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**USING ON-LINE ASSESSMENTS IN A DISTANCE LEARNING TAXATION COURSE:
EFFECTS ON STUDENTS' PERFORMANCE**

LIN MEI TAN*

ABSTRACT

This study examines students' use of on-line assessments (formative), and on-line multiple choice question (MCQ) tests (summative) on students' performance in the final examination in a taxation course. The results show that the majority attempted the on-line MCQ test on time, but only used the on-line assessment resources when it was near the examination time. However, both their on-line MCQ test score and on-line assessment attempts had no significant impact on performance in the final examination. Instead, GPA stood out as the most important predictor of exam score, followed by tax assignment score and prior tax knowledge.

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I INTRODUCTION

Taxation is a complex subject as not only is the body of tax law voluminous, overwhelming, and constantly changing, but there are also countless exceptions to many provisions in the statutes.¹ Therefore, taxation is a subject that challenges not only students attempting to develop a good understanding of the law but also educators who teach tax courses.

Teaching is about enabling learning² and teachers have to consider various learning pedagogies to engage or promote student learning. With the advent of computers, interactive learning through the use of on-line self-assessment questions³ has been widely used by teachers in numerous disciplines such as economics, finance, and accounting.⁴ Amongst other types of on-line assessment approaches (eg true/false, fill-in-the-blanks, and short answers), the multiple choice ('MC') question format is one of the most commonly used for students to self-assess their mastery of the subject matter and for educators to evaluate students' understanding of the topics covered.⁵ The multiple choice format is a popular formative and summative assessment tool as it can cover a wide range of topics, and saves a tremendous amount of teacher's grading time. Although the use of MC assessments was originally driven by a growing number of students and reduced teaching resources,⁶ it has become even more popular with advanced technology because grading of MC questions, and feedback to students, can be instantaneous. However, since MC questions require the selection of a correct answer from a set of alternatives, ie the recognition of the answer rather than the construction of a response, many have questioned its adequacy for assessing students because it fails to test analytical and communication skills adequately.⁷ Instead, constructed response ('CR') questions (eg written essays or reports, etc) are considered more appropriate because a higher level of cognitive understanding is examined in comparison to MC questions.⁸

Empirical evidence from some researchers suggests that MC questions are effective tools for learning and are as good a measure of students' understanding as CR questions.⁹

¹ Cynthia Bolt, 'Case Studies for Introductory Tax: Integrating Research and Ethics' (2006) 11 *Research on Professional Responsibility and Ethics in Accounting* 207.

² Jerome Feldman and Doug McPhee, *The Science of Learning and the Art of Teaching* (Thomson Delmar Learning, 2008).

³ Also commonly referred to as computer based assessments.

⁴ Stephen Buckles and John Siegfried, 'Using Multiple-Choice Questions to Evaluate In-Depth Learning of Economics' (2006) 37 *Journal of Economic Education* 48.

⁵ Lynn Bible, Mark Simkin, and William Kuechler, 'Using Multiple-Choice Tests to Evaluate Students' Understanding of Accounting' (2008) 17 *Accounting Education* 555.

⁶ Pru Marriot and Alice Lau, 'The Use of On-line Summative Assessment in an Undergraduate Financial Accounting Course' (2008) 26 *Journal of Accounting Education* 73.

⁷ David Nicol, 'E-Assessment by Design: Using Multiple-Choice Tests to Good Effect' (2007) 31 *Journal of Further Higher Education* 53.

⁸ Above n 5.

⁹ See, eg, Lynn Bible et al, above n 5; Tom Buchanan, 'The Efficacy of a World-Wide Web Mediated Formative Assessment', (2000) 16 *Journal of Computed Assisted Learning* 193; and Howard Wainer and

Footnote continues over page

Buchanan,¹⁰ for instance, found that the level of use of on-line MC questions correlates positively with examination performance in psychology. Bible et al¹¹ showed that accounting students' test scores on MC questions correlate positively with scores on CR questions. However, they noted the difficulty of simple extrapolation of research results in one area of study to other areas due to differences in abilities and the cognitive skills required in different contexts. One specific area they aptly pointed out is that the study of taxation, which concentrates on tax law, may require a different set of skills or knowledge than other studies. A study in tax, they suggested, would not only offer some additional insight into the MC/CR questions debate but also strengthen the application of results across other accounting fields. Other researchers¹² also called for more research on the effectiveness of on-line or MC assessment on student learning in various disciplines.

This study extends previous research by focusing on students' use of on-line and MC assessments provided in a taxation course and their relationship with students' performance in the final examination. Contrary to some prior findings, the results showed that both the on-line multiple choice question ('MCQ') test score and on-line assessments attempts had no significant impact on students' performance in the final examination. Instead, GPA stood out as the most important predictor of exam score, followed by tax assignment score and prior tax knowledge.

The next section reviews the literature on formative and summative assessments and the use of MC questions or CR questions. Section 3 describes the research method adopted for the study. The empirical results are reported in Section 4 and the last section provides the conclusion.

II LITERATURE REVIEW

Assessments can be summative or formative, on-line or offline (paper based), compulsory or voluntary, and supervised or unsupervised.¹³ Summative assessment (compulsory) is different from formative assessment as it involves a formal testing of what students have learned to produce a mark or grade. Formative assessment (voluntary) on the other hand is set out to give students feedback on their performance and/or the skills gained in performing the task.¹⁴ Usually no course grades are awarded

David Thissen, 'Combining Multiple-Choice and Constructed-Response Test Scores: Toward a Marxist Theory of Test Construction' (1993) 6 *Applied Measurement in Education* 103.

¹⁰ Above n 9.

¹¹ Above n 5.

¹² See, eg, Sally Aisbitt and Alan Sangster, 'Using Internet-based On-line Assessment: A Case Study' (2005) 14 *Accounting Education (Int)* 383; William Kuechler and Mark Simkin, 'Why is Performance on Multiple-choice Tests and Constructed-Response Tests Not More Closely Related? Theory and an Empirical Test' (2010) 8 *Decision Sciences Journal of Innovative Education* 55; Daniel Murphy and Keith Stanga, 'The Effects of Frequent Testing in an Income Tax Course: An Experiment' (1994) 12 *Journal of Accounting Education* 27; and Stephanie Watson, Barbara Apostolou, John Hassell and Sally Webber, 'Accounting Education Literature Review (2003–2005)' (2003) 25 *Journal of Accounting Education* 1.

¹³ Mary Peat and Sue Franklin, 'Has Student Learning Been Improved by the Use of Online and Offline Formative Assessment Opportunities?' (2003) 19 *Australian Journal of Educational Technology* 87.

¹⁴ Mike Thelwall, 'Computer-Based Assessment: A Versatile Educational Tool' (2000) 34 *Computers and Education* 37.

for this type of assessment and it can be done in class time (supervised) or the students' own time (unsupervised). Quick feedback is desirable for formative assessment as it is a more effective way of improving and accelerating student's learning than when delivered after a lapse of time, such as when marking is done manually.¹⁵ Various types of self-tests, such as the use of MC questions, quizzes, true/false questions are therefore considered good tools to use to empower students as self-regulated learners.¹⁶ MC questions, for instance, if administered in an open book situation, allow students to self-assess and self-correct during a testing session.¹⁷ With students nowadays having access to computers, and most universities adopting Learning Management Systems (eg Moodle, WebCT, Blackboard etc), computerisation of such assessment allows instant marking and feedback. This further enhances students' ability to self-regulate their own learning; they can decide when and how many times they like to attempt the questions. Feedback from students about on-line formative assessments is generally positive.¹⁸

Although MC testing is widely used in tertiary education across various disciplines, educators' reactions to the use of this instrument are mixed. Some educators believed that MC tests are only good for assessing students' ability to memorise and are not useful for assessing high order cognitive skills such as understanding, application, analysis and evaluation.¹⁹ Those who dispute the use of MC questions argue that CR questions provide a better measure of a student's ability to solve real world problems. With essays, for instance, educators can better evaluate how well their students are able to communicate their reasoning.²⁰ Essays can test complex thinking by requiring students to organise, integrate, and interpret information, construct arguments, and give explanations.²¹ Other researchers,²² however, maintain that this depends on how the tests are constructed. Carnerson, Delpierre, and Masters²³ argue that MC questions do

¹⁵ John Dempsey, Marcy Driscoll, and Linda Swindell, 'Text-based feedback' in John Dempsey and Gregory Sales (eds), *Interactive Instruction and Feedback* (Educational Technology Publications, 1993) 21.

¹⁶ David Nicol and Debra Macfarlane-Dick, 'Formative Assessment and Self-Regulated Learning: A Model and Seven Principles of Good Feedback Practice' (2006) 31 *Studies in Higher Education* 99.

¹⁷ Above n 7.

¹⁸ See Pru Marriot and Alice Lau, above n 6, and Dan Scheiwe and Renee Radich, 'A Programme to Address Emerging Problems in Auditing Education in Australian Universities' (1997) 6 *Accounting Education* 25.

¹⁹ See Peter Airasian and Michael Russell, *Classroom Assessment: Concepts and Applications* (McGraw-Hill Education, 2008); Lorin Anderson and David Krathwohl (eds), *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (Longman, 2001); and Karen Scouller, 'The Influence of Assessment Method on Students' Learning Approaches: Multiple Choice Question Examination Versus Assignment Essay' (1998) 35 *Higher Education* 453.

²⁰ See Gregory Hancock, 'Cognitive Complexity and the Comparability of Multiple-Choice and Constructed-Response Test Formats' (1994) 62 *Journal of Experimental Education* 143 and Todd Rogers and Dwight Harley, 'An Empirical Comparison of Three- and Four-Choice Items and Tests: Susceptibility to Test Wiseness and Internal Consistency Reliability' (1999) 59 *Educational and Psychological Measurement* 234.

²¹ See, eg, James McMillan, 'Fundamental Assessment Principles for Teachers and School Administrators' (2000) 7 *Practical Assessment, Research and Evaluation*, <<http://PAREonline.net/getvn.asp?v=7&n=8>>; Robert Thorndike, *Measurement and Evaluation in Psychology and Education (6th Edition)* (Merrill, 1997); and Blaine Worthen, Walter Borg, and Karl White, *Measurement and Evaluation in the Schools* (Longman, 1993).

²² Alex Johnstone and Abdullah Ambusaidi, 'Fixed Response: What Are We Testing?' (2000) 1 *Chemistry Education Research and Practice (Europe)* 323.

²³ John Carnerson, Georges Delpierre and Ken Masters, 'Designing and managing MCQ' (1998), <<http://web.uct.ac.za/projects/cbe/mcqman/mcqcont.html>>.

not have to test merely facts; they can require interpretation and probe understanding. In addition, CR questions do not provide a good sampling of content knowledge across a curriculum, and marking is more time consuming and less objective, particularly if several markers are involved.²⁴

Underlying the arguments for and against the use of MC testing is the question of what exactly students should learn from the course. According to Bloom's²⁵ taxonomy of educational objectives, different levels of learning can be classified in the following order (from lowest to highest): knowledge (that can be recalled), comprehension (ability to interpret and make comparisons), application (ability to rephrase knowledge or apply it to new circumstances), analysis (ability to break a problem into its constituent parts and establish the relationships between each one), synthesis (ability to put together pieces of information), and evaluation (ability to make judgment of the worth of something).²⁶ Bloom's taxonomy suggests that mastery of the lower learning objectives allows the learner to progress onto the higher learning objectives involving analysis, synthesis, and evaluation. MC questions therefore can be used in many different subject areas, as they can be set to measure a great variety of cognitive educational objectives.²⁷ They are adaptable to various levels of learning outcomes, from simple recall of knowledge to more complex levels, such as the student's ability to analyse phenomena, apply principles to new situations, comprehend concepts and principles, discriminate between fact and opinion, interpret cause-and-effect relationships, judge the relevance of information, and make inferences from given data and solve problems.²⁸ Since the student selects a response from a list of alternatives rather than supplying or constructing a response, multiple-choice test items, however, are not adaptable to measuring certain learning outcomes, such as the student's ability to articulate explanations, display thought processes, furnish information, organise personal thoughts, perform a specific task, produce original ideas or provide examples. Such learning outcomes are better measured by using CR questions.²⁹

Empirical evidence on the relationship between MC assessment and students' performance contains mixed results.³⁰ Buchanan³¹ and Lowry³² found that students who attempted the MC questions (formative assessment) performed better in the final examination than those who did not. Further support for MC assessment can be found in

²⁴ See McMillan, above n 21.

²⁵ Benjamin Bloom, *Taxonomy of Educational Objectives: The Classification of Educational Goals* (Longman Group, 1956).

²⁶ See George Brown, Joanna Bull and Malcolm Pendlebury, *Assessing Student Learning in Higher Education* (Routledge, 1997) and Hamish Anderson, 'Formative Assessment: Evaluating the Effectiveness of On-line Quizzes in a Core Business Finance Course' (2009) 13 *The Journal of Distance Learning* 26.

²⁷ Bill Jarnagin and John Harris, 'Teaching with Multiple Choice Questions' (1977) L11 *The Accounting Review* 930.

²⁸ *Ibid.*

²⁹ Above n 26.

³⁰ Above n 6.

³¹ Above n 9.

³² Roy Lowry, 'Computer Aided Self Assessment — An Effective Tool' (2005) 6 *Chemistry Education Research and Practice* 198.

a study by Potter and Johnston.³³ Their findings indicate that the use of a virtual learning environment, (which also used MC questions apart from other features), and prior knowledge, had a significant positive impact on performance whereas other factors like gender or student status (domestic or international) did not. Gretes and Green's³⁴ study showed that education students who took computerised practice exams averaged better scores than those who did not. In contrast, prior academic achievement (using a Scholastic Aptitude Test as a measure) and the amount of practice had no relationship with achievement score. Other studies have provided evidence that MC testing and CR testing do in fact measure the same thing,³⁵ and that formative computer based assessments can aid retention of concepts³⁶ and subject mastery.³⁷

On the other hand, Becker and Johnston³⁸ found no relationship between performance on MC and essay questions in economics examinations because they measure different dimensions of understanding. The study by Peat and Franklin³⁹ also indicated that although the majority of students use both offline and on-line assessment resources and find them useful, their use has no differential impact on final learning outcomes. Sangster⁴⁰ also found no significant correlation between MC testing performance and marks achieved in the examination essays. These findings suggest that perhaps the mixed results in the extant literature are due to differences in disciplines which may have specific learning outcomes, or that the CR examination and the MC questions measure different dimensions of understanding. It is also possible, as pointed out by Sangster,⁴¹ that student's learning style may have a role to play in predicting student performance.

Taxation is a highly specialised field and students who are enrolled in such a course are required not only to gain the technical knowledge but also to learn analytical, problem solving, critical thinking, and communication skills. Students need to be able to identify the tax issues or tax problems in simple and complex tax situations, and know the tax implications of various transactions. The use of MC testing is less extensive in comparison to other subject areas as it is more difficult to set due to the many exceptions and ambiguities in tax law. Interestingly, research into the effectiveness of

³³ Bradley Potter and Carol Johnston, 'The Effect of Interactive On-Line Learning Systems on Student Learning Outcomes in Accounting' (2006) 24 *Journal of Accounting Education* 16.

³⁴ John Gretes and Michael Green, 'Improving Undergraduate Learning with Computer Assisted Assessment' (2000) 33 *Journal of Research in Computers in Education* 46.

³⁵ See, eg, Randy Bennett, Donald Rock and Minhwei Wang, 'Equivalence of Free-response and Multiple-choice Items' (1991) 28 *Journal of Educational Measurement* 77; Bible et al, above n 5; Bromley Kniveton, 'A Correlational Analysis of MC and Essay Assessment Measures' (1996) 56 *Research in Education* 73; and Wainer and Thissen, above n 9.

³⁶ Paul Bocij and Andrew Greasley, 'Can Computer-based Testing Achieve Quality and Efficiency in Assessment?' (1999) 1 *International Journal of Education and Technology* 1.

³⁷ John Whiting, 'The Use of a Computer Tutorial as a Replacement for Human Tuition in a Mastery Learning Strategy' (1985) 9 *Computers in Education* 101.

³⁸ William Becker and Carol Johnston, 'The Relationship Between Multiple Choice and Essay Response Questions in Assessing Economics Understanding' (1999) 75 *Economic Record* 348.

³⁹ Above n 13.

⁴⁰ Alan Sangster, 'Objective Tests, Learning to Learn and Learning Styles' (1996) 5 *Accounting Education* 131.

⁴¹ *Ibid.*

MC questions in taxation is scarce and very few studies that have examined on-line assessments in taxation are published. Murphy and Stanga⁴² provided some empirical evidence from an introductory income tax course of the effects of exam frequency on student learning throughout a course, the retention of material covered, and student evaluation of the learning process. Their results suggest that although frequent exams (which consisted of both MC questions and problems) increase student learning throughout the term and lead to more favourable evaluations of the instructor, they did not improve student retention of the material covered. As not many research studies have focused on taxation, this study extends prior research on the use of on-line assessments including MC testing in both formative and summative assessments by examining their relationship with students' performance in a taxation course.

III RESEARCH METHOD

A Sample

A study was conducted on students enrolled in the Estate and Tax Planning course in 2010 in a multi-campus university in New Zealand. There were 124 students enrolled in the course. Four students withdrew from the course a few weeks after it commenced and seven students did not sit the final examination. Thus, a total of 113 students were graded in the final exam.

B Course description and assessments

The Estate and Tax Planning course is a distance learning course which caters primarily to those who are enrolled in the Graduate Diploma in Business Studies. Students are not required to have completed any taxation course before they enrol in this course. However, other Business Studies students who have an interest in this course are also allowed to enrol. The Estate and Tax Planning course is comprised of two parts and runs for 12 weeks. Part 1 is focused on various laws that are relevant to estate planning (eg *Wills Act 2007*, *Property (Relationships) Act 1976*, *Family Protection Act 1955*, etc), and requires students to complete one written assignment (CR questions) and answer two questions (CR questions)⁴³ in the final exam. Part 2 is focused on taxation and requires the completion of one written assignment (CR question), an on-line test which is exclusively multiple choice (20 questions),⁴⁴ and answering three questions (CR questions) in the final exam.⁴⁵ The two parts are each taught by two different staff members, who also grade the assessments for their respective parts.⁴⁶

The course requires an average of 12.5 hours of study each week and students have the option of attending a one-day on-campus course. Study materials including review

⁴² Above n 12.

⁴³ The two questions in the final exam carry 40% of the total exam marks.

⁴⁴ Students were asked to select the best answer from the four choices given.

⁴⁵ The three questions in the final exam carry 60% of the total exam marks. The exam questions require students to provide justifications for their answers to questions posed on several different tax scenarios.

⁴⁶ The author of this paper coordinates the taxation part of the course.

questions and answers are provided to students once they have enrolled in the course. On-line formative assessments and summative assessments (ie quizzes which include MCQs) were used for the first time in the tax component in 2010.

This study focused on Part 2 of the course, ie the taxation component. In the past, the course was only web supported with very little incorporation of on-line learning. In 2010, with Stream (a version of Moodle)⁴⁷ providing e-Learning resources on-line, voluntary interactive quizzes on various taxation topics were introduced by the author to engage students in the learning process.

It is hoped that the different levels of interactive tutorials will help to bring students of various backgrounds up to speed with their learning of the current tax law, and also flesh out the fundamentals of various topics covered. In addition, computer-marked quizzes, as pointed out in the literature,⁴⁸ offer several other advantages, such as students' ability to self-assess and check their progress in a topic through feedback and identify areas of misunderstanding. All 113 interactive questions,⁴⁹ covering various topics before the tax assignment was due, were made available to students on-line and it was left to students to decide whether they wanted to self-assess their understanding of the topic before they embarked on the assignment. The quizzes were in the form of MC (n=32), True/False (n=54), and Yes/No (n=27) type questions. There was no limit to the number of times students could choose to attempt a quiz. A score and feedback was provided to students once they submitted their answers to each set of questions. At the end of the course, the students were asked to share their impressions and comments about the interactive quizzes and the multiple choice on-line summative assessment, which was used for the first time in this course.

A family tax scenario was provided in the tax assignment and students were required to write a report on the tax implications of transfers of various types of assets to different parties, investments choice, dividend and fringe benefit tax implications, and business structure implications. The assignment carried 15% towards the total course grade.

Students were required to complete the on-line MC test in the last week of the semester. It was open book and as most students were working full time, they were given a week to complete the test. This quiz contributed only 5% towards the total course grade. The test covers the topics that were not included in the tax assignment.

C Model

Many of the prior studies described in the literature review studied the influence of personal and contextual factors on students' performance in isolation from other factors.⁵⁰ In some cases, only bivariate correlations were used to examine the

⁴⁷ See *About Moodle* <<https://moodle.org/about/>>.

⁴⁸ Above n 5.

⁴⁹ Forty-one questions were provided in week 6, 41 questions in week 7, and 28 questions in week 8. Assignment 2 (tax component) was due in Week 9.

⁵⁰ Jan Vermunt, 'Relations Between Student Learning Patterns and Personal and Contextual Factors and Academic Performance' (2005) 49 *Higher Education* 205.

relationships, without considering the possible influence of other personal or contextual factors such as age or prior educational background. Such analysis does not tell us which factors are useful predictors of students' performance in the exam. This study used a multiple regression model to predict which of the independent variables were useful predictors of performance in the final exam. The dependent variable was students' score in the tax component in the final exam. The exam had no MC questions and only CR questions were used. One question required students to apply their tax knowledge to a case study of an investor, indicating the tax implications of the various income and expenses derived or incurred by the investor. The remaining questions provided various tax scenarios with a number of true/false statements and students were required to indicate whether the statement was true/false by providing justifications.

The independent variables were students' scores in the MC test and the tax assignment, attempted on-line quizzes, prior tax knowledge, GPA score, gender and age. As students might not have attempted all the interactive quizzes, it was assumed that students who completed at least two thirds of the total quizzes would have self-assessed a substantial portion of the examinable topics and the feedback might have enhanced their learning of those topics. Entwistle⁵¹ identified some student characteristics as factors that may affect the way students go about learning and studying. Among them are prior knowledge, intellectual ability, and motivation. In this study, prior tax knowledge was included as an independent variable as some students might have completed an introductory tax course before. Previous studies have shown that prior knowledge has an impact on students' performance.⁵² Students' abilities have also been shown, in numerous studies,⁵³ to be correlated with academic achievement or aptitude. In this study, ability was measured by using the students' most recent grade point averages ('GPA').

Age may be another influencing variable as there could be differences between younger and more mature students in their learning; the latter may bring more life experiences to a learning situation. Studies which examine gender produced mixed results with some⁵⁴ suggesting that males perform better on MC tests than female students, and others finding no significant gender differences.⁵⁵ Vermunt⁵⁶ further found no

⁵¹Noel Entwistle, 'Approaches to Studying and Levels of Understanding: The Influences of Teaching and Assessment' in John Smart (ed), *Higher Education: Handbook of Theory and Research* (Agathon Press, 2000) 156.

⁵² See, eg, Lin Mei Tan and Fawzi Laswad, 'Impact of prior content and meta-cognitive knowledge on students' performance in an introductory accounting course' (2008) 20 *Pacific Accounting Review* 63.

⁵³ See, eg, Robert Brookshire and Susan Palocsay, 'Factors Contributing to the Success of Undergraduate Business Students in Management Science Courses' (2005) 3 *Decision Sciences Journal of Innovative Education* 99 and Burch Kealey, Jonna Holland, and Marsha Watson, 'Preliminary Evidence on the Association Between Critical Thinking and Performance in Principles of Accounting' (2005) 20 *Issues in Accounting Education* 33.

⁵⁴ See, eg, Bible et al, above n 2; Brent Bridgeman and Charles Lewis, 'The Relationship of Essay and Multiple-choice Scores with Grades in College Courses' (1994) 31 *Journal of Educational Measurement* 37; and William Kuechler and Mark Simkin, 'How Well do Multiple Choice Tests Evaluate Student Understanding in Computer Programming Class?' (2003) 14 *Journal of Information Systems Education* 389.

⁵⁵ Nixon Chan and Peter Kennedy, 'Are Multiple-choice Exams Easier for Economics Students? A Comparison of Multiple-choice and "Equivalent" Constructed-response Exam Questions' (2002) 68 *Southern Economic Journal* 957.

differences between male and female students in their approach to learning. Because of the possible association between these demographic factors, age and gender of students were used as control variables in this study.

In summary, the multiple regression model used to test students' performance was:

$$\text{Taxexam} = \text{Intercept} + \beta_1 \text{Gender} + \beta_2 \text{Age} + \beta_3 \text{Taxknow} + \beta_4 \text{Onlinequiz} + \beta_5 \text{MCtest} + \beta_6 \text{GPA} + \beta_7 \text{Taxassign} + \varepsilon$$

where:

Taxexam = percentage score in the final exam – tax component only

Gender = a dummy variable: 1 = male, 2 = female

Age = age of students

Taxknow = a dummy variable: 1 = never done tax before, 2 = did a tax course before

Onlinequiz = a dummy variable: 0 = those who did not attempt at least 2/3rds of the quizzes, 1= those who did

MCtest = percentage score on the multiple choice on-line test

GPA = GPA scores from 0 (Fail) to 9 (A+) at beginning of the 2010 semester

Taxassign = percentage score in tax assignment.

IV RESULTS

Table 1 (page 163) shows the profile of the students. There is a good representation of male (45%) and female students (55%). Since this course is a distance learning course, most students were working either full-time or part-time and it is expected that there will be more mature students than in a standard face to face university course. The average age was 37 and the majority of the students (73%) were 30 years old or more. About 71% of the students in this study had not enrolled in a tax course before, as this course caters primarily to the Graduate Diploma in Financial Planning. The balance of 29% must have self-selected to do this course. The academic performance of the students also varied, with an average GPA score of 4.5 (in Grade B category). The majority of students (56%) had a GPA grade in the B category, 22% in the A category and another 22% below the B category.

⁵⁶ Above n 50.

Table 1. Profile of students.

	No.	%
Gender		
Male	51	45
Female	<u>62</u>	<u>55</u>
	<u>113</u>	<u>100</u>
Age		
20-29	30	27
30-39	43	38
40-49	28	24
50 and above	<u>12</u>	<u>11</u>
	<u>113</u>	<u>100</u>
Prior tax knowledge		
No	80	71
Yes	<u>33</u>	<u>29</u>
	<u>113</u>	<u>100</u>
GPA grade*		
A+ } A category	1	1
A } A category	7	6
A- } A category	17	15
B+ } B category	16	14
B } B category	20	18
B- } B category	27	24
C+ } C category	17	15
C } C category	7	6
R (restricted pass)	<u>1</u>	<u>1</u>
	<u>113</u>	<u>100</u>
No. of on-line quiz questions completed before assignment due date		
0% of quiz questions	69	61
1% -33% of quiz questions	16	14
Between 34%-66% of quiz questions	18	16
Between 67% and 99% of quiz questions	3	3
100% of quiz questions	<u>7</u>	<u>6</u>
	<u>113</u>	<u>100</u>
No. of on-line quiz questions completed before exam		
0% of quiz questions	23	20
1% -33% of quiz questions	10	9
Between 34%-66% of quiz questions	8	7
Between 67% and 99% of quiz questions	20	18
100% of quiz questions	<u>52</u>	<u>46</u>
	<u>113</u>	<u>100</u>

Disappointingly, the majority of the students (69%) did not use the on-line resources to self-assess their tax knowledge before the tax assignment was due. These interactive exercises were designed to help students reinforce their learning of each topic, and have relevance to the assignment question. The low participation rate could be due to work and family commitments perhaps taking priority for these students. Also from experience, a number of working students tend to do assignments very close to the due date. Only 9% of the students completed at least two thirds of the total interactive quizzes. In contrast, before the final exam, more students did the interactive quizzes, and perhaps they found that it was a good way to revise their studies. About 52% did all the quizzes and another 20% completed at least two thirds of all the quizzes. However, 23% did not attempt them at all.

Table 2 (below) shows the means and standard deviation ('SD') of the marks achieved by students in the summative assessments. The mean scores show that students performed better in the quiz than the tax assignment. Only two students did not submit the tax assignment and thus obtained zero scores. For the on-line quiz test, 96% of the students attempted all the MC questions. In contrast to student participation in the formative assessment, when no incentive was offered only five students chose not to submit their answers to the quiz. This finding suggests that where credit is given for on-line quizzes, most students would participate within the required time period. The mean score for the final exam (56%) was much lower than internal assessments as it was a totally closed book examination.

Table 2. Means (SD) for marks.

	Lowest mark (%)	Highest mark (%)	Mean ⁵⁷ (%)	SD (%)
Tax Assignment	0.00	90.00	63.50	14.30
Quiz (Tax)	0.00	95.00	66.11	19.63
Final exam (Tax)	22.50	83.33	55.74	13.13

Table 3 (page 165) shows the breakdown of the tax exam score based on the students' profiles. Female students had a higher mean score than male students. Those under 30 years of age scored higher than those who were 30 and over. Furthermore, students with prior tax knowledge, and with higher GPA scores, achieved higher exam scores than those with no prior tax knowledge and lower GPA scores respectively. Finally, those who completed more quizzes performed better in the final exam than those who completed fewer. When students were further categorised into three groups: 'failed' students (achieved below 50% of tax exam marks), 'passed' students (50%–74%) and 'excelled' students (75% and above), the results were interesting. Out of the 10 excelled students, 8 (80%) did the on-line quizzes. For the 'pass' students, 42 out of 64 (66%) did the on-line quizzes. For the failed group 22 out of 39 (56%) did the on-line quizzes.

⁵⁷ The median for tax assignment, quiz and final exam are 66%, 70% and 55% respectively.

Table 3. Breakdown of tax exam marks by student profile.

	Marks %	SD
Gender		
Male	53	11.90
Female	58	13.80
Age		
20-29	57	15.10
30-39	55	12.60
40-49	56	11.70
50 and above	54	13.90
Prior tax knowledge		
Yes	59	12.10
No	54	13.40
GPA grade		
A category	69	8.60
B category	54	10.80
C category	46	11.20
R category	43	0.00
No. of quiz questions completed before exam		
0% of quiz questions	52	12.80
1% -33% of quiz questions	52	15.60
Between 34%-66% of quiz questions	55	8.42
Between 67% and 99% of quiz questions	56	12.90
100% of quiz questions	58	13.40

1 Regression

To examine the predictive power of each of the variables on the final exam score achieved by students, a linear multiple regression analysis was carried out. Table 4 (page 166) shows that a significant model emerged: $F(6, 106) = 20.596$, $p < 0.001$ and the model explains 53.8% of the variance.⁵⁸

The results show that students' GPA was the best predictor of exam performance, followed by prior tax knowledge and tax assignment scores, after controlling for gender and age. GPA indicates students' ability in academic studies and therefore it is not surprising to find that good students in terms of academic ability tend to perform well in most subjects. Apart from that, those who had prior tax knowledge appeared to have a better understanding of tax concepts and were able to apply their understanding of the concepts to the scenario situations. These students, who self-selected into the course, perhaps had a real interest in tax and therefore were more motivated to do well than those for whom the course was compulsory. In contrast, quiz attempted⁵⁹ and quiz test

⁵⁸ The variance inflation factors (VIF) were checked and since they were within acceptable limits ($VIF < 10$), there was no issue with multicollinearity.

⁵⁹ To test whether a difference would be found if students had completed at least 50% (instead of 67%) of the total quizzes, a separate test was carried out. However, there were no differences in the results. No significant differences were found even if this variable is used as a continuous variable.

score had no predictive power. These findings reinforce the claim in some studies that MC questions and CR questions test different cognitive processes.

Table 4. Multiple regression analysis results.

Model		B	Std Error	Beta	t-statistic	Sig.
1	(Constant)	17.155	6.318		2.715	.008
	Gender	1.714	1.733	.065	.989	.325
	Age	-.131	.090	-.100	-1.455	.149
	Taxknow	5.005	1.956	.174	2.559	.012*
	Onlinequiz	.021	.019	.077	1.099	.274
	MCtest	.031	.049	.046	.632	.528
	GPA	4.046	.680	.528	5.946	.000***
	Taxassign	.199	.078	.216	2.537	.013*

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

2 Student feedback

A survey of students' perceptions of the on-line assessment was elicited from the students, also on-line. Some of the questions were modelled on the literature.⁶⁰ Eighteen students (16%) responded.⁶¹ Table 5 (page 167) shows the results.

Generally, students who attempted or completed the on-line assessment resources found them to be useful in terms of providing feedback about learning and mastery of learning outcomes, identifying areas of weaknesses, etc. A huge majority (83%) thought they were valuable learning activities and only 39% thought they would attempt the quizzes only if credit was given for them. Some comments received from students which reinforced these points include:

I believe having one or more on-line quizzes for each of the topics covered in the course would be very useful for the distance learning student because it helps to test their knowledge of the topic and identify the areas they are weak in or have not understood properly.

It is also an efficient way to reinforce knowledge of key points in each topic.

...especially for extramural students [*i.e. distance learning students*] the quizzes provide fantastic feedback. I take the quizzes also as a hint of what subjects are important for the final exam.

Quizzes are great, given this paper covers rather broad topics, estate and tax.

⁶⁰ See, eg, Jonathan Kibble, 'Use of Unsupervised Online Quizzes as Formative Assessment in a Medical Physiology Course: Effects of Incentives on Student Participation and Performance' (2007) 31 *Advances in Physiology Education* 253.

⁶¹ Some data was lost (9 in total which appeared blank) due to a technical error, and when it was discovered the next day, the survey was reset. Therefore a higher response would have been obtained if not because of the technical error.

Good mix of questions, valuable tool to understand the concept and learn from wrong answers.

Great tool that you can go back to time and again to reinforce understanding of the topics.

I found having explanations for why an answer was right/wrong EXTREMELY useful.

Quizzes are great for clarifying what rules are black and white. It felt like the course had a lot of grey areas and I was grateful that the quizzes helped clarify matters. Excellent way of making people engage with the course.

Students appeared to have a higher preference for on-line MC questions than yes/no or true/false type. However, only 11% of the students found the quizzes helpful in answering the tax assignment questions. One student pointed out the ambiguity of some questions:

For a quiz to be successful there needs to be a clear right answer. Some of the questions are ambiguous and therefore confusing and not helpful to my learning. I accept that some of the topics are not black and white — perhaps these more obscure concepts are inappropriate for short answer questions.

Table 5. Students' perceptions of on-line assessment resources.

Use of on-line quizzes	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Used them to give me feedback about my learning.	39%	44%	11%	6%	0%
They helped me to identify areas of weakness.	50%	28%	17%	6%	0%
They provide useful feedback to me about my mastery of the learning outcomes.	50%	28%	0%	11%	0%
They helped me to keep up with my studies.	28%	28%	17%	17%	0%
They helped me to learn the course material.	22%	61%	11%	0%	0%
They were a valuable learning activity.	61%	22%	6%	11%	0%
Giving credit for the quizzes will make it more likely for me to attempt them.	22%	17%	22%	22%	11%
I had a better grasped of the topic after going through the quizzes.	56%	22%	17%	0%	0%
The quizzes, to a certain extent, helped me to answer Assignment 2 questions.	0%	11%	17%	33%	11%
I think the yes/no questions are most helpful in reinforcing what I have read about the topic area.	0%	39%	44%	11%	0%
I think the true/false questions were most helpful in reinforcing what I have read about the topic.	11%	22%	44%	11%	0%
I think the MC questions were most helpful in reinforcing what I have read about the topic area.	28%	33%	17%	11%	6%

The author accepts the ambiguity of some MC questions, especially those which were set to assess higher learning objectives. MC questions in taxation are certainly more difficult to construct, particularly if one wants to assess higher level thinking and analytical skills. Some types of question might be better asked in a CR question form, as certain tax decisions require justifications and support from the tax law.

V CONCLUSION

Extant literature on student learning and motivation supports the use of on-line assessment such as MC questions as it provides instant feedback, enabling students to assess their own strengths and weaknesses in their understanding of the subject matter so that they can improve future performance. This study was carried out to examine the use of on-line learning opportunities by tax students and to determine whether participation helped students in their performance in the final examination. Students' performance in an MC test, and its relationship with their examination scores, was also examined. The results revealed that use of on-line quizzes and the MC test were not good predictors of examination scores. Instead, students' GPA stood out as the most important predictor of performance in the examination, which is consistent with many prior studies in accounting courses.⁶² Other significant predictors were the CR type tax assignment and prior tax knowledge. Students with high GPA scores perhaps have a good mastery of all the different cognitive levels, from knowledge to evaluation, compared to those with lower GPA scores. The literature further indicates that those with a strong academic record tend to be those who are more motivated and willing to put more effort into their studies.⁶³ Prior tax knowledge may also serve as motivation, as students who have completed an introductory taxation course before and have self-selected into this course appear keen to learn more about the subject.

The finding that MC test scores are not a predictor of student performance indicates that MC assessment is not a good surrogate for CR assessment. This result is consistent with those studies that found no relationships,⁶⁴ but inconsistent with those that found positive relationships.⁶⁵ As pointed out by Bible et al,⁶⁶ it is important to consider the nature of the CR questions used in the exam when making comparisons with the findings of prior studies. Results could be different due to the type of assessments and the disciplines in which they are used, or due to the level of educational objectives set for MC and CR questions.⁶⁷ Both the exam questions and the tax assignment questions in this study required students not only to have knowledge and understanding of the tax law but also to be able to apply it, as well as to analyse and evaluate the various tax situations. Furthermore, with numerous exceptions to tax rules, there is not always one correct answer. Sometimes answers to a tax scenario could be different if valid assumptions are made. Therefore CR questions are more suitable for assessing students' ability to construct a logical argument or justification. MC tests and quizzes have more to

⁶² See, eg, Kealey et al, above n 53.

⁶³ See, eg, Brookshire and Palocsay, above n 53.

⁶⁴ See, eg, Becker and Johnston, above n 38; Kuechler and Simkin, above n 53; and Sangster, above n 40.

⁶⁵ See, eg, Bible et al, above n 5 and Buchanan, above n 9.

⁶⁶ Above n 5.

⁶⁷ See, eg, Kuechler and Simkin, above n 12.

do with the first three cognitive levels, ie knowledge, comprehension, and application. This perhaps explains why quizzes are not significant predictors of examination performance. Using MCQ as a surrogate for CRQ therefore is not appropriate for a taxation course which requires students not only to be able to evaluate a tax situation, but also to provide justifications for their answers to various tax scenarios set in the assignment or examination questions.

Does this mean that MC questions or other forms of on-line interactive exercises are not useful for learning purposes, as they do not help students to perform better on course assessments and examinations? Although they did not play a significant role in exam performance, as shown in this study, students' feedback suggests that there are students who like a combination of various on-line activities, and there is a preference for MC type questions. This is more the case for distance learning students who are working on their own, as it can be extremely frustrating not knowing whether one is on the right track. Also, as students may have different learning approaches, providing a diverse range of assessments allows students to tailor their use to their own learning style and also helps to reduce student anxiety.⁶⁸ Furthermore, students generally like to see a range of assessment opportunities as it helps to keep them motivated in their studies.⁶⁹ These types of interactive assessments provide good support for self-regulated learning.⁷⁰ It is, however, challenging for tax teachers to write MC questions to assess outcomes at the higher cognitive levels. Coming up with plausible distracters requires a certain amount of skill and it is time consuming. MC questions are perhaps more suitable for testing a student's achievement at the lower level, such as simple recall of facts, and understanding of tax concepts.

The other interesting finding from this study is that incentives (course credit of a certain percentage) provided for on-line quizzes increases student participation. The interactive quizzes were set with the good intentions of helping students in learning the subject and the author thought most students would want to attempt them before the tax assignment was due. Having said that, the majority of distance learning students worked full-time and they had to juggle and prioritise their time between study, work, and family. When no credit was awarded for the quizzes, attempts appeared to be of low priority but when credit was awarded, students completed the quizzes on time. However, when it came to studying for the examination, a huge majority used them for revision purposes. This approach to learning is rather similar to what Entwistle and Ramsden⁷¹ and Biggs⁷² termed as the strategic approach, as students who want to do well in the course are guided by an awareness of assessment criteria. Many distance

⁶⁸ See, eg, Roy Clariana, 'A Review of Multiple-try Feedback in Traditional and Computer Based Instruction' (1993) 20 *Journal of Computer-Based Instruction* 76; Peat and Franklin, above n 8; and Stan Zakrzewski and Joanna Bull, 'The Mass Implementation and Evaluation of Computer-Based Assessments' (1999) 23 *Assessment and Evaluation in Higher Education* 141.

⁶⁹ See, eg, Jane Seale, Judith Chapman and Christine Davey, 'The Influence of Assessments on Students' Motivation to Learn in a Therapy Degree Course' (2000) 34 *Medical Education* 614.

⁷⁰ See, eg, Nicol, above n 7.

⁷¹ Noel Entwistle and Paul Ramsden, *Understanding Student Learning* (C Helm; Nichols Publishing Company, 1982).

⁷² John Biggs, *Student Approaches to Learning and Studying* (Australian Council for Educational Research, 1987).

learning students in particular are, of necessity, strategic in their approach to learning.⁷³ An interesting question is raised at this point: should distance learning students be left to self-regulate their own learning or should the educator look at ways to encourage student participation at an earlier stage? There are indeed no hard and fast rules as to which is the best approach but it is a question which every teacher needs to ask in order to decide which is more appropriate for their course.

This study examined distance learning students enrolled in a taxation course in one university only. Therefore the findings may not be generalisable to other universities, disciplines, or to on-campus students. Future studies could extend to more advanced tax courses or to on-campus students. Furthermore, the design employed in this study is a 'between subjects' design, and therefore the findings did not tell us whether the examination scores of the same student improved because the student attempted the quizzes and learned from the feedback. For instance, to examine whether the quizzes helped the weaker students would require a 'pre- and post-test' design. Another interesting aspect was that when students were grouped into failed, passed, and excelled students, it was found that 22 students who attempted the on-line quizzes still failed the final examination. Does this mean that they just attempted the quizzes without reflecting on the feedback? Examining the learning approaches or styles of students who achieved a fail, pass, or excellent grade and using a longitudinal study may provide further insights into how students engage with their studies on-line, including the use of interactive exercises and the benefits they reap from such engagement in terms of enhancing their learning and development.

⁷³ See, eg, Mark Stansfield, Evelyn McLellan, and Thomas Connolly, 'Enhancing Student Performance in Online Learning and Traditional Face-to-face Class Delivery' (2004) 3 *Journal of Information Technology in Education* 173.