The development of online assessment in the Moodle Virtual Learning Environment (VLE) as a replacement for traditional written assessment

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Abstract

The objective of this project is to examine if online or computer based assessment is a realistic alternative to written assessment. Electronic assessment techniques have evolved considerably in recent years; well beyond multiple choice assessment which is the favoured method in electronic assessment.

In the Moodle virtual learning environment, there are many different types of questions that can be set including multiple-choice, essay, matching, short answer, numerical, calculated, true/false, cloze (embedded), random, drag-and-drop and ordering. Assessments can be devised that include some or all of these question types. Multimedia images and objects may be embedded in questions quite easily. Feedback may be included in questions also.

The project researches continuous and final assessment types with various course groups using the facilities provided in the Moodle VLE. It determines the development effort in terms of time and technical knowledge required by the lecturer to produce the assessments. This can be considerable and a major concern for academic staff.

Limitations of the online assessment questions are examined. The project examines if all aspects of a module, including final exams, can be examined using Moodle assessment, or if it is more suitable as a continuous assessment tool. The experiences of other academic staff that use Moodle in Athlone Institute of Technology (AIT) are collated via a survey, so as to ascertain the usage of online assessment and attitudes to this concept. The feedback from department heads is collated to determine their views to e-assessment.

1. A brief history of written assessment

The earliest known written examinations are the Chinese Imperial Examinations which began in 587 AD (Feng, 1994). Closer to home, in Europe, the first written examinations were held at Cambridge University in 1792 (Wikipedia, 2010). Oral examinations were the primary method of assessment prior to the introduction of written assessment in universities.

What this brief history serves to illustrate is the length of time that written assessment has been in existence and how little the system has changed in over 200 years with respect to Europe; given the enormous technological advances that have occurred in this period. The central question that must be asked is: given the proliferation of technology available to educators, why is the uptake and delivery of e-assessment solutions by educational organisations so slow as to be almost negligible in the grand scheme of assessment?

2. The views of learners, academic staff, department heads and external examiners with regard to e-assessment

Online surveys were conducted with learners, academic staff and department heads in the period September to November 2009 using the online survey tool, Zoomerang (Zoomerang, 2009). The objective was to determine the views and attitudes of the various parties involved with e-assessment in AIT. All surveys were anonymous.

2.1 Academic staff survey

The academic staff surveyed are spread across AIT with representation from all the schools of Engineering, Science, Business and Humanities. A wide variety of Moodle users responded, ranging from staff some with considerable e-assessment experience to those with little or no experience. The primary objective is to determine awareness of e-assessment and if staff would consider using e-assessment for continuous and final assessment of modules. The results show that respondents are enthusiastic about using e-assessment for continuous assessment (Q6, 89% Yes, 11% Don't Know) but much less so about using e-assessment for final assessment (Q7, 36% Yes, 28% Don't know). Awareness of the quiz and questions features in Moodle (Q1, 89%) is high and also for awareness of the multiple choice question type (Q2, 83%). Awareness of the other question types available in Moodle is considerably lower (Q2, ranging 22% to 53%). The time required to create e-assessment questions is a concern (Q4, 61% Yes).

2.2 Management (department heads) survey

The department heads surveyed are spread across AIT with representation from the schools of Engineering, Business and Humanities. The questions in the management survey are somewhat different because they have other considerations including scheduling of assessment. They are enthusiastic about encouraging staff to use e-assessment for continuous assessment (Q4, 83% Yes) but more cautious about using it for final assessment (Q5, 50% Yes, 33% Don't know). The scheduling of e-assessment in computer laboratories is a concern also (Q9, 33% Yes, 33% Don't Know). Half the group agreed with the concept of e-assessment of modules (Q10, 50% Yes, 50% Don't know).

2.3 Learners survey

The learners surveyed are from the Department of Electronic & Computer Engineering and all have some experience of e-assessment through the Moodle VLE or the Cisco Networking Academy (Cisco Systems, Inc, 2010). They are a mix of first and second years. In the case of first years, their experience of e-assessment was very limited because they had just begun college. Overall, the learners are very enthusiastic about e-assessment expressing a preference for e-assessment over traditional written assessment (Q9, 95% Yes) and indicating that all modules should incorporate some form of e-assessment (Q8, 89% Yes, 2% Don't know).

3. Benefits and drawbacks of Moodle e-assessment

All types of assessment system have benefits and drawbacks for the learners, the academic staff and the organisation as a whole.

3.1 The benefits of Moodle e-assessment for learners can be summarised as follows:

- The learner is provided with instant assessment scores.
- The gradebook logs all assessment scores for viewing at any time and gives a real time view of learner progress.
- Feedback may be provided for each question, where appropriate, to give pointers to students and aids in the learning process.
- Adaptive testing is provided for in Moodle whereby the learner may attempt an assessment many times but loses some marks on each attempt; this aids the learning process while giving some credit for subsequent attempts.
- Writing difficulties for the learner are lessened because there is no hand writing of solutions.

- Assessments can be undertaken off-campus for continuous assessment where appropriate to encourage independent learning.
- Assessments can be provided in any discipline or subject (Engineering, Science, Business, Humanities) as the system is completely flexible.
- It may be an a highly interactive experience for the learner depending on the design of the questions in the assessment e.g. watching a video clip, listening to a podcast, drag-and-drop, ordering etc.
- An on screen timer during the assessment informs the learner how much time is remaining.

3.2 The drawbacks of Moodle e-assessment for learners can be summarised as follows:

- A minority of learners are not comfortable with using a computer for testing purposes, especially from the non technical disciplines; they prefer written exams.
- Learners may feel disadvantaged because of a lack of keyboard skills, particularly if a lot of typing is required, for example, with essay questions.
- Lack of subjectivity by the marking system i.e. it is rigid.
- Currently, it is not possible draw and insert diagrams as part of a solution to a question.

3.3 The benefits of Moodle e-assessment for academic staff can be summarised as follows:

- Large variety of question types to choose from.
- Solutions are marked by the system thus considerable time saving when large numbers of learners involved (essay questions must be marked by the staff member).
- Feedback may be integrated into questions in order to provide guidance to learners.
- A large amount of data is available in the gradebook for each assessment including time spent on each question and a history of responses that may be used for further analysis.

- The solutions and marking scheme for the external examiner are easily produced by taking screen shots, thus no more hand writing or typing of solutions.
- Learner performance over an academic year may be examined in detail, where necessary, because of the availability of the gradebook, log files and attendance data within the Moodle VLE.
- Interactive and innovative assessments may be produced.

3.4 The drawbacks of Moodle e-assessment for academic staff are as follows:

- Production of questions is a time consuming process in the early stages of development of the question bank.
- A minority of question types require some technical knowledge e.g. cloze, drag and drop.
- Additional training is required to become familiar with the various question types and the development of questions.
- Not suitable for every module e.g. long derivations or proofs in mathematics and engineering.

4. The quiz module and question types available in Moodle.

According to Cole and Foster in their book on Moodle (Cole & Foster, 2007), Moodle's quiz module is one of the most complex pieces of the VLE. There are a large number of options and tools in the quiz engine, making it very flexible. The main features of the quiz module can be summarised as follows:

- In excess of 20 question types to choose from.
- Automatic scoring of questions, with the exception of the essay question type.
- Instant results for learners.
- Strong security features through the use of a secure window with a password which blocks access to the host computer and other websites. IP address range limits can also be used to improve security.
- Shuffling of questions within a quiz and shuffling of options within a question; this improves security during a quiz.

- A quiz can be set for adaptive mode, whereby the learner can have multiple attempts but will lose marks each time he/she tries the same question.
- Random generation of quizzes from large question pools.
- The gradebook provides considerable detail on the quiz results, including time spent on each question and a complete breakdown on the responses provided by the learner.
- Overall feedback and per-question feedback may be provided to learners to aid with the learning process.
- Import and export of question to facilitate interaction with other VLEs including Blackboard (Blackboard, 2010).
- A time limit and date can be set for each quiz.

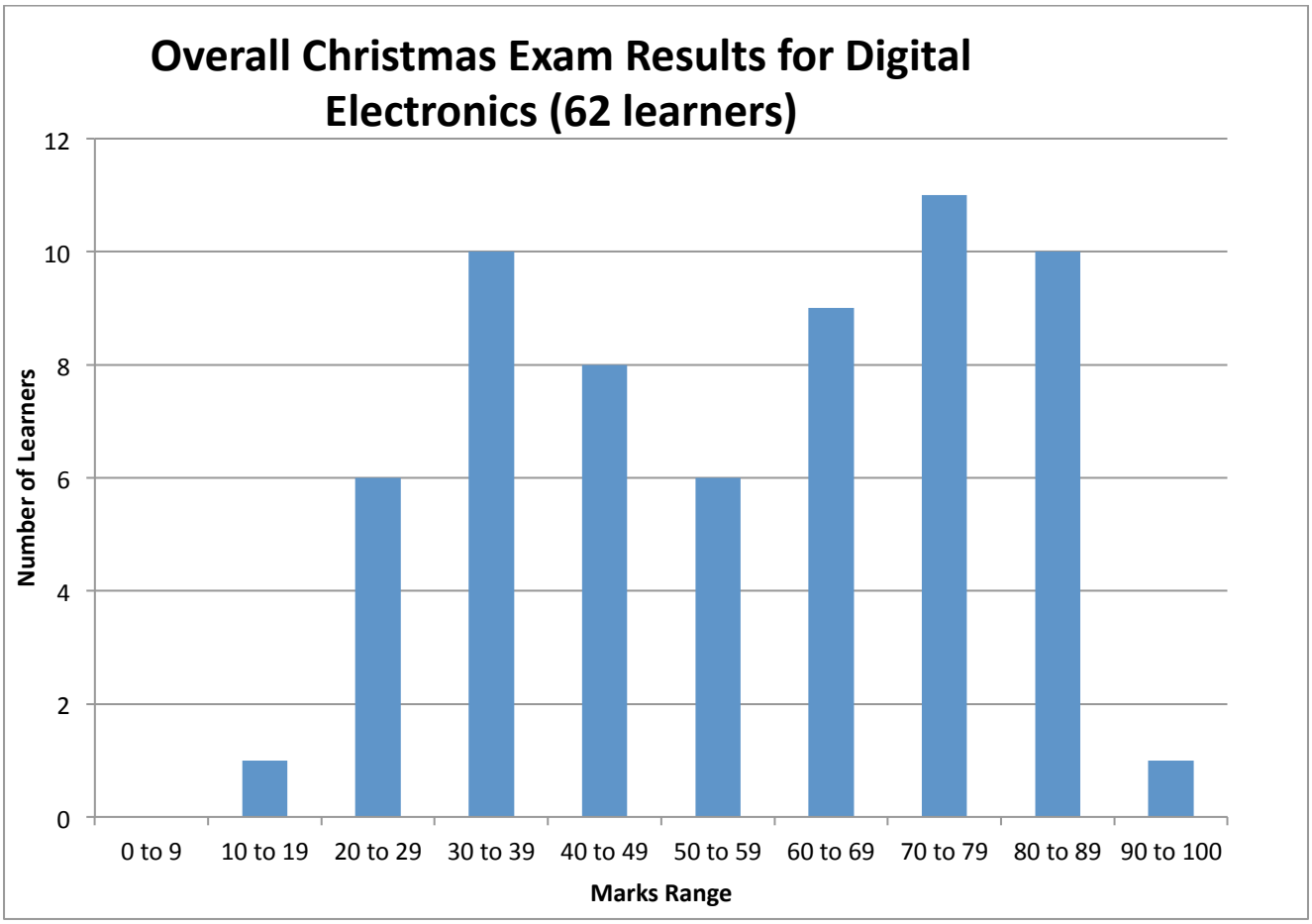
This project examines the implementation of 17 question types as per the following list: Multiple Choice, True/False, Essay, Short Answer, Embedded Answers (Cloze), Matching, Description, Numerical, Calculated, Order Exercise, Algebra, Drag and Drop, Image Target, Multinumerical, Random Short-Answer Matching, Regular Expression Short Answer, Drag and Drop Matching.

5. Results and evaluation

How can this project be evaluated? Is this approach to the use of Moodle e-assessment successful or is it a failure? Is traditional written assessment the best method? Is e-assessment more suitable for continuous assessment than final assessment of a module? Is it more suitable for formative assessment than summative assessment?

5.1 Exam results and evaluation for an end of year exam

One set of exam results is analysed here; the Digital Electronics Christmas exam 2009 for the year 1 groups. This is a common module across three courses. 62 learners sat this exam under 'normal' exam conditions i.e. closed book and proctored. This was their first normal exam in Moodle; the previous assessment was not proctored and open book. The grade ranges are shown in Graph 1 for the overall group. The average mark is 52.76.



Graph 1: Overall Christmas Exam Results for Digital Electronics

17 learners failed this exam, using the module pass mark of 40, giving a failure rate of 27%.

It can be concluded from these results that the exam, through Moodle e-assessment, did not confer any advantage or disadvantage to the learners and that there are other factors at work, including personal motivation for the course and attendance at lectures and laboratory sessions. The average attendance data and average mark for each group is shown in Table 1 as follows:

Course group (Year 1)	Attendance % (Digital Electronics: Lectures and labs)	Average Mark % Digital Electronics Christmas Exam
BEng Mobile Communications &	59.6	50.50

Electronics		
HC in Electronics & Computer Engineering	51.6	43.32
BSc Computer Network Administration	69.8	67.17

Table 1: Attendance and average marks for each group

The Moodle question types used in the Digital Electronics exam are shown in Table 2 as follows:

Question type	Number of questions in exam
Multiple Choice	19
True/False	2
Short Answer	15
Cloze (compound questions)	3
Calculated	1
Drag & Drop	3
Numerical	1
Matching	1
Total	**45**

Table 2: Moodle question types used in Digital Electronics Christmas exam

The time permitted for the exam was 2 hours maximum. A breakdown of the time spent on the exam by the learners is shown in Table 3:

Time in minutes spent on exam by learner (t)	Number of learners
$t < 30$ minutes	0
$30 \leq t < 45$	1
$45 \leq t < 60$	19
$60 \leq t < 75$	16
$75 \leq t < 90$	18
$90 \leq t < 105$	4
$105 \leq t < 120$	4

Total number of learners	62

Table 3: Time spent on exam by the learners

Table 3 illustrates an exam sitting with the majority of learners taking between 45 minutes and 1.75 hours to complete the exam. This is quite satisfactory as it illustrates that sufficient time was given for the exam and learners were not leaving too quickly, indicating that they were quite busy for the duration of the exam.

6. Conclusions

The project illustrates the many possibilities for assessment through the Moodle VLE. There are many approaches that may be used to assess learners as follows; from formative assessment using short quizzes to self test knowledge and understanding at regular intervals, summative assessment where the learner undertakes a number of low value assessments that contribute to the final module grade and final assessment where the learners undertake a high value final exam. All of these approaches are possible with Moodle. The number of question types available ensures that varied, interactive and challenging assessments can be constructed relatively easily. This project illustrates that the technology is available now and it is possible to replace traditional written exams with e-assessment that will adequately assess learners.

There are many advantages for educators in adopting the e-assessment approach, whether in a minor or major way, including a considerable reduction in the time spent on marking assessments and the much faster provision of feedback to learners. The drawbacks include the learning curve to become familiar with the system and the generation of questions for the question banks; the latter, in particular, takes a considerable amount of time. The limitations of the system must be acknowledged also; long derivations/proofs and the drawing of diagrams cannot be adequately handled by Moodle currently. The logistics of organising e-assessment on a large scale within an institution can be problematic e.g. having networked computers with internet access for all candidates.

The advantages for the learners are many; regular self-assessment to aid knowledge and understanding, variety and interactivity in assessment, timely results and feedback. Current learners, being the true digital natives, are web savvy individuals who adjust very easily to e-assessment.

E-assessment is one of the many features and modules available in Moodle. Regular Moodle users already use the VLE for storing resources including lecture notes and other digital resources, communicating with learners through forums, recording attendance, collecting assignments,

flagging upcoming events, and recording grades in the grade book. In effect, Moodle becomes the portal for a subject or module and hence e-assessment is another method of extending its usage. The integration of the grade book with the quiz and attendance modules is very useful because it allows learners to see in real-time their marks and attendance as they work through a module. This feature can help to incentivise learners to greater future performance.

The use of e-assessment will grow considerably in future years as VLEs gain widespread use in all sectors of education, not only in tertiary level education. The Smart Schools report (Department of Education and Science, 2009) looks certain to push this policy forward in the coming years.

References and bibliography

Blackboard. (2010, Febraury). Retrieved February 1, 2010, from Blackboard home page: http://www.blackboard.com/

Cisco Systems, Inc. (2010, February 1). Retrieved February 1, 2010, from Cisco Networking Academy: http://www.cisco.com/web/learning/netacad/index.html

Cole, J., & Foster, H. (2007). Using Moodle -Teaching with the Popular Open Source Course Management System, 2nd edition. In J. Cole, & H. Foster, *Using Moodle* (pp. 95-122). Sebastopol, California: O'Reilly Community Press.

Department of Education and Science. (2009). *Smart Schools = Smart Economy : Report of the ICT in Schools Joint Advisory Group to the Minister for Education and Science.* Dublin: Department of Education and Science.

Feng, Y. (1994). From the Imperial Examination to the National College Entrance Examination: the Dynamics of Political Centralism in China's Educational Enterprise. *Association for the Study of Higher Education*, (p. 42). Tucson, Arizona.

Wikipedia. (2010, March 22). *Test (student assessment) - Wikipedia, the free encycloppedia*. Retrieved March 22, 2010, from Wikipedia: http://en.wikipedia.org/wiki/Test_(student_assessment)

Zoomerang. (2009, October 1). Retrieved October 1, 2009, from Online surveys by Zoomerang: http://www.zoomerang.com/