CHANGING EVALUATION OF A MASTER PROGRAMME MODULE TO IMPROVE STUDENTS' OVERALL ACHIEVEMENTS

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Abstract: One of the modules delivered since 2001 in the Mechanical Engineering taught Masters Programme at Dublin City University is entitled "Product Design, Development and Value Analysis". The module is assessed by two continuous assessments, both worth 10% and by a final exam worth 80%. In 2005, the exam period of this module was increased from 120 minutes to 150 minutes. Additionally, the second continuous assessment assignment was change from a report assignment to a set of 20 Multiple Choice Questions (MCQ) covering the entire module content. This assessment was run in the final week of the module. The first assignment was and remains as a report assignment. These two modifications were introduced to give the students sufficient time to complete the exam paper, and to provide a more comprehensive evaluation by the students for themselves as to their extent of knowledge on the module content. Average results of continuous assessment, exam marks, and overall marks before and after the change were assessed from 2002 to 2015 and presented in this paper. The two above-mentioned changes brought 14.2% increase in the continuous assessment average results, and 15.7% increase in the final exam marks. Therefore the combined effect of the changes has resulted in a significant positive increase in the student overall achievement within this module. The data and reasons behind these changes are discussed.

Keywords; Mechanical Engineering taught Masters programme module assessment, exam period, Multiple Choice Questions (MCQ), Continuous assessment, Exam marks, Overall marks.

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1. INTRODUCTION

For many centuries, oral and written exams have been used as a significant part of education. "Will this be in the exams?" might be the most common student question, so this signifies that assessment usually motivates student learning. Assessment practices have a significant value to students' learning (Boud 2013). Assessment is normally undertaken to assess teaching effectiveness, to make sure that the course planned learning outcomes are being met, to supply feedback to students on their learning, to encourage students to carry out suitable work, and to specify student accomplishment, advising decisions on progress and awards (O'Farrell 2002). Table 1 shows a comparison between contemporary and traditional way of thinking about assessment.

Table 1: Contemporary vs traditional way of thinking about assessment (Suskie 2010).

Contemporary approaches: Assessment is …	Traditional approaches: Assessment is …
Carefully aligned with learning goals	Planned and implemented without consideration of learning goals
Focus on thinking and performance skills	Often focused on memorised knowledge
Developed from research and best practices on teaching and assessment methodologies	Often poor quality because staff have had few formal opportunities to learn how to design and use effective assessment strategies and tools
Used to improve teaching and learning as well as to evaluate and assign grades to individual students	Used to evaluate and assign grades to individual students

The continuous assessment (CA) of graduate students during semester can be performed by a number of methods including class tests, student seminars, class assignments, report writing, and laboratory performance etc. The CA should be performed in a way to encourage students to engage in class activities, high-level participation and learn the breadth of the course contents. The correct selection of CA methods is critical as it allow teachers to evaluate the learning objectives of a course achieved by students effectively (Lynch, Woelfl et al. 1998). The CA of students demonstrates what students have learned from the lectures and how much they retained from the course contents. The CA results and feedback provided by instructors enable students to evaluate themselves regarding achievement of degree/program/course learning objectives and effectiveness of instructional programs. In addition to that, the CA provides motivation to students to perform well in final examination. The feedback from instructors also enables educators to improve the teaching strategies.

In the recent decades, semester system is widely adopted by higher education institutes around the world as it enables continuous learning and assessment of students (Rafiq, Ghazal et al. 2007, Perveen, Saeed 2014, Yousaf, Hashim 2012).

The engineering students from undergraduate and graduate programs prepare for examination selectively (Besterfield-Sacre, Atman et al. 1997, Van Etten, Freebern et al. 1997). From cognitive learning point of view, the use of Multiple Choice Questions (MCQ) as continuous assessment method could predicts and correlates the self-efficacy and competence of students (Van Etten, Freebern et al. 1997). The use of MCQ based CA encourages students to retained the breadth of course contents (Bridgeman 1991, Woodford, Bancroft 2004).

MCQ method of CA is beneficial for both students and teachers in a number of ways. The perceived objectivity for grading process could be clearly identified by MCQ (Wainer, Thissen 1993, Becker, Johnston 1999). The MCQ exam could be taken in class or using information technology systems. In both cases, the assessment could be performed quickly and feedback could be provided timely in class or immediately using IT tools (Delgado, Prieto 2003, Epstein, Epstein et al. 2001, Krieg, Uyar 2001). The MCQ exam facilitates teachers to evaluate students over a wide range of course materials and contents (Walstad, Robson 1997, Walstad, Becker 1994). The students are able to score better marks in MCQ exam comparing to other CA

methods as the marks for spellings, grammar or writing style and clarification are not accounted (Zeidner 1987).

The increase in number of students, increasing use of information technology tools in teaching, and abovementioned advantages encouraged teachers across the world to include MCQ exam in continuous assessment of undergraduate and graduate students.

Clearly, there is an intersection between the assessment and grading, as the purpose of both is to measure what students have learned. A major difference is assessment focuses on entire cohorts of students, while that grades focus on individual students. Grades alone are usually insufficient evidence of student learning for assessment purposes. Evaluation is using assessment information to make an informed judgment on the students' achievement of leaming goals set for them, the teaching and learning strategies' strengths and weaknesses, and what changes in goals and teaching-leaming strategies might be appropriate (Suskie 2010, Johnstone, Ewell et al. 2002).

There are several kinds of assessments; namely summative, formative, and continuous assessment. Summative assessment refers to the assessment of participants where the focus is on the outcome of a program. The formative assessment summarizes the participant's development at a particular time. For Continuous Assessment, the goal is that students are examined more continuously over the duration of their education. The purpose of formative assessment is to monitor learning and to provide feedback to the learner and evaluation information to the teacher. Thus, it allows learners and teachers to find out areas of weakness and to work on these. The purpose of the summative assessment is to decide if students are ready to move up to the next stage of their learning. Therefore, using the best features of both formative and summative assessment should outcome enhanced continuous assessment and continuous feedback (Walsh 2015).

2. MODULE DELIVERY AND ASSESSMENT METHODS

The module "Product Design Development and Value Analysis" is being taught to Mechanical Engineering Masters programme at Dublin City University since 2001. According to National Qualifications Authority of Ireland, this module is currently a National Framework of Qualifications (NFQ) level 9 module having credit rating of 7.5. The objective of this module is to develop advanced level skills in the design process and engineering value analysis in students. The module covers various topics related to new product development process, customer requirements, product specification, prioritisation of new product projects, concept analysis, and product value analysis. The module total workload on participants is 188 hours per semester. The workload consists of 36 hours lectures, 12 hours tutorial, 24 hours seminar, and 116 hours independent study. The module therefore recommends participants to spend about two hours daily during the weekdays on independent learning, studying the lectures and preparing themselves for continuous assessments and final examination.

The assessment of module "Product Design Development and Value Analysis" is break down into continuous assessment (CA) and end of academic session assessment. The CA accounts for 20% of total marks. A formal final examination at the end of the semester is taken from participants, which accounts for 80% of the total marks. From 2001 to 2004, the period of this final exam was 120 minutes. The exam paper consists of 5 questions and students are required to solve any four questions, each carrying equal marks. Each question composed of three to four

sections. From 2005, the exam is increased to 150 minutes to give students sufficient time to complete the exam paper.

Prior to 2005, for continuous assessment, the students are assigned with writing of two scientific reports on topics related to product design, development, and value analysis. Each report submission is worth 10% of the final marks. In 2005, the second continuous assessment assignment was changed to a set of 20 Multiple Choice Question (MCQ) exam. The MCQ exam covers the contents of entire module. The MCQ exam runs in the final week of the module after completion of all lectures of the module. The first assignment, submission of report, remains same. In this paper, the average results of continuous assessment, final examination marks and overall marks before and after the abovementioned changes are assessed from 2002 to 2015.

3. RESULTS AND ASSESSMENT METHODS

The aforementioned changes in assessment methods of students lead to interesting results. Figure 1 demonstrates the CA results from academic year 2002 to 2015. By introducing the MCQ exam in continuous assessment in 2005, an increment of 14.2% was observed in average results (figure 2). The average results show a positive impact on average CA results from 2005 to 2015. By examining the individual academic year, it can be observed that the student performed well in CA performance. The average results in most years is 60% or above.
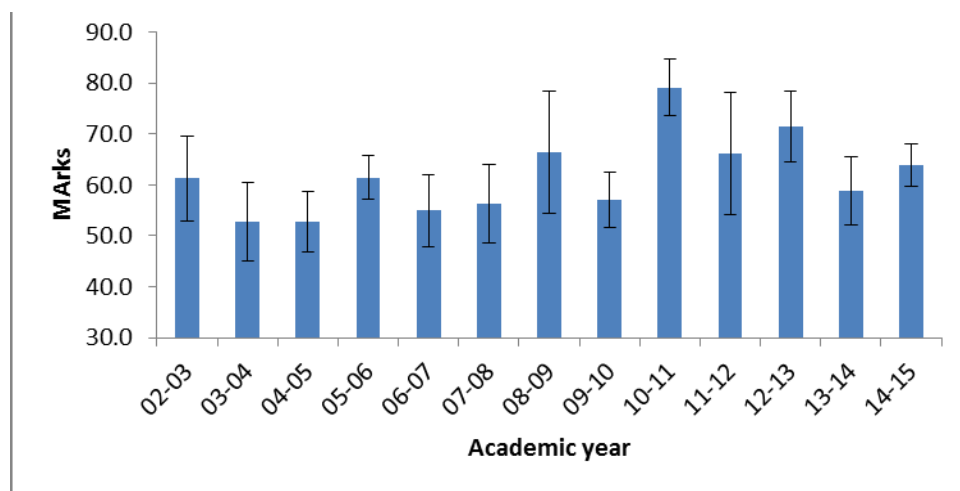

Figure 1 Continuous assessment mark from academic year 2002 to 2015

It is well known that the students study for exams selectively. Since the MCQ exam covered the whole contents of the course, students therefore are implied to study and prepare for the exams by covering the depth and breadth of the course equally. Interestingly, an increment of about 16% was observed in the average final exam marks of the students from 2005 to 2015 comparing to 2002 to 2005 (see figure 3).
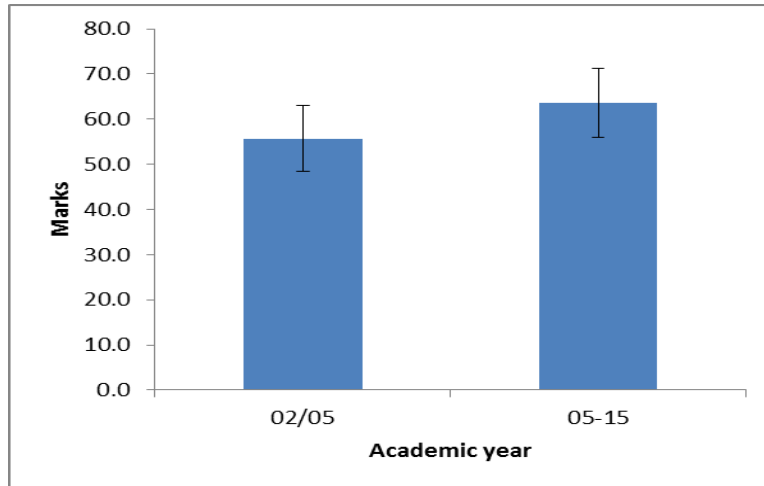
**Figure 2 Continuous assessment mark comparison
between academic years 2002 to 2005 and 2005 to 2015.**

The reason behind this increment could be increased exam duration from 120 minutes to 150 minutes. The increased exam duration provided sufficient time to students to solve the exam questions. In addition to that, as explained above the MCQ exam encouraged students to study the whole contents of the course. Therefore the students were not only able to perform well in continuous assessment, the improved learning style for preparation of exams resulted in better performance of students in final exam. Consequently, the exam marks of students increased about 15% from academic year 2005 to 2015 comparing to 2002 to 2005 (figure 4). Figure 5 shows the overall marks achieved by students during academic year 2002 to 2015. By examining each year separately, it can be observed that the students perform better in exams after the modifications in the assessment. Therefore, the combined effect of two modifications in the assessment of the students resulted in positive influence on the overall exam results.
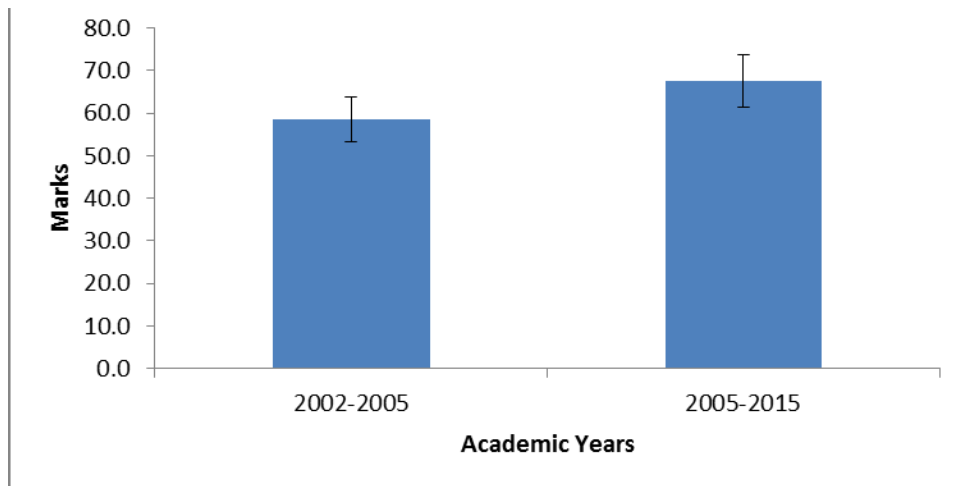

**Figure 3 Final exam mark comparison
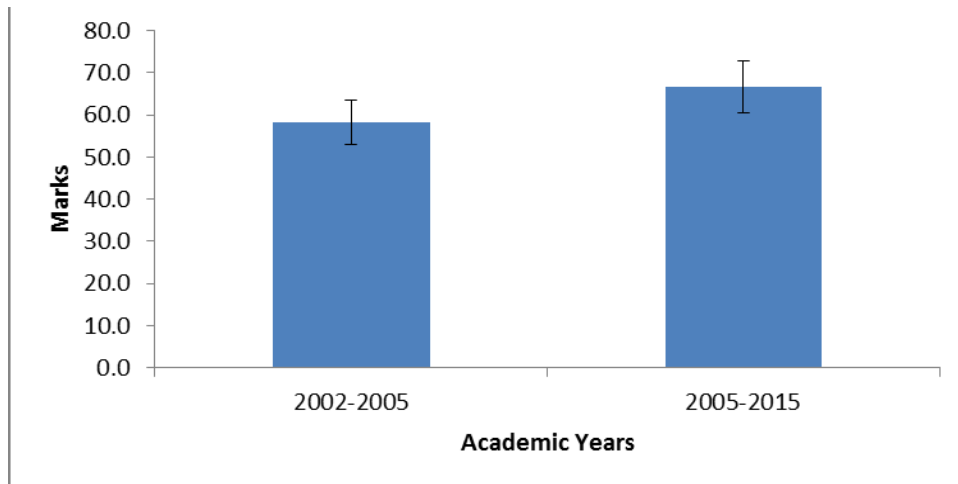between academic years 2002 to 2005 and 2005 to 2015.**

Figure 4 Overall mark comparison between academic years 2002 to 2005 and 2005 to 2015.
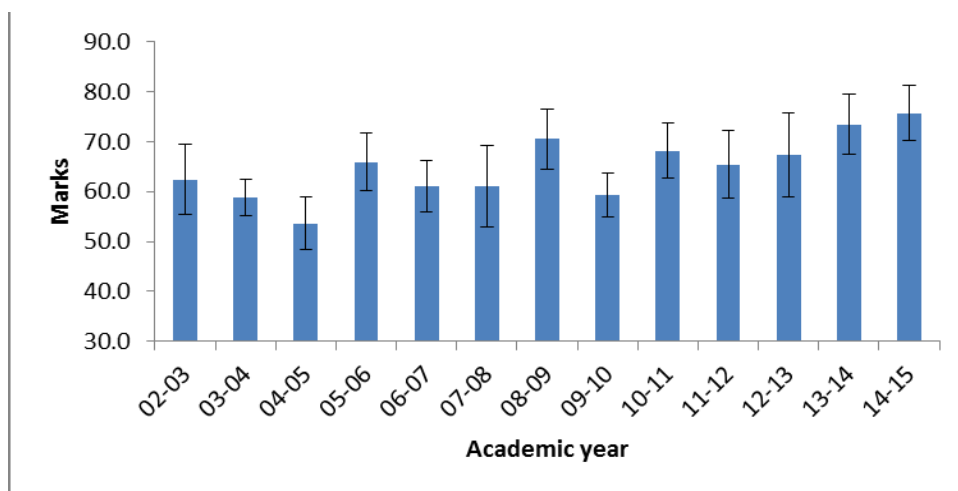

Figure 5 Overall mark comparison between from academic year 2002 to 2015.

4. CONCLUSIONS

The selection of appropriate assessment methods for graduate and postgraduate courses is important for both the teachers and students. In this paper, two modifications introduced in the assessment methods of a course entitled "Product Design, Development and Value Analysis" delivered in Mechanical Engineering programme at Dublin City University, Ireland are discussed. The introduction of MCQ exam as a continuous assessment method resulted in increased continuous assessment marks obtained by students. It was observed that as MCQ exam covers whole contents of the course, it encourages students to prepare comprehensively for the examination. The exam duration was also increased from 120 minutes to 150 minutes. The combined effect of these two modifications was positive and an increment of about 15% in overall marks was observed from academic year 2005 to 2015 as compared to the average overall results received between 2002 to 2005.

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