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Exciting technical learning in large classes through personal response technology

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Abstract

The use of radio frequency personal response system (PRS) to stimulate the learning activity in large class groups has been tested and found invaluable over a period of 3 years. The paper describes the benefits of using the PRS as well as some of the logistical problems and their solutions as practiced in the Mining Department of the University of Johannesburg. The applicability of PRS particularly in technical modules is confirmed.

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1. Introduction and background

Virtually all institutions of higher learning are experiencing the economic need to increase the size of class groups. Bigger and bigger lecturer halls are being introduced in the interests of viability. With this necessity comes the downside of less interaction with students: A “lecture” is a lecture and virtually no interaction can be allowed in these large classes. Compensating lecture tutorials and supporting homework are two of many alternatives to the problem of ensuring the internalization of knowledge following the formal lecture. Of course in some types of modules and under many circumstances the lecturer is the only source of query whilst in other type modules the ever increasing responsibility is placed on the learner to do self-learning through the many avenues available. The adage “it is important that the learner learns and not so much that the teacher teaches” applies.

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This paper deals with an intervention used, together with many others, in attempting to blend tutorial work directly from the responsible lecturer during the lecturer/tutorial time. Particularly for large classes and in technical modules, there is a desperate need for direct interaction between lecturer and the individual student. The authors are of the opinion that this is particularly true in developing countries and probably at the early stages of undergraduate learning. It is also well established that students learn best from both the formal lecture with individualized lecturer interaction, as well as greatly from the interaction with peers. In the case being described a clear indication of a deeper internalization of knowledge is enumerated for both technical and non-technical types of modules as presented at the University of Johannesburg's Mining Department.

Applied technology is one of the effective methods of diminishing the negative impacts of large class groups – many systems are available to assist the lecturer in assessing progress of students and carrying out formal assessments with technology facilitated grading. At the UJ Mining Department these systems are in place and being used. The PRS system is not widely used within the UJ but the Mining Department have consistently been using the process and are convinced that broad implementation of the process has resulted in better transfer of knowledge and an excitement in the learning process that enhances “deep learning”.

From literature survey and the particularly the useful paper of Jane E Caldwell “Clickers in the Large Classroom” published in Spring 2007 it appears as if there is strong general international conviction on the benefits of using PRS clickers in the class room to facilitate teaching and learning.

The context of this paper is in tertiary education at the comprehensive University of Johannesburg. This University offers the full range of qualifications from higher certificates to post doctoral studies. The setting within the UJ for this paper is the applied technology programme of Mining Engineering Diploma. The class is made up of a broad range of demographics and social backgrounds from families of disadvantaged communities to students that have had high quality private schooling. The class size ranges from 130 in 2010 when the first trials with clickers began, to the class of 2014 with 258 students in the class. The minimum requirement of entry to the class is a Grade 12 National Senior Certificate with Mathematics and Science at 50% or more together with a 50% pass in English. Many of the students have English (the medium of instruction) as a third language. History has indicated that of the 258 students in the 2014 class about 20% although “present” in class, are virtually completely absent from class discussion, due to the fact that, despite further and further explanations, these students seem to have the feeling that they will not be successful. They seem to be completely and continuously confused. They feel that they “just can't understand” the concepts. This group has got the tendency to be sitting at the back of the class venue and they prefer not to be close to the lecturer. Their attendance is at best is passive, and many attend just because it is “compulsory”.

The objective of introducing the clickers (PRS) was to find a technique that would encourage particularly the despondent and hapless students into active participation in the class room and to develop a confidence in particularly basic understanding, while progressively moving to more complex exercises ie by keep a high level of “engagement” from all students.

The modules subjected to test particularly in 2014 are “Science Mining “ presented by one of the authors of this paper and the module “Mineral Exploitation” presented by the other author.

The modules differ considerably in that Science Mining is basically applied physics and chemistry in a Mining Engineering context. Mineral Exploitation is a module that incorporates mining technology, geology, mineral processing and mine survey. The range is therefore from hard memory based material to understanding and application content and mathematical manipulation. The modules are both at first year (post grade 12) level.

In 2009 after a visit to an education technology expo the suppliers of Personal Response System (PRS) were approached and sponsorship for the purchase of 200 clickers was obtained. These had not been used at the university at all, prior to this activity. Literature convinced the authors of the validity of making use of these clickers for several of the standard and researched reasons as recorded below:

- Maintaining a register of attendance with little effort
- Reduced or even eliminated assessment marking and feedback
- Immediate feedback to students
- Immediate feedback to the lecturer

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