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Factors Affecting Academic Performance of In-service Students in Science Education: A Case of the University of Zambia

By

Foster Chilufya[1] and Daniel Ndhlovu[2]

1.

2. University of Zambia, Zambia, daniel.ndhlovu@unza.zm

ABSTRACT

The study sought to determine factors that affected academic performance of in-service students in Science Education Degree Programme at the University of Zambia. The study was motivated by the knowledge gap as to why it was common in Science Education at the University of Zambia for both school leavers and in-service students to be excluded from school, repeat courses or change to non-science programmes due to poor academic performance. In order to have in-depth understanding of the phenomenon being studied, a case study design was used. Both qualitative and quantitative research methods were used to collect data from 88 respondents. Simple random and purposive sampling procedures were used to select the study sample. 80 students were selected by simple random sampling procedure. This procedure was used in order to allow all the students to have an equal chance to be selected for the sample. Purposive sampling procedure was used in order to select the lecturers and tutors. The procedure was used to select the lecturers and tutors because they were the only ones with adequate knowledge about Science Education Degree programme at the level of lecturers which the researchers were inquiring. The study findings showed that several factors adversely affected academic performance of the in-service students who were studying Science Education Degree programme at the University of Zambia. These included; inadequate supportive lecturer-student relationship, combining Science with Mathematics in one programme, dilapidated classroom infrastructure especially the laboratories, too much content in the curriculum of which some was considered irrelevant to what was taught in schools, personal life problems and responsibilities, pace at which material were being delivered in class was too fast for them, poor attendance to lectures and laboratories by students themselves. In addition, students were stressed by their own poor

academic performance and had difficult to comprehend advanced concepts in Mathematics. Based on these findings, the study recommended that (i) the School of Education should introduce a programme in Science Education specifically for students training to be teachers of Science, (ii) review the current curriculum so that its content relates with what is taught in schools, (iii) in order to support the students who felt the pace of delivery was too fast for them, there was need to encourage group discussions among them, (vi) the School should provide a conducive learning environment by repairing classroom infrastructure and providing adequate learning materials.

Key Words: Academic performance, in-service students, motivation

BACKGROUND TO THE STUDY

Worldwide, a number of in-service students are pursuing university education (Mc Innis, 2001). However, Taniguchi & Kaufman (2005) noted that although the number of in-service students pursuing university education was increasing, it was not the same with Science related programmes. In addition, the few who enrol in Science related programmes did not academically perform well. In 2002 for instance, the population of mature–age students between 40 and 49 years that enrolled in Australian universities was 4,975. Their academic performance measured by class attendance, course work and examination scores fell below the pass grade. As a result, at the end of the first academic year, approximately 27% of them failed or withdrew from the programme (Lukie, Broadbent & Maclachlan, 2004). The question that arose was why do mature-age students who had been teaching the subject do so badly to the point of failing or withdrawing from the Science Education Degree programme? In search for answers to this question, Krause et al. (2005) conducted a study and found that a number of factors negatively affected the academic performance of mature –age students. Some of the factors included students' demographic characteristics, psychological characteristics, prior academic performance, social and institutional factors.

The situation of having fewer students enrolling for Science Education degree programmes and their poor academic performance was not different in Zambia. For instance, over the past five years, the academic performance of in-service students who enrolled in the Science Education Degree programme at the University of Zambia had not been good and raised a lot of concern in the students themselves and generally among academic staff in the university.

At the end of first year and subsequent years their status was characterised by proceed and repeat, withdrawn or exclude. As a result, the number of in-service students graduating in Science Education at the University of Zambia has not significantly increased as compared to the non-science programmes. The effect of the small numbers of graduates in Science Education degree programme can be seen by shortages of Science teachers, especially in Secondary schools.

In response the government's demand for more Science teachers in schools, the University of Zambia in 1999 introduced a programme specifically for in-service Science teachers in the School of Education. The programme was called Bachelor of Education Mathematics and Science (BEMAS). It started as a project by the University of Zambia in conjunction with the Ministry of Education. The total number of students enrolled in 1999 was eighty (80) and all of them were sponsored by the Ministry of Education. The academic performance of this cohort of students in BEDMAS programme was not satisfactory. As a result, almost half of them failed. Over the years, the name of the programme changed to Bachelor of Education Secondary (B.Ed Secondary). However, the academic performance of students in this programme has not improved. It has been a common practice in the Science Education programme at the University of Zambia for in-service students to be excluded from school, repeat courses or change to non-science related programmes due to poor academic performance. The situation raised concern among students themselves and other stakeholders. The questions that searched for answers were why should in-service students who had done initial training and had been teaching the subject or course for a number of years fail the same course when they came to be taught at the University of Zambia? Was there a big difference between what they taught in schools and what they were taught at the University of Zambia? The expectation was that in-service students had prior knowledge of the course by virtue of their previous training, had taught the course in schools and were driven by both intrinsic and extrinsic motivation. Similarly, Spence et al. (1983) found that in-service students were usually driven by intrinsic motivators such as need to raise their academic status and self-actualisation. Additionally, every student enrolled into a university study programme including Science Education Degree programme with a purpose of achieving by obtaining a degree. The drive to achieve is what Spence (1983) calls achievement motivation. Achievement motivation is a conscious process in which a decision on how to act or not is

made. Similarly, it was found by Wloodkowski (1985) that achievement often brought benefits and pride while failure brought shame in students. If in-service students had inherent desire to achieve, why did they perform poorly in the Science Education Degree programme? In order to determine answers to this question and those asked earlier, it became apparent to conduct a case study of the University of Zambia.

STATEMENT OF THE PROBLEM

It was a common feature in Science Education at the University of Zambia for both school leavers and in-service students to be excluded from school, repeat courses or change to non-science programmes due to poor academic performance. This situation raised concern in the researchers. Particular interest was in in-service students because these students were believed to enrol into Science Education Degree programme with clear purposes (Spence, 1983). What was not known were factors that contributed to poor academic performance in Science Education programme by in-service students at the University of Zambia.

Purpose of the study

The study sought to establish factors that contributed to poor academic performance of in-service students in the Science Education Degree programme at the University of Zambia.

Study objectives

The objectives that guided the study were:

1. To determine factors that motivated in-service students to choose Science Education Degree programme at the University of Zambia
2. To establish factors that contribute to poor academic performance by in-service students in Science Education Degree programme at the University of Zambia
3. To determine how the challenges, if any that negatively affect academic performance of in-service students in Science Education Degree programme at the University could be addressed.

Research Questions

The study sought to answer the following questions:

1. What factors motivated in-service students to choose Science Education Degree programme at the University of Zambia?
2. What factors contributed to poor academic performance of in-service students in Science Education Degree programme at the University of Zambia?
3. How can the challenges, if any that negatively affect academic performance of in-service students in Science Education Degree Programme at the University be addressed?

RESEARCH METHODOLOGY

Research Design

Since the study sought to have an in-depth understanding of factors that adversely affect academic performance of in-service students in Science Education Degree programme at the University of Zambia, a case study design was used.

Study Population

The study population was all in-service students pursuing the undergraduate degree in Science Education Degree programme at the University of Zambia, all lecturers and tutors in the Department of Mathematics and Science Education in the School of Education.

Study Sample

The sample had 88 respondents consisting of 80 in-service students pursuing Science Education Degree programme, four (4) lecturers that taught the students in the sample and four (4) tutors that conducted tutorials to the sampled students.

Sampling Procedure

Simple random sampling procedure was used to select the in-service students in the sample. This procedure was chosen because it allows equal chance for the respondents to be selected for the sample. Since the lecturers and tutors for these students were few and only ones meeting the characteristics desired for the study, purposive sampling procedure was used.

Instruments and procedure for data collection

Two research instruments were used. These included semi-structured questionnaire and interview guide. A semi-questionnaire was chosen because it allowed same question items to be asked to all in-service students that participated in the study without alterations. In addition, a semi-structured questionnaire enabled the researchers to collect both qualitative and quantitative data. Interview guide was chosen for the study because it allowed the researcher to ask follow up questions that could not be asked if a questionnaire was used. Interview guide was used to get qualitative data from lecturers and tutors.

Reliability of the study findings

The use of the two instruments (semi-structured questionnaire and interview guide) in data collection allowed for triangulation which helped to ensure that study findings were reliable.

Data Analysis

As regards data analysis, thematic analysis was used to analyse qualitative data. Thus, similar themes were grouped together and described while Statistical Package for Social Sciences (SPSS) was used to analyse quantitative data in order to generate graphs in an accurate and fast way

Ethical considerations

In order for the respondents to get involved in the study, they gave consent. To ensure that confidentiality was upheld, respondents were assured that their names would remain anonymous. In addition, respondents were told that in case they felt they could not continue participating in the study they were free to withdraw. They were also told that the results of this study may provide evidence of the need for curriculum review of the Science Education Degree programme.

FINDINGS AND DISCUSSIONS

This section presents and discusses findings based on the following research questions:

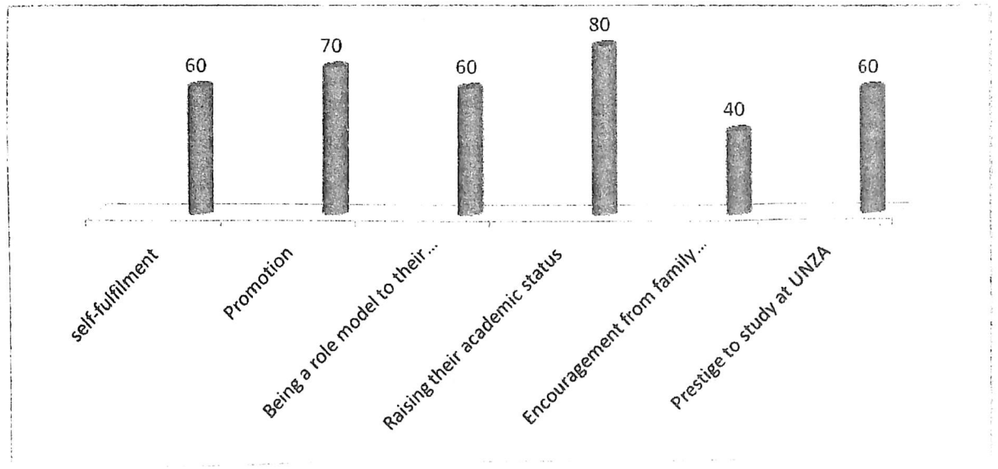
1. What factors motivated in-service students to choose Science Education Degree Programme at the University of Zambia?

2. What factors contributed to poor academic performance of in-service students in Science Education Degree Programme at the University of Zambia?
3. How can the challenges, if any that negatively affected academic performance of in-service students in Science Education Degree Programme at the University be addressed?

Factors that motivated in-service students to choose Science Education Degree programme

The study found that several factors motivated in-service students to pursue studies in Science Education Degree programme at the University of Zambia. The factors included: successful previous performance at diploma level of training, need for self-fulfilment, promotion at their work places, becoming role models to their children, raising their academic status and encouragement from family members. Additionally, to some, it was prestigious to study at the University of Zambia. A distribution of factors that motivated the in-service students to choose Science Education Degree programme at the University of Zambia is shown in figure 1.

Figure 1: Motivators to Students' Choice of Science Education Degree Programme at UNZA



On the basis of these results, it is clear that several factor motivated the in-service students to choose Science Education Degree Programme. These results also indicate high levels of motivation in the in-service students. In addition, results imply that apart from those who

were encouraged by their family members, the rest were intrinsically motivated to choose the Science Education Degree programme. To the contrary, Kantanis et al. (2000) found that the strongest indicator for student choice of study programme was the social influence he or she had from family, friends and peers. In this study, respondents were more motivated by intrinsic than extrinsic (social influence) factors to choose the study programme. Could this have been one of the consequences of their poor academic performance? The response to this question may be yes and no. Alluding to this fact, one of the students said,

> *"I chose Science Education Degree programme because I thought that by doing the course my financial and academic status will go up."*

Success in Science related subjects at diploma level of education motivated most of the students to choose Science Education degree programme at the University of Zambia. For example, one student said,

> *"I chose Science Education Degree programme because my performance at grade 12 and diploma levels of education were very good."*

The preparatory education at diploma level of education had influence in their decision to study at the University of Zambia. In addition, it was found that the good performance at lower level of education such at grade 12 and diploma provided pre-requisite knowledge in higher learning. On this premise, in-service students were expected to perform well in the Science Education Degree at the University of Zambia. This expectation was consistent with that of McClelland and Kruger (1993) who found that pre-requisite knowledge was relevant for good academic performance in the Science related study programmes. However, findings from the University of Zambia lecturers contradicted the views of McClelland and Kruger. They argued that pre-requisite good academic performance was not a strong predictor of university academic performance. One of them said,

> *"Even if some of the in-service students were motivated to choose Science Education Degree Programme based on their academic performance at grade 12 or diploma levels of education, others proved to perform poorly due to the differences between pre-university and university study environments. In addition, it is common to find that students who performed very well at diploma level of education performing poorly in Science at university level of education."*

The views of lecturers at the University of Zambia were consistency with those of Mackenzie and Grow (2004) who found that pre-university performance was not a strong predictor of university academic performance. The researchers were left wondering as whether the belief that good pre-university performance was a good indicator of their university achievement was true to their actual performance in the programme. As a result, further inquiry was done among lecturers and tutors in order to determine academic achievement of in-service students in the programme. In response, both lecturers and tutors indicated that academic performance of in-service students in Science Education Degree programme was average. Similarly, Cantwell et al. (2001) found that in-service students were thought to be highly motivated to succeed due to their maturity with life issues and experience in study skills but when it came to actual achievement, they were found to have performed poorly due to over-dependence on their past experience in teaching. It was clear that pre-university training was not a best predictor of good academic performance of students. The researchers then proceeded to determine factors the contributed to poor academic performance of in-service students.

Factors that Contributed to Poor Academic Performance of In-service students in Science Education Degree Programme

As regards to factors that contributed to poor academic performance of in-service students in Science Education Degree programme, it was found that several factors existed. Some of them include: inadequate supportive student-lecturer relationship, combing Mathematics with Science, lack of adequate maintenance and repair of classroom infrastructure and school requisites such as learning materials, water and electricity. In addition, other students found it difficult to apply the knowledge acquired within a short time because the topics had too much content. In addition, being in-service students had a lot of life's problems to attend to. When asked if they were happy with their academic performance, 91% of them indicated that they were not happy with their results as they were not good. In cross checking this finding with those of the lecturers and tutors, similar views were indicated. The findings clearly showed that 91% of the in-service students did not perform well in Science Education degree programme. This poor performance was attributed to many other factors. Among others were: that in-service students struggled with the pace at which the material was presented, had difficult to comprehend the subject, poor attendance to lectures, tutorial and laboratories also

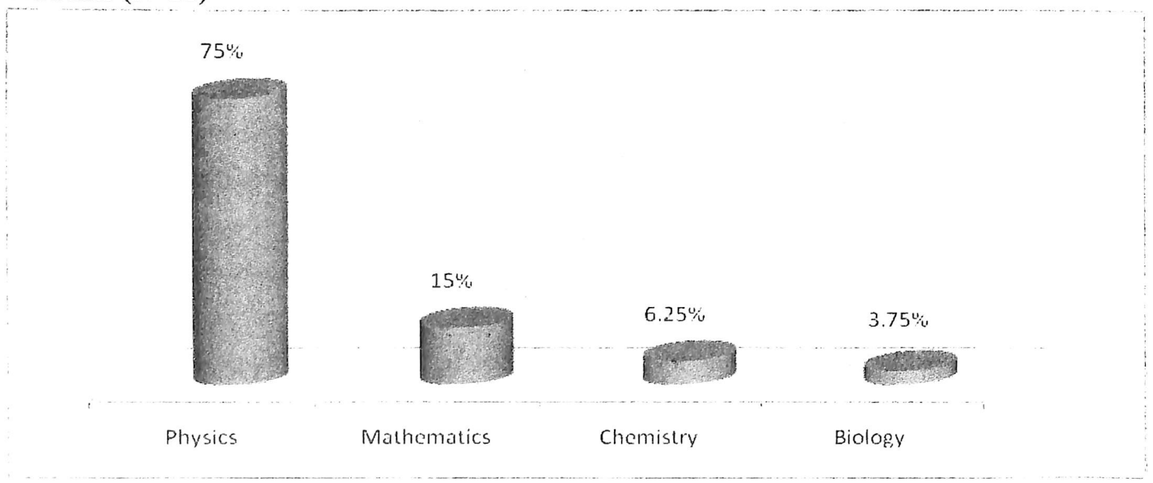
negatively contributed to their poor academic performance. High levels of stress and difficult to understand advanced concepts posed a challenge to their achievement. One of them said,

> *"Science like Mathematics is proving difficult because they difference between what I have been teaching and now learning is too much. What we learn here does not relate to what is taught in schools. It is like we are just being tortured with difficult materials we shall not even use when we go back to our schools. Do these lectures know what is taught in schools? If they knew they would have been teaching us material related to secondary school curriculum."*

To some extent these views by students made sense as they were similar to those of Tinto (1993) and West et al. (1986) who found that academic integration with out-of class reality or materials to be a significant predictor of good academic performance. It therefore, implies that the degree of relevance of what is taught in class is very key to academic success.

Students were further asked to rank the subjects or courses in order of how they found difficult with each of them. They ranked Physics as the most challenging course to them. See figure 2.

Figure 2: Level of Difficulty in Science Education Degree Programme Courses by Students (N=80)



On the basis of these findings, it is clear that Physics and Mathematics course posed a big challenge to the students pursuing Science Education Degree programme at the University of Zambia. The reasons advanced by students were that Physics was supposed to be understood at three levels namely: the law, concepts and a combination of the law and concepts to solve a

practical mathematical problem. In other words, Physics required a lot of mathematical involvement and understanding. Additionally, students indicated that Mathematics was difficult to them because at secondary school and college (grade 12 and diploma levels of education), they did Ordinary level mathematics ('O' level) but when they came to the university, they did Advanced level of Mathematics ('A' level). If lecturers and tutors can realise that there is a gap between what is taught in schools and the university it may help to use teaching methods that emphasise students' active participation in the lessons. Similarly, Lucas (1990) found that students learn more by doing, making, writing, designing, creating and solving. Therefore, active involvement by students in the learning process is a key element to their academic success.

As rightly put by Sass (1989) students motivation to learn and their good academic performance also depends on enthusiasm of lecturers and relevance of the material taught, organisation of the course, appropriate content of the material, active involvement of students, variety of teaching methods, rapport between lecturers and students and appropriateness of examples used by lecturers.

As regards content of curriculum, findings of this study showed that curriculum content and workload given to the students negatively affected their academic performance. Most (78% of the respondents (students) indicated that the curriculum content in some case did not relate to what was taught in schools and workload in Science courses was too much resulting in their poor performance. Triangulating the views of students with those of lecturers, it was found that lecturers also alluded to the fact that content was too much for the students. For instance, one lecturer said,

> *"In-service students were hard working but were negatively affected by too much content to cover in a semester. Compounding the problem was the fact that some of them left school many years ago."*

Implication of these views is that lecturers must ensure that the levels of students' motivation are maintained. A similar view was also expressed by Erickson (1978:3) who reported that,

> *"Effective learning in the classroom depends on teachers' ability to maintain the interest that brought the students to the course in the first place."*

If the levels of motivation are therefore maintained by what goes on in the teaching and learning process, the performance of students may be improved regardless of how challenging the course is.

As regards delivery of material by lecturers similar findings were reported by Tito (1993) who found that students struggled with pace at which material in the undergraduate science was presented. It was observed that students became discouraged and ended aiming at just clearing the course as they did not have hope of getting better grades. To this effect, one of them said,

> *"I feel so discouraged with this poor performance that I now just aim at clearing the course rather than getting a merit. With this experience, I do not know if I can recommend someone else to come and do this programme. Why should one come, suffer and in the end fail like this."*

This lamentation clearly shows that something was not well with regards to the performance of students in Science Education Degree programme. Their motive for enrolling in Science Education programme was not being realised due to their poor academic performance. The findings by McMillan and Forsyth (1991) may provide the way forward here. They found that students learn best when incentives for learning in a classroom satisfy their own motives for enrolling in a programme.

Concerning the combination of courses, findings show that most (80%) of the students were of the view that Mathematics be studied on its own as a Major while Science (Biology, Chemistry, and Physics) be studied individually as independent majors and not a combination of all of them. The reasons advanced by the students were that at diploma level of education their area of specialisation was Science Education. Mathematics was done to help them understand mathematical concepts in Physics and Chemistry. They therefore, expected that when they enrolled at the university they would learn Mathematics for application in the Science subject areas and not the 'A' level Mathematics they were subjected to. They noted that the combination of Mathematics and Science contributed to the academic stress they went through in the process of learning new and difficulty concepts in Mathematics.

Despite all these negative factors that negatively affected academic performance of in-service students in Science Education Degree programme, there were still positive factors that were appreciated by students. These included: group discussions, consultations with lecturers, participation in research, family and peer support, encouragement from lecturers and tutors, feedback on work done, motivation from graduates of Science Education programme. These positive factors appeared to inspire the in-service students to keep working hard even though they encountered problems contributing to their poor academic performance.

Measures to address challenges faced by in-service students in Science Education

The study found that several measures could be used to address challenges in-service students face as they study the sciences. These included: reviewing the curriculum to make it relevant to what was being taught in schools, reducing the topics offered to the students so that they could have enough time to study, providing latest study materials in science, providing introductory lectures, letting students specialise in one of the Science courses while Mathematics being a separate major. In addition, there is need to provide necessary equipment, and adequate teaching materials for practical lessons.

Concerning reducing the curriculum content and workload, all the in-service students that participated in the study felt it would help reduce on the amount of stress that they faced. Triangulating this view with that of the lecturers, it was found some lecturers also suggested that it would be better to exempt in-service students with diploma in Science Education from first and second year courses so that they begin the degree programme in third year. This measure of exempting relevant diploma holders from first and second year courses was not going to be new as it was already in existent in the other university degree programmes.

As regards curriculum review, all the respondents (students, lecturers and tutors) indicated that it was necessary. To this effect, one of the tutors said,

> *"Reviewing curriculum is definitely needed. Surely, how can we continue with a curriculum which is not relevant to the needs of students and schools? This is why the failure rate is high even for in-service students with teaching experience and prior training in Science."*

Lecturers also pointed out that they were understaffed as result quality of delivery of the courses was somehow compromised. To this effect, one of the lecturers said,

> *"We are understaffed in Science Education degree Programme as a result, students are not given adequate support. We partly attribute their poor academic performance to understaffing."*

In order to address this challenge, they suggested that more lecturers in Science Education programme were needed. It was delighting to note that the study found measurers to address the challenges contributing to poor academic performance in Science Education Degree programme by in-service students.

CONCLUSION

The study sought to determine factors that contributed to poor academic performance of in-service students in Science Education Degree programme. Several factors were found. These included: inadequate supportive lecturer-student relationship, combining Science with Mathematics in one programme, dilapidated classroom infrastructure especially the laboratories, too much content in the curriculum of which some was considered irrelevant to what was taught in schools, personal life problems and responsibilities, pace at which material were being delivered in class was too fast for them, poor attendance to lectures and laboratories by students themselves. In addition, students were stressed by their own poor academic performance and had difficult to comprehend advanced concepts in Mathematics.

RECOMMENDATIONS

Based on the study findings, the following recommendations were made:

1. In order to make the curriculum relevant to what is taught in schools, curriculum review was necessary.

2. Instead of combining Science and Mathematics into one Major, Mathematics should be a separate major while in the Science Education Degree programme only relevant applied Mathematics was necessary.

3. In order to address the shortage of staff, the University management should recruit more staff in the area Science Education Degree Programme.

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