Bridging The Gap: Addressing The First Year University Mathematics And Statistics At Vaal University Of Technology, South Africa

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ABSTRACT
Vaal University of Technology (VUT) has developed a number of initiatives in order to deal with the delivery of first year mathematics and statistics courses (mathematics 1, mathematics 2 and quantitative techniques/statistics). Students entering Higher Education (HE) are often overconfident in terms of their projected academic performance yet lack the necessary mathematical skills. Hence, their confidence does not translate into automatic academic success. The Centre for Academic Development (CAD), Accounting Department (AD) and the Mathematics Department (MD) at VUT have implemented a variety of strategies to address these issues. This article is a response to the fast growing number of first year University students who are underprepared for mathematics and statistics modules at VUT. Outreach to surrounding high schools so as to promote interest in mathematics is recommended.

Key words: first year, mathematics, statistics, initiatives, centre for academic development.

INTRODUCTION AND BACKGROUND
Vaal University of Technology (VUT) was established in 1966 firstly as a College of Advanced Technical Education (1966-1979) then as Vaal Triangle Technikon (1979-2003). VUT has grown in stature as a higher education institution, drawing students from all over the country and abroad. It is one of the largest residential Universities of Technology, with approximately 17 000 students (www.vut.ac.za). Students from disadvantaged educational backgrounds as well from privileged backgrounds generally enter Higher Education (HE) with insufficient knowledge and skills required for studying key areas such as mathematics (Paras, 2001; Howie and Pietersen, 2001). Underprepared students do not possess the necessary language or mathematical proficiencies required for HE or may have gaps in the foundational disciplines knowledge. University tasks present major challenges for the underprepared students (Hardman and Ng’ambi, 2003).

According to Greene and Foster (2003) approximately two-thirds of recent high school graduates enter HE each year underprepared academically for University-level material.

This article describes efforts by the Centre for Academic Development (CAD), Accounting Department (AD) and the Mathematics Department (MD) at VUT to enhance learning experience of students in their first year mathematics and statistics courses. Particular emphasis is placed on the role of Mathematics Centre at VUT; work done by MD and motivational seminars done by the First Year Experience (FYE).

CURRENT INITIATIVES BY VUT

1. CENTRE FOR ACADEMIC DEVELOPMENT (CAD)

The CAD Department has various initiatives they are providing to first year mathematics and statistics students through the following units: Mathematics Centre and First Year Experience.

MATHEMATICS CENTRE
Mathematics Centre (MC) is a facility offered at VUT to help registered students in addition to their normal classes of teaching through tutorial classes, consultation (one-on-one and small group) and examination revision sessions. MC offers free support to all registered students through well-designed tutorial classes, one on one consultation and small group consultations, where necessary, examination revision classes, extra classes, and developing and using tools that will improve understanding. The aims and objectives of the MC is to ease transition of all students to HE courses with a significant numerate component and also to provide non-judgmental support for students outside their teaching time with the aim of improving mathematics and statistics pass rate and success rate.

Other objectives is to support students who are struggling with the mathematical and statistical components of their studies and to aid departments who wish to refer students to the MC when specific needs for tutorial or remedial work arise. The MC assists students in developing fully their mathematical knowledge and skills and to help raise their mathematical confidence and also provide one on one support for any student of the University with mathematics difficulties no matter how small it is.

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At the beginning of the year, all first year students are encouraged to write a diagnostic testing which covers a range of questions from high school to maths 1 work. The purpose of the test is to identify students early who need extra help (Early Warning System). The diagnostic test is used to check for student readiness to begin maths 1 course. The test will inform if students are well prepared for HE maths. All students who fail to meet 50% mark are referred to MC for further help during the course of the semester.

**FYE SEMINARS**
First Year Experience (FYE) at VUT is held twice a year to motivate students with aim of good retention and success of first year students. The role of FYE is to assist first year students’ transition from high school to University life. Motivational speakers are invited to address first year students with the aim of motivating them on their studies. For applied sciences and engineering faculties where all students are doing mathematics, MC is invited to such seminars to motivate students.

**2. MATHEMATICS DEPARTMENT**
The following are the initiatives adopted by the Mathematics Department (MD):

**REMEDIAL**
There are consultations – open door policy- where students just walk into the office of the lecturer to consult and also extra lessons which are usually 1 hour allocated per day to attend to students’ problems by assigned lecturers. The MD also offers winter and summer schools for those preparing for the second opportunity examinations.

**INCORPORATION OF TECHNOLOGY IN THE LEARNING PROCESS**
Whilst there is no blanket policy on the use of technology, lecturers are encouraged to apply and to keep abreast with the trends of the use of Information Technology in the learning process.

**EXPOSING FIRST YEAR STUDENTS TO UNIVERSITY LIFE**
In coming first years are inducted /orientated by an assigned lecturer who is called a mentor. The duties of the mentor are to guide on study habits and expose the students to the expectations of the department.

**BRIDGING COURSES**
Eight hours are allocated at the beginning of the semester for Mathematics 1 in trying to bridge the gap in high school maths and college maths through doing revision of algebra and functions. The emphasis being to strengthen the foundation and to link the basic concepts to the topics they will cover.

**CHALLENGES OF LARGE CLASSES**
Many Universities, including VUT, have to accommodate large classes in mathematics and statistics courses. The large classes in many cases contain more than 80 students. This poses extra challenges for the lecturer in dealing with such large numbers. In particular, it is especially demanding for the lecturer to engage with such a large group and create an atmosphere of interaction (Hardman and Ng'ambi, 2003). MD staff at VUT who have experience teaching large groups use a variety of approaches to enhance the learning experience of students in these classes and have developed methods specific for instruction of these courses (Jungic, Kent and Menz, 2006).

**3. ACCOUNTING DEPARTMENT**
This department offers statistics module called Quantitative Techniques. All first year Management Sciences students are supposed to do this module. As most students were struggling with this module, the department invited Mathematics Centre to offer a supplementary course called ‘Numeracy Skills’. The Numeracy Skills course cover topics such as arithmetic operations, percentage calculations, indices, equations and graphs and is offered to students once a week for 1 hour/class.

This programme intervention was formed with the following purposes which include developing learners’ knowledge, skills and values, motivating and encouraging learners to like statistics and numbers in general and also to build learner’s confidence.

**RECOMMENDATIONS**
- Outreach to surrounding high schools so as to promote interest in mathematics is necessary (thus bridging the gap).
- The use of clickers and other technologies especially for large classes will help lecturers interact with students.
- A further study into the effectiveness of these interventions is recommended by the author.
CONCLUSION
In this article, the author has summarised some of the initiatives developed in the Department of Mathematics and Centre for Academic Development at VUT to enhance the learning experience of first year mathematics and statistics. The initiatives must start while students are still at high school by visiting them and motivate them and this should continue into their first year at University by offering a variety of support as mentioned in the study.

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References
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