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Assessment of Student Program Outcomes through a Comprehensive Exit Strategy

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Abstract

Choosing methods to assess student program outcomes is a matter of balancing best practices against the constraints imposed by the respective education authorities mainly the Engineering Accreditation Council (EAC) for engineering degrees offered by institutions of higher education in Malaysia. Methods that directly measure student learning and yield the most rigorous results are usually the most time consuming and may require the expertise of educational researchers or outside consultants. Currently, the Department of Electrical, Electronics and Systems Engineering at UKM use their classroom and existing grading practices to collect data that will contribute to assess student learning directly, but this requires extra time and effort. In addition, mechanisms to adequately report the findings need to be properly implemented. Another mechanism that could be used to assess student program outcomes is through a thoroughly designed student exit strategy. The exit strategy implemented this academic year involves two parts; exit survey and exit test. This is a Continuous Quality Improvement (CQI) effort done since the past two academic years that enables the department to assess student program outcomes directly and indirectly in one approach. The exit strategy has proven successful as a valid measurement of student program outcomes. The exit strategy which combines both direct and indirect assessment forms a comprehensive and robust tool to effectively measure student program outcomes.
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1. Introduction

Institutions of higher learning throughout the world now have recognized that a full commitment to teaching and learning must include assessment and documentation of how much students are learning and how this information can be used to improve the overall educational experience offered (Cartwright et al. 2009). Systematic assessment has become the requirement for accreditation by various accrediting organizations.

This is also true for the case of Malaysia. The Engineering Accreditation Council (EAC) is the only body granted the recognition by the Board of Engineers Malaysia (BEM) to accredit engineering degree programs offered in Malaysia. In order to achieve the accreditation, institutions of higher learning in Malaysia must provide evidence of

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quality engineering education. The minimum standards for engineering education are defined in the EAC Engineering Accreditation Manual.

One of the important aspects being evaluated for accreditation is assessment plans. The process of developing assessment plans for a certain degree program involve the development of student program outcomes, (PO), development of assignments and techniques to look into the program outcomes, as well as direct and indirect methods of measuring these outcomes (Merhout et al. 2008). Assessment can be defined as processes that identify, collect, analyze and report data that can be used to evaluate achievement (Rogers 2002). This definition also encompasses the aspect of continuous improvement or Continuous Quality Improvement (CQI).

The dilemma when determining methods to measure student program outcomes is whether to use direct or indirect method of assessments. Direct assessments provide for the direct examination or observation of student knowledge and skills (Rogers 2006). This is measured against measurable program outcomes throughout the course using exams, quizzes and reports. Through direct assessment, strong evidence of student learning can be obtained. On the other hand, indirect assessment of student learning ascertains the value of the learning experiences. Student knowledge and skills are assessed through information on their perception of learning. This may be difficult to obtain directly. Indirect measures are not as strong as direct measures. This is because through indirect measures assumptions are made on the findings and this is not easy to validate.

Different assessment methods can be mixed and combined to measure the program outcomes. Each of the methods has their own limitations and therefore the use of multiple assessment tools can provide converging evidence of student learning. Currently, the Department of Electrical, Electronics and Systems Engineering at UKM use their classroom and existing grading practices to collect data that will contribute to assess student learning directly, but this requires extra time and effort. The findings of the direct assessment has to be properly implemented to enable conclusive evidence of student learning.

Therefore, another method of assessment is suggested to complement the existing assessment practice, and this involves the design of an exit strategy. An exit strategy can involve the use of exit surveys, exit interviews and exit tests. Data from a properly designed exit strategy can be very valuable in obtaining feedback such as employee satisfaction, managerial performance, salary and benefits in a school system (Mazzei 2008). In Texas A&M University, feedback from students obtained from exit surveys has highlighted the most desirable/enjoyable aspects of a certain career orientation course organized by the university (Smith and Hallmark 2004).

In the case of the Department of Electrical, Electronics and Systems Engineering at UKM, an exit strategy is designed to obtain feedback from the final year students on their perception of student learning and achievements. For the past two years, there has been a continuous effort by the department to improve the implementation of the exit strategy. This paper will report the evolution of the exit strategy since it was first implemented two years ago, highlighting the CQI culture in practice. The findings of the most recent exit strategy is also included to highlight the success of obtaining feedback on student learning.

2. Methodology

The Department of Electrical, Electronics and Systems Engineering at UKM offers three of four-year degree programs, namely Electrical and Electronic Engineering, Microelectronic Engineering and Communication & Computer Engineering. For the purpose of monitoring the achievement of program outcomes, graduating students from every batch are asked to answer an exit survey.

In year 2008, a student exit survey based on the developed program outcomes has been created. The first exit survey was created where students have to assess their achievement of the program outcomes. Students perception are marked on a Likert scale of 1 (least achieved) to 5 (most achieved). This exit survey was implemented to graduating students of the year 2008. The twelve student program outcomes are listed in Table 1. To assess students' achievement, an average of all student responses is calculated. An average of three for each program outcome is perceived as achievement of the outcome.

For the next batch of graduating students (year 2009), the exit survey was improved. Three to five questions are developed for each program outcome (PO) and students have to select either as 'Yes' or 'No' answer based on their own response. The same twelve program outcomes are used. To analyse the survey, the number of 'Yes' or 'No' answers for each question and for each PO are calculated. From this, the percentage of 'Yes' or 'No' answers for

each program outcome can be identified. An average percentage of 60% is accepted by the department as the minimum benchmark for student program outcome achievement.

The most recent batch of graduating students (year 2010), are required to fill in a similar exit survey as well as an exit test. The exit survey used is the same as the one implemented in year 2009, while the exit test is a totally new design based on a certain number of program outcomes. The exit test is designed as a direct assessment of student learning to complement the exit survey which is based exclusively on student perception.

Table 1. Twelve student Program Outcomes (PO) that provide the basis for the exit survey for graduating students of year 2008

PO#	Program Outcomes (PO)
PO1	Ability to acquire and apply knowledge of basic science and engineering fundamentals
PO2	Ability to communicate effectively, with technical and non-technical community
PO3	Having in-depth technical competence in electrical and electronics engineering/communication and computer engineering/microelectronics courses
PO4	Ability to undertake problem identification, formulation and solution
PO5	Ability to utilize systems approach to design and evaluate operational performance
PO6	Ability to function effectively as an individual and in a group with the capacity to be a leader or manager as well as an effective team member
PO7	Having the understanding of the social, cultural, global and environmental responsibilities and ethics of a professional engineer and the need for sustainable development
PO8	Recognizing the need to undertake lifelong learning, possessing/acquiring the capacity to do so and the need to have information management skill
PO9	Ability to design and conduct experiments, as well as to analyze and interpret data
PO10	Ability to function on multi-disciplinary teams
PO11	Having the knowledge of contemporary issues in particular those related to electrical and electronics engineering/communication and computer engineering/microelectronics
PO12	Ability to use techniques, skills and modern engineering tools necessary for engineering practice

Again, the same program outcomes are used this year. In the exit test, only PO1, PO3, PO4, PO5, PO6, PO7, PO8 and PO11 are evaluated. The remaining four program outcomes are not included since they are of practical implementation and cannot be measured directly in a test. For each program outcome, three questions are prepared. These questions have been designed carefully so that student responses reflect their grasp of the related program outcome. Student responses are recorded, and the number of correct answers is identified. To indicate that students have achieved the program outcome, students must obtain two out of three answers correct. The percentage of students obtaining two out of three answers correct is calculated for each program outcome. The percentage is compared with the 60% benchmark set by the department as the minimum for program outcome achievement.

3. Analysis And Findings

A total of 65 respondents took the exit survey and test. 22 students are from the Microelectronic Engineering program, 27 from the Electrical and Electronic Engineering while the remaining 16 are from the Communication & Computer Engineering program. Students have to attend a scheduled session where they are required to answer the survey first, and then do the exit test. Respondents are anonymous as the study is not looking at individual student, but towards the students' achievement throughout all degree programs.

The result of the exit survey is represented in Figure 1. The figure shows students' achievement of the program outcomes from all three degree programs offered. The benchmark shown is at 60%.

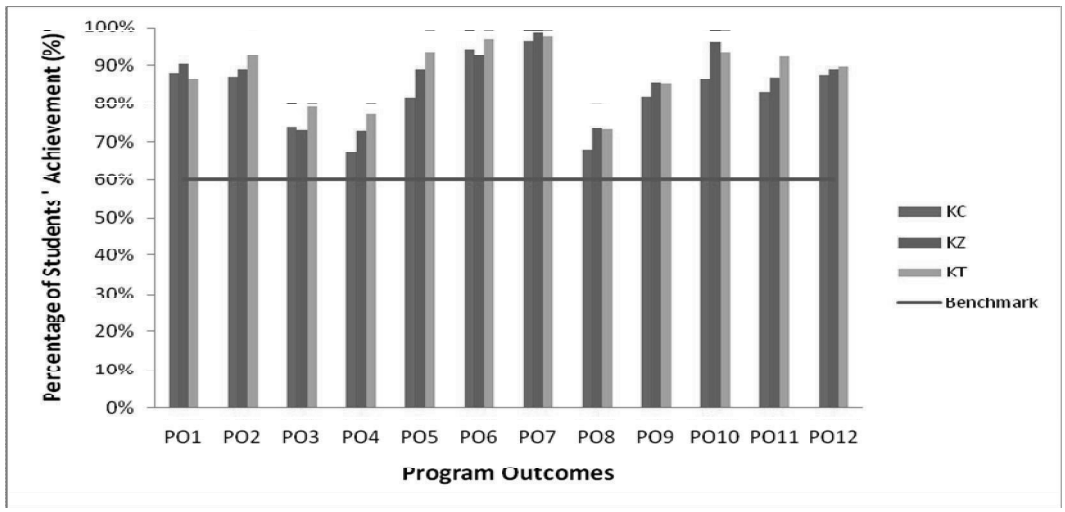

Figure 1 Students' achievement of all twelve program outcomes from all three degree programs offered based on the Exit Survey (KC = Microelectronic Engineering, KZ= Electrical and Electronic Engineering, KT= Communication & Computer Engineering)

The results show that all program outcomes are achieved. PO7 shows the highest overall achievement for all three programs, while PO4 and PO8 shows the lowest level of achievement. Students perceived that they have achieved all program outcomes targeted.

The exit test analysis for all three degree programs is shown in Figure 2. The benchmark shown is at 60%. PO6 shows the highest level of achievement. However, PO3 and PO7 show the lowest score across three degree programs.

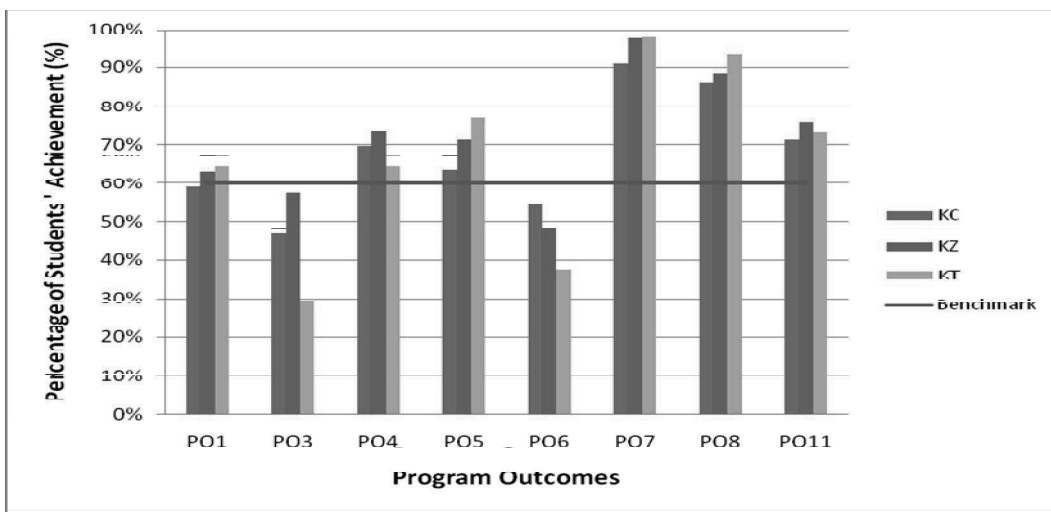

Figure 2 Students' achievement of all twelve program outcomes from three degree programs offered based on the Exit Test (KC = Microelectronic Engineering, KZ= Electrical and Electronic Engineering, KT= Communication & Computer Engineering)

Generally, the results for both exit survey and exit test agree with each other. This means that the results are both representative of students' achievement of all program outcomes.

The question is now looking at the two program outcomes which show scores lower than the benchmark, and investigating the reason why that happens. PO3 is related to students having in-depth technical competence in all three degree program specialisations. The related question in the exit test requires technical knowledge of the field of electrical and electronics, common to all degree programs. One probable reason could be that student has forgotten the theoretical basis to answer the questions and therefore, got the answers wrong. In terms of teaching, it could be because there was not enough emphasis on establishing the basic technical knowledge firmly before proceeding to other topics. As a result, students did not get enough exposure to the basics and resulting in the inability to answer the question correctly.

Meanwhile, PO7 is related to understanding responsibilities and ethics of an engineer and the need for sustainable development. The questions used for PO7 were taken from the final year examination paper for the course Engineering Ethics and Technology Development (KKKF3283). However, students could be confused since they took the examination in Bahasa Malaysia while the exit test was conducted in English. This could be the main reason why students did not get the right answers.

However, the two program outcomes with the lowest score provide some indication to the teaching and learning process in the department. It would be up to the departmental administration to sit down and find out the reasons behind the scores, and then recommend some improvements that need to be implemented.

As mentioned in the methodology section, the implementation of this year's exit strategy is a result of a CQI process done since two years ago. The results for the exit survey was carried out in year 2008 and 2009 have also shown that all program outcomes have been achieved. Students perceived that they have achieved all targeted outcomes. However, when the exit strategy combines both direct and indirect assessment of the program outcomes, more meaningful findings are obtained, and further avenues of improvements in teaching and learning can be explored.

4. Conclusions And Recommendations

This paper has highlighted the evolution of the exit strategy implemented at the departmental level for the past two years. Initially, the exit strategy is based exclusively on indirect assessment of student program outcomes. With the process of CQI, the exit strategy has been improved to incorporate both direct and indirect methods of assessment. The exit strategy is used to complement the direct assessment methods obtained through course assessments.

Some recommendations for improvement could include a more comprehensive exit strategy which measures all program outcomes, and could also include interviews of selected students so that improvements to teaching and learning can be further enhanced.

The use of multiple assessment methods provides converging evidence of student learning. The implementation of indirect methods supplements the direct methods and these form a robust assessment plan.

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