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**Further evidence of critical thinking and final examination performance in
advanced financial accounting**

by

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Abstract

This study examines whether in-course test components requiring more critical thinking skills can help explain final examination performance in an advanced undergraduate financial accounting course, conducted in 2003 and 2004 over three continuous semesters at a metropolitan Australian university. It proposes and validates two levels of dimensions affecting final examination performance: in-course test components and previous university academic performance of students. Analysis of a database of 1,816 students using standardised multiple regression over three continuous semesters suggests that while Grade Point Advantage (GPA) is the single best predictor of final examination performance, in-course test components with more critical thinking are better predictors than others, except for the in-course ethics essay test. Length of stay also had some predictive ability. This study suggests that academics should pay attention to monitoring and providing feedback to students on their in-course performance in tests that examine critical skills covering a wide range of topics. Such monitoring and feedback may assist in improving the final examination performance of students in this course.

Keywords: GPA; final examination; performance; generic skills; technical skills

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1. Introduction

The objective of this study is to examine whether in-course test components requiring more critical thinking skills can help explain final examination performance using a database maintained by the students' faculty. The aim is to diagnose predictors, other than the overall Grade Point Average (GPA), of the final examination performance in an advanced undergraduate financial accounting course conducted in 2003 and 2004 over three continuous semesters at a metropolitan university in Australia. The overall GPA comprised the average of all prior coursework before undertaking this course. It also relates to all prior university coursework, not merely accounting coursework, and hence it is general academic ability rather than prior accounting knowledge. Critical thinking skills are more than the recall of procedures and rules; the term is described in this paper as "the process of determining the authenticity, accuracy and worth of information or knowledge" (Beyer, 1985, p. 276). The motivation of this study is to understand the implications of inculcating critical thinking skills as in-course test components in facilitating students to perform better in their final examination in the context of an advanced financial accounting course, as supported by previous studies in the context of an introductory accounting course and auditing.

The paradigm of final examination performance and two dimensions, (a) in-course performance in tests and (b) students' previous performance in the university, may help us to understand how universities can ascertain the predictability of student performance in the university. An understanding of these two dimensions can act as a precondition for subsequent arrangements to optimise students' final examination performance.

Section 2 of this paper outlines the course structure. Section 3 develops a hypothesis based on the literature relating to two dimensions: in-course test performance and previous academic performance of students. Section 4 outlines the data and structure of the statistical analysis. Section 5 presents the findings and the extent to which final examination performance can be explained by the two dimensions. Section 6 closes the paper with further remarks.

2. Course structure

The objectives of the course (Financial Accounting Theory and Practice) are for students to develop both their technical accounting skills through an understanding of selected accounting standards, and their ability to critically evaluate financial accounting information and standards through an understanding of the different theoretical and philosophical approaches to accounting. It combines financial accounting theory and practice at an advanced level and the objectives of the course have remained unchanged during the period of this study (i.e., Semester 2, 2003 to Semester 2, 2004). The objectives of the course are achieved by developing a broad range of skills in students: critical thinking, communication, and interpersonal and routine application skills, assessed through various tests. For instance, Kealey, Holland & Watson (2005) demonstrated that critical thinking skills can be developed during the course using student writing samples, and this course uses writing answers to questions as a way of developing critical thinking skills (Table 1 and Appendix 1).

Table 1. Summary of course assessment

Type of assessment	Nature of assessment	Nature of skill-building
Tutorial assignment test	Weekly essay and problem questions relating to each lecture topic given at the beginning of the course. Answers are discussed in the two-hour tutorial class following the lecture week.	Critical thinking, application of concepts, and interpersonal skills
Multiple-Choice Questions test	Weekly short multi-choice, closed-book test containing 10 questions, completed in 15 minutes in tutorial class.	Critical thinking, and application of concepts
Class presentation	Once-only five-minute presentation on an article or publication of interest to financial accountants; topic given at the beginning of the semester.	Oral communication
Ethics essay test	Once-only take-home essay completed over the mid-semester two-week vacation on an ethical dilemma. Students are provided with a framework for evaluating the ethical dilemma.	Written communication and critical thinking
Final examination	A three-hour, closed-book test comprising essay and problem questions on theoretical and the practical components studied in the course.	Critical thinking, and application of concepts

Similar to Kealey et al.'s (2005) demonstration of the importance of critical thinking skills for success in the coursework of an introductory accounting course, the critical thinking skills may play a vital role in the advanced financial accounting course investigated in this study. Since this course is taught at an advanced financial accounting level, it attempts to advance the lower level of cognitive skills acquired by students in a previous course on financial accounting. Based on Bloom, Englehardt, Furst, Hill & Krathwohl's (1956) taxonomy of educational objectives, this course builds on previously acquired cognitive skills of students on knowledge (remembering previously learnt material), comprehension (grasping the meaning of material), application (using information on concrete situations), analysis (breaking down material into parts), and synthesis (putting together parts into a whole), while focusing on the highest level of cognitive skill – evaluation – that consists of making judgements based on previous levels of learning to compare an 'agenda' with a designated standard. Although critical thinking skills can be inculcated at a lower level of cognitive skills, as demonstrated by Kealey et al. (2005) in an introductory accounting course, this study varies from Kealey et al.'s (2005) by investigating critical thinking skills on a different level of cognitive skills in an advanced financial accounting course.

The tutorial assignment test questions are directed to develop critical thinking at the highest level of cognitive skills – synthesis and evaluation. The test questions are followed by a discussion in the tutorial class with students exchanging ideas and view points during

the class, and discussing their ideas with the tutor in class. This format has two outcomes: sharing critical knowledge through interaction and improving inter-personal skills.

Weekly multiple-choice-question (MCQ) tests attempt to examine the application of concepts learnt during the course, and critical thinking skills are developed in the application and analysis levels of cognitive skills which are at a lower level of cognitive skills than those which are developed in tutorial assignment tests.

The class presentation is not necessarily designed to develop critical skills, but to develop cognitive skills at the knowledge and comprehension level. The ethics essay, which is based on a case scenario provided to students, has several questions to it, and attempts to develop critical thinking skills from a comprehension level to an evaluation level of cognitive skills.

The final examination comprises questions that examine course content, requiring a combination of cognitive skills based on Bloom et al.'s (1956) taxonomy of educational objectives, although these questions are dissimilar to the in-course test component questions.

3. Hypothesis development

The literature abounds with various aspects of investigations into the examination performance of students within the accounting curriculum. These studies can be broadly classified as investigations into grading techniques (Weinstein, 1994) and policies (Ravenscroft & Buckless, 1992); prior academic exposure (Canlar, 2001; Loveday, 1993; Moses, 2001) and performance (Doran, Bouillon & Smith, 1991; Gammie, Jones & Robertson-Millar, 2003; Koh & Koh, 1999; Ward, Ward, Wilson & Deck, 1993; Wong & Chia, 1996; Tho, 1994); student demographics (Carpenter, Friar & Lipe, 1993; Harnett, Romcke & Yap, 2004; Koh & Koh, 1999); the personality factors of students (Clark & Schwartz, 1989; Gul & Fong, 1993), effort and expectation of students (Baldwin, Hansen, Howe & Wasson, 1989; Christensen, Fogarty & Wallace, 2002; Ibrahim, 1989); work experience (Koh & Koh, 1999); learning environment (Ault & Carver, 2001; Ciccotello & D'Amico, 1997; Edmonds & Alford, 1989; Hill, 1998; Ott, Deines & Donnelly, 1988; Porcano, 1984; Seay & Milkman, 1994), and the influence of instructors (Porcano, 1984). The findings of most of these studies suggest that many factors are positively associated with student performance, with a greater body of evidence existing in relation to *previous university examination performance* where overall GPA is used as an indicator.

In more recent studies of student performance, researchers have attempted to understand the impact of critical thinking skills as additional predictors (Clinton & Kohlmeyer, 2005; Jenkins, 1998; Kealey et al., 2005; Murphy & Stanga, 1994). Kealey et al. (2005) found that critical thinking skills, overall GPA, aptitude (i.e., ACT scores) in mathematics and English prior to entering university, and majoring in accounting were significant predictors of examination performance in a Principles of Accounting course. However, the length of stay (total hours completed) in the university prior to attempting the course was not significant.

Jenkins (1998) measured the critical thinking ability of students undertaking an auditing course using Watson Glazer Critical Thinking Appraisal and who volunteered to take part in the study, and found that students with higher critical skills performed better in the final examination. Kealey et al. (2005) found that critical thinking in the in-course test component has a significant and positive association with total examination performance in

an introductory accounting course. Their study has demonstrated that in-course test components are an effective way of developing students' critical thinking skills.

The present study builds on the work of Kealey et al. (2005) and Jenkins (1998) by examining in-course subject-specific examination performance. This study however examines whether in-course test components that includes critical thinking skills help to explain final examination performance (as done by Jenkins) rather than total examination performance (as done by Kealey, et al.), the reason for this being that the final examination performance component is independent of the in-course test components, and therefore is not influenced by in-course test component scores.

In-course subject-specific examination performance

It is acknowledged in this study that each in-course assessment attempts to foster a different set of skills, some being critical thinking skills and others not, and hence different test components can contribute differentially to final examination performance. Further, this study applies to an advanced financial accounting course, whereas Kealey et al. (2005) used an introductory accounting course, and Jenkins (1998) used auditing. The major predictors of in-course test performance investigated in this study are classified into four variables based on the assessment criteria, and they are selected as predictors for this study as follows: (1) the weekly tutorial assignment test, (2) the weekly MCQ test, (3) the class presentation, and (4) the ethics essay test.

Based on the course outline in building different skill sets, it was expected that the weekly tutorial assignment test performance, fostering critical thinking skills, should have the most positive association with final examination performance. Since the aim of the class presentation was to foster oral communication skills, its test score was expected to have the least positive association with final examination performance. And although the ethics essay attempts to foster critical thinking skills, since it is based on a single topic in the course, this study assumes a less positive association was expected with the final examination.

Previous university examination performance

GPA: Several researchers including Kealey et al. (2005) have confirmed that GPA is a significant predictor of final examination performance (Allen & Bycio, 1997; Davidson, 2002; Harnett, Romcke & Yap, 2004; Ibrahim, 1989; Stout, Bonfield & Battista, 1987; Tickell & Smyrnios, 2005). Thus it is assumed here that GPA is positively associated with final examination performance. Although Kealey et al. (2005) investigated pre-university aptitude, this study did not do so, as it is based on an advanced financial accounting course rather than an entry-level course. As students stay longer in the university, the GPA becomes a more relevant predictor to investigate than does pre-university aptitude.

Duration in university: Although Hill (1998) found a positive relationship between examination performance and duration of student stay in classrooms, Kealey et al. (2005) found that the length of enrolment was not a significant predictor and offered no explanation for this finding. However, it is assumed here that duration in university has a positive relationship to final examination performance, as students have completed more courses.

4. Research methods

All predictors in this study were continuous variables. Performance was measured as the total percentage score a student achieved in the final exam (lowest = 0 and highest = 55). The in-course test performance types were: (1) weekly tutorial assignments (lowest = 0 and highest = 10); (2) weekly MCQ tests (lowest = 0 and highest = 15); (3) a class presentation (lowest = 0 and highest = 5); and (4) the ethics essay (lowest = 0 and highest = 5). This study used overall GPA (lowest = 0 and highest = 4). *Duration in university* (lowest = 0 and highest = 6)¹ was defined as the difference in years between first enrolment at university and the year in which the final examination was attempted. The same instructors taught the same topics over the three semesters during the study period. The course content did not change over that period.

This study used a database compiled for the Accounting Theory and Practice course for three continuous semesters, from Semester 2, 2003 to Semester 2, 2004. Standardised regression analysis was applied to the data to determine predictors. The sample size of this study was 1,816, comprising all students enrolled in the course over three consecutive semesters. The predictors were reviewed for multicollinearity to ensure that any two predictors did not reach a high bivariate correlation ($r < .7$). The variance inflation factor (VIF) in the regression model was checked to ensure that it was within acceptable limits (VIF < 10), indicating that there were no additional collinearity issues relating to the predictors. The tolerance indicators for each predictor were within acceptable limits (< .1). Using casewise diagnostics, the Mahalanobis distance value and Cook's distance results, a check was made to ensure that data lay within three standard deviations.

The regression model is therefore as follows:

$$\text{FEP} = \text{TATP} + \text{MCQTP} + \text{CPP} + \text{EEP} + \text{DU} + \text{GPA}$$

FEP = Final examination performance; TAT = Tutorial assignment test performance; MCQT= MCQ test performance; CP= Class presentation performance; EEP= Ethics essay performance; DU= Duration in the university; GPA= Grade Point Average. GPA= Average of all prior coursework before commencing this commencing studies on this course

5. Results and discussion

Table 2 provides descriptive statistics and a Pearson correlation matrix. It shows low multicollinearity among variables (< .9), and a significant correlation between five of the proposed predictors (the exception being the in-course ethics essay mark) and final examination performance.

To assess the influence of various predictors on final examination performance, a standardised regression analysis was conducted (Table 3). The regression model demonstrates a high statistical significance in explaining variations in final examination performance ($R^2 = 0.36$) at $P < .0001$.

¹ The lowest was 0, as some students at this university followed an alternative path for student entry during the degree program to study the courses offered by accounting program of this university.

Table 2. Descriptive statistics and Pearson correlation matrix (N = 1,816)

Variable	Mean	Standard deviation	FEP	TATP	MCQTP	CPP	EEP	DU	GPA
FEP	28.12	9.362	1.000						
TATP	18.58	19.767	.169**	1.000					
MCQTP	8.603	2.119	.342**	-.193**	1.000				
CPP	3.801	.6241	.181**	.019	.115**	1.000			
EEP	11.221	2.503	.095**	-.238**	.237**	.253**	1.000		
DU	1.61	1.112	-.026	.193**	-.189**	.099**	-.044*	1.000	
GPA	1.987	.796	.539	.169**	.342**	.181**	.095**	-.026	1.000

** Significant at .001 and * significant at 0.05

Table 3. Predictors of final examination performance for all semesters: standardised regression (N = 1,816)

Variable	Coefficient
<i>In-course test performance</i>	
TATP	.209**
MCQTP	.177**
CPP	.048*
EEP	.000
<i>Previous university examination performance</i>	
DU	.078**
GPA	.479**
Model F	169.93
P<	.048
R square	36%**

** p < .001; * p < .05

In terms of previous university examination performance, the predictors GPA and duration in the university made a significant contribution, as shown by the standardised beta values. GPA made the strongest unique contribution, explaining 47.9% of the final examination performance. In terms of in-course test performance, weekly tutorial assignment test performance and weekly MCQ test performance explained most of the final examination performance, 20.9% and 17.7% respectively. Backward stepwise regression at 0.05 probability retained both weekly tutorial test assignment performance and weekly MCQ test performance. Forward stepwise regression at 0.05 probability showed weekly tutorial test assignment performance to be significant at 0.0001 and weekly MCQ test performance at 0.0024, confirming that the former is a stronger predictor than the latter of

final examination performance. The once-only class presentation performance was a low predictor (4.8%), and the ethics essay performance was not significant.

The key findings of this study suggest that final examination performance is determined by multilevel factors. Previous research has already shed light on the influence of overall GPA on final examination performance. The overall GPA comprised the average of all prior coursework before undertaking this course. The final examinations of courses in the accounting program held at this university comprised at least 50% of the total examination score (i.e. out of 100%), as is the case in Australian universities generally (Brailsford, 2005; Simon, 2005; Windeknecht, Kehoe & Tennent, 2005). It is therefore plausible that a large part of the overall GPA takes the character of final examination attributes, with an emphasis on critical thinking skills. The tutorial assignment test performance that fosters critical thinking skills was the second best predictor. The ethics essay performance, although it attempted to foster critical thinking skills, was one of thirteen topics in the course, and had little impact on final examination performance.

6. Concluding remarks

The major findings of this study are consistent with those of Kealey et al. (1985) and indicate that in-course tests fostering critical thinking skills (also represented by overall GPA) are a significant predictor of final examination performance in this course. This study suggests that academics should pay attention to monitoring and providing feedback to students on their in-course performance in tests that examine higher cognitive levels of critical thinking covering a wide range of topics. Providing feedback on a single topic examining critical skills may not be effective as shown with the ethics essay which was a low predictor of final examination performance. Such monitoring and feedback may assist in improving the final examination performance of students in this course. Further, the weekly tutorial assignment tests continuously oriented students to think critically at a higher cognitive skill level over the entire semester leading into the final examination at the end of the semester. The weekly tutorial assignments also had the advantage of face-to-face discussions in the tutorial class that enabled students to exchange and listen to viewpoints and solutions that are different from theirs. Further, students had the opportunity in sharing their critical thoughts with fellow students. The ethics essay was strictly an individual assignment and feedback given to students was on their individual essays only. The ethics essay had a combination of questions, and some developed critical thinking using a medium level of cognitive skills and others using a higher level of cognitive skills. One reason for this is that the department wanted to submit the best ethics essay to CPA Australia's annual ethics essay competition where students can win prizes. Therefore, the ethics essay topic was less aligned with preparing students for the final examination although it examined critical thinking skills. On the other hand, the tutorial assignment tests were more aligned with preparing students for the final examination. As found in Jenkins' (1998) study, one possible explanation of tutorial assignments test being a better predictor of final examination performance is that these tests develop critical thinking skills over the entire semester, and that differentiates from other forms of in-course assessments.

With the aim of diagnosing the major predictors of final examination performance of an advanced undergraduate accounting course, available for accounting major students only

at this university, this study attempted to further its contribution in several ways. First, as demonstrated in the literature review, particular in-course test components have been rarely investigated in the context of critical thinking skills together with aspects of previous university performance of students as predictors of final examination performance. Such an investigation allows academics to focus more on some in-course components in their delivery to maximise student performance. Second, a limitation of several previous studies is that they were often single-semester studies. Further, some previous studies have violated the randomness of subject selection due to self-selection bias. Sample size has diminished the generalisability of findings. In the present study, steps were taken to eliminate such limitations. Third, this study examined critical thinking skills in in-course components of an advanced accounting course in the undergraduate curriculum that required higher order thinking, whereas the previous studies have investigated an introductory accounting course.

Various factors examined in this study may still be incomplete. The negative correlation between tutorial assignments and either multiple-choice tests or the ethics essay warrants further investigation in a future study. However, it is possible that as students become more focused on honing the critical thinking skills required for better performance in tutorial assignment tests on a weekly basis, they become less focused on sharpening different skill sets required by multiple-choice tests and the ethics essay. Additionally, one may argue that teacher demographics and other student demographics (such as enrolment status, fee basis and entry route) are likely to be pertinent to final examination performance. Because such additional factors may also influence final examination performance, future studies should incorporate them into an integrated model for assessing final examination performance. This could improve our understanding of the factors that are common to final examination performance. Examples of such factors include student effort level (Ibrahim, 1989), level of student motivation (Harrell & Stahl, 1983), study approach (Davidson, 2002), personality (Chamorro-Premuzic & Furnham, 2003; Furnham & Chamorro-Premuzic, 2004; Ott, Mann & Moores, 1990), and gender (Ravenscroft & Buckless, 1982). Further, the effect of restructuring course curriculum on final examination performance (English, Bonnanno, Ihnatko, Webb & Jones, 1999; Keef, 1988) and ordering effects of questions (Baldwin, Pattison & Toolson, 1989; Paretta & Chadwick, 1975) are other variables that could be included to improve the understanding of common factors relating to final examination performance. Further, the database used for this study did not release information relating to the gender and age of students, and this study therefore could not examine the differences in those demographic attributes to confirm homogeneity of the sample over three continuous semesters.

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Appendix 1. Course outline and assessment

Unit outline

- Week 1: introduction to the unit and a consideration of the nature of theory
- Week 2: normative accounting theory
- Week 3: positive accounting theory, with the primary focus on agency theory and the principal–agent relationship
- Week 4: the international harmonisation of accounting
- Week 5: examination of the ‘critical’ perspective in accounting, exploring accounting in a social, political and environmental context
- Week 6: ethics in accounting
- Week 7: accounting for employee benefits such as annual leave, sick leave, and long-service leave, as well as disclosures associated with related parties
- Week 8: accounting for financial instruments such as convertible notes, futures contracts and interest rate swaps
- Week 9: the valuation of heritage assets and of biological assets such as agricultural products
- Week 10: accounting for both finance and operating leases
- Week 11: accounting for intangibles
- Week 12: the technical requirements of accounting; reporting for general insurance activities, using values other than historic cost.

Unit assessment

- Ten-question multiple-choice test each week, at the end of the tutorial. Questions are based on material from the lecture and through weekly designated readings. The best 10 of 12 tests contribute a total of 15% to the overall unit mark.
- Weekly written assignments for tutorials. The best 10 contribute a total of 10% to the overall unit mark.
- Five-minute tutorial presentation on an article or publication of interest to financial accountants (5%)
- 2,000-word ethics case-study assignment (15%)
- Final examination (55%). This course examination must be passed to earn a passing grade for the unit. The examination comprises questions that require application of technical skills learned in the course, critical and analytical thinking. Students must also achieve satisfactory marks for each of the theoretical and the practical components of the final exam to pass the course.