarding the balancing of content with time they recommended an increase of the biological science periods and that these periods should be in the morning. Some nursing students recommended that remedial classes be arranged for those students who do not understand biological science. An improvement in the layout of the biological science study guide was recommended by some of the nursing students.

Assessment methods

Recommendations related to assessment methods included more formative assessment opportunities as a way of improving the biological science performance of the students. A number of recommendations were made by the nursing students that related to 'reasonable examination questions'.

Discussion

The most satisfying aspects of biological science as identified by the nursing students should be carried forward to influence the academic performance of biological science positively through the use of the following strategies:

Accompaniment of students by biological science educators to promote understanding of the structure, function and pathology of body parts of real patients

The biological science nurse educators should accompany their nursing students to the various clinical areas to enhance understanding of biological science during actual patient care. The nursing students indicated that the use of biological science knowledge during clinical care promotes understanding of the subject. Therefore, nurse educators should assist those nursing students who are unable on their own to apply biological science in patient care. The nursing students should be assisted to state the area affected by the diagnosis and its functions. This will promote understanding of the clinical manifestations of the patient and nursing care. In this way the nursing students will actually realise and fully understand that biological science is, in essence, the foundation of nursing. Also, to improve the nursing students' skills, they should be encouraged to indicate the structure and function of the area where the skill is performed.

During the accompaniment process nursing students should also be given biological science assignments and case studies related to the patients they are nursing. The use of such patient-related assignments and case studies will promote understanding of the scenarios during formative and summative assessments.

NEIs should admit students that have a strong background of life science

Knowledge of life science (biology) enhances understanding of biological science and better performance as stated in the nursing students' positive stories. Nursing students with higher life science symbols like a 'D' and higher should be admitted to the four year comprehensive nursing programme.

Appointment of dedicated, supportive and passionate educators

NEIs should strive towards appointing educators who possess the above mentioned characteristics. For the nurse educators who are already in the system these characteristics should be nurtured through staff development. Nurse educators should be capacitated in the use of facilitation strategies that promote fun and active participation from the nursing students.

The dedicated, supportive and passionate educators should continue promoting and encouraging the nursing students since a supportive educational environment enhances learning. Nurse educators should be cautious though not to make the extra classes during weekends and public holidays compulsory for all the nursing students as this may displease those who feel they understand biological science. The nurse educators who demonstrate passion when facilitating biological science should also be videotaped and the compact discs (CDs) of biological science facilitation should be kept at the NEI. These CDs can then be used by the nursing students of the various campuses of the NEI. This will facilitate exposure of the various campuses' nursing students to the particular facilitation strategies of the nurse educators from the different campuses. For those nursing students who do not understand or fully comprehend what is discussed in class, viewing the CDs in their own spare time when they can concentrate and focus will be emboldening. Nursing students should also watch these CDs during their group study sessions followed by a group discussion. This will promote E-learning opportunities at the NEI.

Regular biological science formative assessments

It was communicated by the nursing students of the most under resourced campus that other formative assessments were written to promote understanding of biological science. These were the quiz test and assignments respectively. All the NEI campuses should implement similar helpful formative assessment strategies to enhance the nursing students' understanding of biological science. Drawings should also be included in formative assessments as they are part of summative assessments. For clarity purposes these drawings should be in colour as it was indicated by the nursing students that they found black and white drawings to be confusing.

It is also recommended that the NEI should attend to the nursing students' wishes by providing more practical facilitation and learning opportunities that should make the already interesting content even more interesting and satisfying. The NEI should strive towards providing the educational resources as identified in the nursing students' dreams. Living in a time where technology is at the forefront of all knowledge and advancement, most young people are technologically skilled and adept. It is therefore essential that the nursing

students are provided with a more hands-on approach through interacting with the various technological educational aids. The EC DoH should assist the NEI by providing it with more funds to acquire the necessary educational resources.

The NEI should also consider prescribing one simple book that provides the basic understanding of biological science as wished by the nursing students. Having to study one prescribed book will reduce the workload of the nursing students and influence their performance in the subject positively. Therefore, the provision of such educational resources and one simple prescribed book will lead to the realisation of the dream of an increased pass rate.

It is recommended that the design phase of AI should be used in biological science and even in other subjects studied by the nursing students. This will assist the nursing students in designing their own biological science vision, mission and core values. Then the stakeholders (the nursing students and the nurse educators) should frequently evaluate to determine whether they are performing according to the core values of realising their visions. This will promote introspection on the part of the stakeholders and timeous adjustment of activities where necessary. The core values for both the nursing students and the nurse educators should be positive language and attitude, dedication through reading and research, and making biological science a fun subject to study.

The aspect of improving setting of test and examinations should be part of the nurse educator capacity building sessions. In these sessions the issue of the scope for examinations should be discussed so that the NEI can have some guidelines regarding the scope for examinations. The nursing students' recommendations could be achieved by the NEI through implementing the following recommendations.

Appreciative evaluation sessions of biological science

The destiny of the subject biological science should be based on the involvement of all the relevant stakeholders as identified by the nursing students. These stakeholders are the NEI management, the nurse educators, and the nursing students. There should be appreciative evaluation sessions of biological science.

During the evaluation sessions the stakeholders should focus on positives, solutions and team work towards improving biological science academic performance. The evaluation sessions may also render information as to what needs to be changed and how it can be changed. That is, what can be done better and differently to improve the academic performance of the subject biological science.

Provision of appropriate infrastructure

In line with the recommendations of the nursing students and based on evaluation made by the various stakeholders of the NEI, the identified projects and activities should be implemented towards improving academic performances in biological science. These should include provision of appropriate infrastructures like adequate classrooms and nurses' residences which would promote adequate facilitation and studying opportunities.

Provision of material and human resources

More nurse educators should be employed to improve the student nurse/educator ratio. If this is not possible the number of students per intake should be reduced. Collaborative approaches among the EC DoH, the NEI, the clinical areas in the EC and the one affiliated university to develop identified professional nurses to become nurse educators should be continued. This approach will in the long run produce the required number of nurse educators for the NEI.

The competencies of the nurse educators should be assessed periodically through the performance management system of the NEI. Appropriate remedial measures should be taken where gaps are identified. The nurse educators should also be encouraged to continually update themselves through research and reading. These measures will ensure that the competencies of the nurse educators are always up to date.

Competent biological science facilitation should be through cadaveric exposures of the students. The EC DoH through its' research and epidemiology section should assist the NEI towards legally obtaining permission to expose the biological science students to cadaveric exposures.

Guiding nursing students regarding effective study strategies

The nurse educators should guide the nursing students regarding effective study strategies like commencing studies as soon as the academic year begins or even before that, underlining important aspects, and summarising when reading and studying as individual and groups.

Evaluation of biological science structure including study guides

Nursing students should be orientated on how to use the study guide as some students indicated that the study guides are useful and others felt that they must be improved. All relevant stakeholders like nursing students and nurse educators should evaluate the prescribed books and study guides periodically to determine whether it still adds value to the education process. As the study guides are

reviewed yearly the inputs of the nursing students should be considered during these reviews. Also, nursing students and all the relevant stakeholders should be given an opportunity to evaluate the entire biological science structure. This will give the stakeholders the opportunity to identify strengths, weaknesses and areas in need of improvement. The nursing students, for example, came up with a number of biological science workload reduction suggestions. An evaluation of the feasibility of these workload reduction strategies should be done so that the best ones can be implemented through the correct channels.

Evaluation of biological science assessments

A number of assessment related recommendations came from the nursing students. Therefore, an evaluation of the biological science assessment practices should be done by its stakeholders. This evaluation session can be done in the form of a workshop. The workshop should cover aspects like the phrasing of questions, constructing scenarios, setting assignments, calculation of specification tables, compiling a marking guide, and marking of test and examinations. Newly appointed nurse educators should be inducted on these aspects. All this could be done to ensure that biological science assessments are fair; fair assessments may lead to the positive biological science performance of the students.

Monitoring of assessment practices

The responsible managers should monitor adherence to agreed assessment practices across the NEI campuses. The emphasis during this monitoring should be on the formative assessment practices of the various campuses of the NEI. This monitoring is essential to ensure that there are similar assessment practices at all the campuses. The managers should also ensure that assessments are according to the course outcomes and study guides.

Conclusion

Several factors are affecting the academic performance in biological science among students in a nursing education institution in the Eastern Cape Province. The main factors identified were biological science content, characteristics of educators, educational strategies, resources and biological science assessments. The various stakeholders, namely, nursing education institution management, nurse educators, nursing students and Eastern Cape Department of Health should be involved in the designing, planning and assessment of the biological science subject in order to ensure a positive attitude and better performance in the subject among nursing students.

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