Implications of student generated screencasts on final examination performance

James Wakefield[a],*, Jonathan Tyler[a], Laurel E. Dyson[b], Jessica K. Frawley[c]

[a] *UTS Business School, University of Technology Sydney, Australia*

[b] *School of Software, University of Technology Sydney, Australia*

[c] *Faculty of Architecture, Planning and Design, University of Sydney*

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***Corresponding author, James Wakefield**
UTS Business School, Accounting, University of Technology Sydney
City Campus, PO Box 123 Broadway, NSW 2007 Australia
Tel: +61 2 9514 3583; Email: James.Wakefield@uts.edu.au

Implications of student generated screencasts on learning outcomes

ABSTRACT

While educational technologies can play a vital role in students' active participation in introductory accounting subjects, learning outcome implications are less clear. We believe this is the first accounting education study examining the implications of student generated screencast assignments. We find benefits in developing the graduate attributes of communication, creativity and multimedia skills, consistent with calls by the profession. Additionally, we find improvement in final exam performance related to the assignment topic, notably in lower performing students. The screencast assignment was optional and the findings suggest a tailored approach to assignment design related to students' developmental needs is appropriate.

1. Introduction

The objective of this study is to analyse the impact of student generated screencasts on learning outcomes in an introductory accounting subject. In particular, we consider the impact on the development of specific student 'graduate' attributes as well as final exam performance in the topic area for which the screencast was produced. A screencast[1] consists of a digital recording, or screen capture, of any actions taking place on a computer screen, accompanied by an audio narration. The motivation for this study stems from the challenges associated with teaching introductory accounting. Many students, even accounting major and international students, exhibit low motivation in their accounting studies (Phang, Johl, and Cooper, 2014). These students may view accounting as boring, technically difficult, and rule-based (Jackling, 2005; Jackling *et al.*, 2012; Marriott and Marriott, 2003), thereby perpetuating their surface learning approaches to study (Biggs, 1987). This issue is further compounded when using the transmission model of learning (Palm and Bisman, 2010), resulting in negative attitudes, poor performance, and high failure rates (Ferreira and Santoso, 2008). The accounting profession is calling for new teaching approaches to address these issues and to better prepare students for the workplace, emphasising the importance of developing graduate attributes associated with communication, creativity and multimedia skills, in addition to enhancing student performance (Howieson, 2003; Hancock *et al.*, 2010; Wells *et al.*, 2009). These calls fit with the need for constructive alignment between introductory accounting learning objectives, course activities, and assessment.

[1] Examples of student generated screencasts are provided in Appendix 2.

Greater application of technology and participative pedagogies have been used to address challenges faced in accounting education, more generally, with the inclusion of online content delivery and the provision of online learning resources, homework and assessment tools (Khanlarian and Singh, 2013; Albrecht and Sack, 2000). However, changes in teaching introductory accounting subjects have been slow as the creative use of new technologies to facilitate student-centred approaches to learning and the creation of meaning, consistent with a constructivist approach (Biggs, 1996), seem the exception rather than the rule (Carnaghan *et al.*, 2011; Fouché, 2013). The slow rate of change can be partially attributed to the inconclusive findings concerning the impact of new technologies and constructivist approaches more generally on learning (Wang *et al.*, 2013). These inconclusive findings may result from: the confounding effects of technology and pedagogy, the instructor effort required, the difficulty introducing novel approaches, the interaction between the user and the technology, the aptitude of the student and the preferred learning styles of the individual (Bryant and Hunton, 2000). Apostolou, Drominey, Hassell and Watson (2013) stress that the range of educational technologies is evolving and more research, in particular through the empirical measurement of performance, is needed to understand how technologies can promote learning in accounting.

Our study reports what we believe is the first example of a student-generated screencast assignment in the field of accounting education. Most examples of screencasting reported in the literature relate to expert-generated content where instructors make screencasts for students to view (Marriott and Teoh, 2012). Even in the broader tertiary education literature, there appears to be limited research on student-generated screencasts. Notable exceptions are Croft, Duah and Loch (2013), Esgi (2014) and Powell and Wimmer (2015). The emergence in recent years of free, easy-to-use screencast software and cloud-based storage, have made this type of multimedia

much more accessible (Séror, 2012) and has enabled us to task students to produce their own screencasts to explain accounting concepts. This maximises student learning outcomes, consistent with constructivism based theory (Biggs, 1996). It does so by tying together the introductory accounting learning objectives of both developing graduate attributes and comprehension of basic accounting content with an active student centred learning experience of a screencast assignment and the associated assessment of its content, communication, creativity and multimedia use. In this study we examine the implications of student generated screencasts on learning outcomes. This is an important contribution to the literature, particularly due to the limited education research reported in many mainstream accounting journals, including those based within the Asia Pacific region (Benson *et al.*, 2015), outside accounting education focused journals such as *Accounting Education* and *Issues in Accounting Education*. First, we examine the implications of completing the screencast assignment on developing graduate attributes, specifically, communication, creativity and multimedia skills. The development of multimedia skills is particularly relevant in light of surveys demonstrating a gap between the IT skills of accounting graduates and the level of proficiency expected by the accounting profession (CGMA, 2014). Second, we examine the implications of the screencast assignment on students' content knowledge, specifically, the implications for final exam performance concerning the topic area chosen for the screencast assignment.

The paper commences with a review of the literature in the context of screencasts and possible learning outcomes. The context of the study is then presented in Section 3 with a description of the introductory accounting subject and the screencast assignment activity. The method, results and associated discussion relating to the development of graduate attributes and

performance implications of completing the screencast assignment are presented in Section 4. In Section 5, we conclude with the implications for teaching practice and future research.

2. Literature review on student-generated multimedia and learning outcomes

2.1 Screencasting and the rationale for its use

In recent years, there has been a change in the way that multimedia is used in education, reflecting the general increase in use of technology in society. There has been a massive rise of user-generated content (Dale and Povey, 2009), and the uptake of convergent technologies, that is, the inclusion of multiple functions within the one device. Decreasing costs of technology, widespread student ownership of devices, and engagement with user-generated multimedia, have fuelled an interest in the potential use of multimedia by a growing body of educators (Dyson, 2012).

In the modern armoury of student-generated multimedia, which includes podcasts, vodcasts, digital storytelling, animation and digital games, screencasts have their own distinct characteristics and strengths. One attribute is the ability to capture any activity visible on a computer screen, thus screencasts can assume a wide variety of creative visual forms. For example, screencasts can record screenshots progressively drawn in graphics programs like Paint, progressively typed explanations in Word, slideshows taking place on the computer and each keystroke and narration in assembling a spreadsheet. Screencasts are easy to make, require nothing more than basic computer skills to produce, and use only a computer and a microphone. In addition to their simplicity, the availability of free programs for producing screencasts and free cloud-storage options for the finished product make them attractive from a cost perspective (Séror, 2012). Screencasts are a powerful form of educational multimedia due to the combination of communication through visual material and synchronised explanatory narration (Marriott and

Teoh, 2012). This is a distinct advantage over slide presentations such as PowerPoint which are best used to support spoken presentations.

Compared to videos and vodcasts, screencasts are believed to be more suitable for conveying accounting topics. While video lends itself to filming people and events, interviews with experts, or university lectures (Dyson, 2014; Parson *et al.*, 2009), screencasts can be more easily and creatively adapted to convey accounting topics. The variety of visual formats screencasts support allows a diversity of different accounting topics to be presented and communicated. They allow the presentation of worked examples, problem-solving strategies, and explanations behind the reason for selecting alternative approaches (Doering and Mu, 2009). In developing this assignment, we discounted other forms of multimedia; some had a limited range of visual expressiveness (e.g. enhanced podcasts), others were targeted at younger audiences (e.g. digital storytelling), and others were more technically challenging (e.g. digital games).

2.2 Impact of student-generated screencasts and other multimedia on learning outcomes

Existing student-generated screencast studies reported in the literature are largely descriptive, rely on reporting instructors' impressions or student self-reports of learning (Séror, 2012; Dyson, 2012; Shafer, 2010; Rocha and Coutinho, 2011). Our study builds on prior research, including that related to other forms of student-generated digital media, by focusing on the process of students' creating multimedia based on an (active) student centred approach to learning.

2.2.1 Graduate attribute development

A number of studies have reported the development of graduate attributes in student-generated screencast projects. Producing screencasts gives students the freedom to judge,

evaluate, select and order, which covers many levels of Bloom's Digital Taxonomy, including the highest level, that of creativity (Shafer, 2010). In a study of student-generated podcasts, a number of metacognitive skills were identified: self-awareness, understanding of the task, strategising, goal setting, redefining the task, and persistence (McLoughlin, Lee, and Chan, 2006). Management information system students producing a podcast developed skills in communication, creativity, and self-reliance with multimedia (Armstrong, Tucker, and Massad, 2009). Croft et al. (2013), using a case study approach, examined the reluctance of lecturers to adopt student generated screencasts and student perceptions of producing screencasts. They argue mathematics students develop technical skills, outcomes which we believe would be directly applicable to accounting students, in addition to a deeper understanding of the relevant concepts. Given the importance of equipping accounting students with the skills necessary to meet workplace demands (De Lange, Jackling, and Gut, 2006; Kavanagh and Drennan, 2008; Tempone *et al.*, 2005) the potential of student-generated screencasts to develop these skills appears significant.

The audience effect, where students are aware that their work is viewed by others, motivates students to enhance their screencast quality (Goodson and Skillen, 2010; Wheeler, Yeomans, and Wheeler, 2008). As a result, further to the content aspects of the assignment, students are also likely to consider how they communicate and, in particular, how they demonstrate their creativity and multimedia skills to enhance the quality of their screencast assignment. Accordingly, literature suggests student generated screencasts are a useful way for students to develop graduate attributes in communication, creativity and multimedia skills. In this study, we take the opportunity to examine whether this holds true in the specific domain of

introductory accounting concerning communication, creativity and multimedia skills. We propose:

H1: *Screencast assignment completion is associated with graduate attribute development.*

2.2.2 Performance implications

Asking students to generate screencasts, in contrast to traditional forms of teaching, provides a very active approach to learning (Rocha and Coutinho, 2011; Biggs, 1999). This allows students to be more engaged in learning by constructing, rather than receiving, knowledge (McGarr, 2009). One study found deep levels of engagement evidenced by the time and care students spent on their screencasts (Shafer, 2010). Such engagement is typically associated with deep approaches to learning: deep learners "understand ideas and seek meanings …[and] have an intrinsic interest in the task and an expectation of enjoyment in carrying it out" (Prosser and Trigwell, 1999). Deep learning has been associated with knowledge retention and improved learning outcomes in accounting students (Dallimore, Hertenstein, and Platt, 2010).

To create a screencast involves a whole sequence of tasks: planning and brainstorming, scripting, recording, editing and dissemination (Falaschi and Athey, 2008). Research into student-generated stop-go animations created by trainee school teachers shows an evolving series of representations emerging as students perform the various tasks necessary to produce the animation. In particular, creating a representation, students make meaning as they are thinking about the relationship between what they are making, that is the 'representation', and the concept or object they are trying to represent (Hoban and Nielsen, 2010). Hoban and Nielsen (2010) propose deep learning occurs as a result of the multiplication of meaning as it is transferred from one representation (form) to another. A study of university student-generated vodcasts supports

this theory and also revealed students who revisit the task more than once are more likely to experience deeper learning (Dyson, 2014).

Empirical evidence of improved content based performance is limited in the context of existing studies of student-generated screencasts, certainly concerning the context of large student groups studying accounting. While empirical research has demonstrated improved performance from viewing expert-generated multimedia, especially video (Choi and Johnson, 2007; Martin, Evans, and Foster, 1995), there is limited equivalent research on students creating multimedia outputs. Literature suggests the creation of screencasts may improve understanding of focal content. Esgi (2014), found students who prepared the own screenshots on learning 'Photoshop' performed better than those who viewed instructor prepared screencasts. Further, Powell and Wimmer (2015) examined students who created their own screencasts on computer programing and documented positive outcomes in 'theory assessment, lab assessment and final exam scores' when compared to students who did not prepare screencasts. However, the benefits of applying new technologies as a means of improving student performance are not always clear and can be confounded by other factors including students' individual learning approaches, which could be particularly problematic in the context of smaller student group based experimental studies (Bryant and Hunton, 2000; Marton and Säljö, 1976; Biggs, Kember, and Leung, 2001). Accordingly, we tentatively propose:

H2: *Screencast production is associated with higher final exam performance in the focal topic area of the screencast completed.*

3. Screencast task background

The screencast assignment was introduced during the first semester of 2012 on an ongoing basis, after a successful trial and evaluation, in the undergraduate introductory accounting subject at a large Australian university. The introductory accounting subject covers both financial and management accounting topics through a lecture and tutorial teaching format. The subject has consistently high student numbers with a total of 5,800[2] students enrolled over the study period (six semesters, Autumn 2012 to Spring 2014 inclusive). The subject is compulsory for many students, including those studying business, which presents a number of challenges. In particular, many students have preconceived views at subject commencement that accounting is boring, leading to low motivation and surface approaches to learning, consistent with experience noted in the literature (McGuigan and Weil, 2011). The subject also suffers from a failure rate of nearly 30%, which is high relative to other subjects in the business school. Accordingly, our motivation to introduce the screencast assignment to the introductory accounting subject was to increase student engagement and facilitate deeper approaches to learning (Biggs, 1999).

The screencast assignment is optional over the entire period of this study; students can complete the assignment to earn up to ten bonus marks (extra credit). While bonus mark assessments are not widespread practice, we believe it is justified in this case for a number of reasons. First, scaling was typically applied to the final results based on expectations concerning maximum acceptable failure rates. The bonus mark aspect of the assignment largely removes the need to scale. Second, bonus marks emphasise the relative uniqueness of the assignment activity

[2] Excludes student who studied the subject in the fast track mode (different assessment structure) and those who did not complete any assessments (zero grade).

and encourages students to engage in a creative and active student centred learning approach not normally part of an accounting curriculum.

To participate in the assignment (assignment briefing provided in Appendix 1), students must register by the end of week seven of the twelve week semester through an online registration form available on the students' learning management system (LMS). Students are specifically instructed to create a short (180 second), standalone screencast explaining any one of the threshold accounting concepts listed in the assignment briefing. They are given no training but have access to resources providing advice on screencast production and a library of examples through the LMS (five examples of student generated screencasts are provided in Appendix 2). It is recommended students use a free online program called "Jing" to produce their screencast, but they have the option of using any screencast software as long as their screencast is freely available online. The student's screencasts are due in week 10 and assessed based on three criteria: content accuracy, creativity, and multimedia skills. Across the six semester study period, 2,567 (44%) students completed the screencast assignment out of the 5,800 enrolled in the subject.

4. Results and discussion

We apply a two-step approach to consider the implications of the screencast assignment on student learning. First, we examine student perceptions of the development of their graduate attributes to examine Hypothesis one by using data collected through screencast assignment registration and submission forms and discuss the results. Second, we test for performance implications, concerning focal screencast topics in the final exam, through a regression based approach to examine Hypothesis two and discuss the results.

4.1 Examination of graduate attribute development

To examine Hypothesis one, the screencast assignment registration (pre-assignment completion) and submission (post-assignment completion) forms include a number of questions developed to understand students' perceptions of their graduate attributes associated with screencast assignment completion, in particular, relating to communication, creativity and multimedia skills. We received a total of 2,360 usable pairs of forms (pre- and post-assignment form for each student).[3] The questions and data from these forms is summarised in Table 1 below[4] and assigned to an item number (1–11) for reference purposes in the discussion below. To mitigate any students' concerns associated with sharing their true perceptions, students were informed that data collected was confidential and processed by researchers from the school of software, separate from the business school teaching and administration staff of the introduction accounting subject.

[INSERT TABLE 1 HERE]

First, we examine the implications of the screencast assignment on communication skills. In the pre-completion form, students are asked the extent they agree with statement, "I feel confident about explaining accounting concepts to others" (item 1), and they responded with a mean score of 3.343 on a Likert ranging from 1–5. In the post-completion form, students are asked the extent to which they agree with "I believe my screencast communicates the accounting concept clearly" (item 2) and responded with a mean score of 4.286. The Wilcoxon signed-rank

[3] For the purpose of the regression analysis presented in this section, we examine a total of 5,032 students, including 2,367 who completed the screencast assignment, after removing extreme outliers in the data and students who did not complete all assessment items captured in our analysis. Accordingly, we examine the pre- and post-completion forms of the same screencast completion students examined for the purpose of the regression analysis. Based on the 2,367 student who completed the screencast assignment, 7 did not complete the pre- and post-completion forms due to technical issues and special considerations.

[4] Given the detail provided in Table 2, concerning the pre- and post-completion forms and associated Likert scales and response categories, we do not include these in this paper. They are available upon request.

test[5] indicates a significant increase in the mean agreement score ($z = 33.412$, $p = 0.000$), with a large portion of students initially (pre-completion form) indicating neutral agreement in their confidence about explaining basic accounting concepts to others, to between agreement and strong agreement in the post-completion form that their screencast clearly communicates the accounting concept clearly. Accordingly, there appears a clear increase in student confidence and perceptions of their communications skills. This is notable in the context of introductory accounting, given prior studies have noted the limited development of accounting students' oral communication skills (De Lange, Jackling, and Gut, 2006). Large student cohorts traditionally mean, due to time constraints on staff, opportunities for students to engage with activities other than written communication are minimal (Palm and Bisman, 2010) despite such skill development being regarded as a fundamental learning objective by the profession.

The flexibility of the screencast technology provides students more creative freedom when completing the screencast assignment (Séror, 2012), relative to more standard assessments. In the post-completion form, students are asked two questions centred on whether using the screencast technology was a disabler or enabler of facilitating student creativity. First, students are asked whether they agreed with "This technology prevented me from being creative" (item 3), and second, whether they agreed with "Using a new technology allowed me to be more creative than if I had been asked to do a more standard accounting assignment" (item 4), responding with mean scores of 2.239 and 4.093 respectively. The Wilcoxon signed-rank test confirms a significant difference in mean response scores to these two items ($z = 37.096$, $p = 0.000$), indicating students generally agree the screencast technology is an enabler, rather than

[5] The Wilcoxon signed-rank test is a non-parametric test comparing two sample related means, appropriate in this study given the ordinal and non-normal distribution of the available data.

disabler, of exercising creativity skills. Students were asked in the post-completion form to select the things they like and dislike about the assignment from a predefined list (12 options for like and 8 options for dislike) and were free to choose as many or as few as they like. For things students like about the assignment, 45.5% selected "It allowed me to be creative" (item 10a), while only 20.9% selected "It was difficult being creative" (item 11c). This reinforced the notion that the screencast assignment generally facilitated the development and application of creative skills. Students were also indirectly asked the degree to which they exercised creative skills through two questions in the post-completion form. First, they were asked the extent they agree with "I had to take existing ideas that I had learnt and combine them in new ways to make my screencast" (item 5) and second, "I had to consider different ways of presenting the accounting concept in my screencast" (item 6), responding with mean scores of 3.889 and 3.961 respectively, with the majority of students indicating agreement or higher. In general, the screencast assignment appears an effective means of encouraging students to apply and exercise creative skills, which otherwise may not be encouraged through more traditional, less problem based, activities and assessment methods (Palm and Bisman, 2010; Biggs, 1999).

The development of multimedia skills is an important graduate attribute in the contemporary context of business (Kavanagh and Drennan, 2008). To gauge students' level of development in this area, they were asked in the pre-completion form on a five point Likert scale to "Indicate the degree of experience you have with multimedia production" (item 8) and "Indicate the degree of experience you have in making screencasts" (item 9), responding with means of 2.735 and 1.728 respectively. This indicates students have a relatively low perception of their multimedia skills. In the post-completion form, students are asked to indicate their agreement with "I found it difficult to use this technology effectively" (item 7), responding with

a mean of 2.559 indicating students generally did not find it difficult to use the technology and accordingly exercise their multimedia skills. However, it should be noted that the Spearman correlation of item 7 with pre-completion items 8 and 9 were negative (–0.197 and –0.118 respectively) and significant (p = 0.000 in both cases), indicating students with less multimedia experience found it more difficult to use the technology. We don't perceive this as problematic, as it suggests students with less experience are motivated to develop multimedia skills. From the predefined list relating to dislikes, "I experienced difficulties in using the technology" (item 11a) and "Recording the video and voice together was difficult" (item 11b), were selected by 28.3% and 27.8% of students respectively, suggesting a significant portion did find the multimedia aspect of the assignment challenging, and provided the opportunity to improve their skills in this area. It should also be noted that 37.3% of students selected "It was a chance for me to use new technology and multimedia" (item 10b). It, therefore, appears the assignment provides an important introduction to students' active development of multimedia skills and motivated some students, particularly those with lower perceived skills in this area, to improve.

In sum, there appears a clear increase in student confidence concerning communications skills, encouragement to apply and exercise creative skills and active development of multimedia skills. Collectively, the development of these graduate attributes, at the introductory accounting level provides support for Hypothesis one.

4.2 Examination of performance implications

To test Hypothesis two we apply a regression approach to examine the effect of an independent dummy variable, based on screencast completion in a particular topic area, on a dependent variable based on final exam performance in the same topic area. Specifically, two

particular topics are chosen for the purpose of examining performance implications, the accounting equation and financial statements. There is a contrast in the nature and scope of these two topics, despite both being introduced at the commencement of the teaching period, facilitating a comparison in terms of the performance implications of screencast completion. The accounting equation topic is a basic threshold concept, narrow and specific in scope. In comparison, the financial statements topic is broader, concerning the scope of information conveyed, progressing from basic threshold nature of the accounting equation. A sufficiently large number of students completed screencasts on the accounting equation (137) and financial statements (495) for the purpose of statistical analysis.[6]

Consistent with the two topics, we choose to examine performance implications by running two sets of ordinary least squares (OLS) regressions based on accounting equation and financial statement performance dependent variables respectively. Each dependent variable is based on three multiple choice questions (MCQ) asked in the final exam (Appendix 3). These questions, which vary in difficulty, are asked throughout the study period, and the performance is consistent throughout the study period. Given these questions are multiple choice, the marking process is objective and consistent throughout the study period.[7] The following model is representative of the two sets of ordinary least squares (OLS) regressions we run:

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[6] We split the sample on the basis of overall student performance in the introductory accounting subject, detailed below; the number of students completing the screencast on the accounting equation and financial statements topics in the low performance and high performance sub-samples is very similar, indicating bias in student selection of these topics is not a concern.

[7] Please note that the final examination in the subject was designed solely as the assessment tool for the course, rather than for the purposes of this study or other teaching and learning experiments. Accordingly, we have carefully reviewed the available data throughout the study period and as described selected the most appropriate and consistent questions available for the purposes of this study.

$$FE\_Perform\_TopicX_i = \beta_0 + \beta_1 SC\_TopicX\_Completion\_Dum_i + \beta_2 Acct\_Major\_Dummy_i + \beta_3 Age_i + \beta_4 Campus_i + \beta_5 Gender\_Dummy_i + \beta_6 Mid\text{-}semester\_Result_i + \beta_7 Time\_Period_i + \beta_8 WAM_i + \beta_9 Year\_Study_i + \varepsilon_i$$

- The dependent performance variables are:
  - *Accounting_equation_performance$_i$:* Calculated based on the average performance of accounting equation MCQ 1–3. Consistent with the nature of this topic, the questions are very specific to the accounting equation, starting with an identification based question and followed by two accounting equation application based questions.
  - *Financial_statement_performance$_i$:* Calculated based on the average performance of financial statement MCQ 1–3. Consistent with the nature of this topic, the questions are much broader and relate to a number of important elements of financial statements. In particular, these elements concern the purpose of an external audit, contrasting and identifying the information conveyed in financial statements, and the core information in a retailer's income statement.
- The independent variables are:
  - *SC_TopicX_Completion_Dum$_i$:* Dummy variable assigned 1 if a student produced a screencast on the focal dependent variable topic (either the accounting equation or financial statements), 0 otherwise.
  - *Acct_Major_Dum$_i$:* Control variable assigned 1 for a student who plans to major in accounting, 0 otherwise. Students planning to undertake an accounting major may exhibit higher levels of motivation to succeed in accounting, impacting their assignment performance.

- *Age_i:* Prior research finds student age to be a significant predictor of improved exam performance and accordingly it is relevant to include as a control variable (Edmonds and Edmonds, 2008).
- *$Campus_i$:* Dummy variable assigned 1 for students at the small campus, 0 for the main campus. The introductory accounting subject is offered at both campuses. At the main campus, a larger proportion of students complete the business degree, and therefore, are able to major in accounting. The subject is a compulsory part of non-business degrees primarily delivered at the small campus, resulting in negative student attitudes towards the subject and lower dedication and engagement levels, which may negatively affect performance.
- *$Gender\_Dummy_i$:* Assigned 1 for female, 0 for male students. There are mixed findings concerning the effects of gender on performance. Some studies indicate it is to associated with different learning approaches and performance (Schleifer and Dull, 2009).
- Past student performance, is on average, a good predictor of future performance (Crawford and Wang, 2014; Duff, 2004). Given the diversity of students studying introductory accounting, two control variables are included to capture the effects of past performance. We acknowledge university entrance scores are also important determinants of student performance (Heales, 2005); however, the diversity of entrance schemes for students means a consistent noise-free entrance score is not available. Therefore we use:
    - *$Mid\text{-}semester\_Result_i$:* Mid-semester exam results are an important predictor of how students will perform in the introductory accounting final exam.

- *WAM_i:* The weighted average mark (WAM) is based on the final results in all subjects students have studied, up to but excluding introductory accounting.

- *$Time\_Period_i$:* We examine the performance implications of the screencast assignment over a series of semesters. This variable relates to the time period students completed the subject, ranging from 0 (Autumn 2012 semester) to 5 (Spring 2014 semester). Despite the security associated with exam administration and storage, and variation to the exam every semester, it is possible students may gain information over time concerning possible exam content, causing increased performance over time.
- *$Year\_Study_i$:* The year of study is a relevant control variable as the further a student has progressed in their degree, the higher the metacognition scores (Sperling *et al.*, 2004), and the more likely they are to adopt different learning approaches (Jackling, 2005), potentially leading to better performance in this introductory accounting subject.

Two sets of OLS regressions are run, one for each dependent performance variable (the accounting equation and financial statements). The initial sample used to run the regressions consists of 5,032 students studying introductory accounting across the study period (six semesters), after removing extreme outliers in the data and students who did not complete all assessment items captured in our regression equations. It should be noted that the option to complete the assignment on the accounting equation topic was only available in the 2012 academic year (two semesters). Accordingly, to control for any student variation outside this period, we examine the performance implications of completing a screencast on the accounting equation in this period only (1,544 students). The descriptive statistics and frequencies of the

variables are provided in Table 2 below, indicating sufficient variation for the purpose of the regression analysis.

[INSERT TABLE 2 HERE]

Given the screencast assignment is optional and provides extra credit, there is a possible bias towards more committed and dedicated students completing the assignment. Equally, students desperate for extra marks may sensibly be attracted to completing the assignment. Such possibilities would limit the generalisability of the results to a compulsory multimedia assignment. To check whether this is the case, two regressions are run, consistent with the model described above, replacing the screencast topic variable with a dummy variable indicating whether students did (dummy variable of 1) or did not (dummy variable 0) complete the screencast assignment. The results in Table 3 indicate that students who participated in the screencast assignment did not perform better in the final exam according to the accounting equation and financial statement performance variables. This is consistent with a range of students completing the assignment, exhibiting a large variation in commitment and dedication, thereby indicating that bias in students completing the assignment is not a concern.

[INSERT TABLE 3 HERE]

A number of sub-samples are created and the OLS regressions re-run based on splitting the main samples accordingly to the median mid-semester exam result, final exam result, and the weighted average mark (WAM). The median values are removed from the split samples to ensure a clear separation of high and low results. We also split the main samples according to students' assessment option selection. Students had the option to sit a mid-semester exam which accounts for 40% of assessment (option A), or select a compulsory tutorial attendance option where 10% of assessment is based on class participation and homework completion and 30% is based on a

mid-semester exam (option B). Differences in result levels and assessment option selection may reflect students' dedication and commitment to their studies of both accounting and broader studies in general (degree of self-regulated learning), leading to differing effects of screencast completion on their performance (Phang, Johl, and Cooper, 2014). Students with greater dedication and commitment to their studies may devote greater efforts to screencast completion, leading to more substantial performance effects. Alternatively, students with lower dedication and commitment to their studies may benefit more substantially from screencast completion, through spending time understanding a topic they may not have otherwise devoted substantial effort.

4.3 Regression results and discussion

Student performance in the accounting equation questions on the final exam when students' screencast assignment was completed on that topic is presented in Table 4 below.[8] The screencast assignment dummy variable (accounting equation) coefficient for the sample is statistically significant, however, there is variation in the sub-sample results. We find positive and significant results for students in the low performance sub-samples (low mid-semester, low final exam, and low WAM) and students enrolled in assessment option A (higher mid-semester exam weighting and no class mark). This indicates both lower performing students and those who have chosen less class participation, perform better in the accounting equation sections of the final exam performance when they have completing a screencast on this topic. In contrast, the effect of completing a screencast on the accounting equation is not statistically significant for all high

[8] The collinearity statistics (tolerance and variance inflation factors) indicate multicollinearity is not a concern for the regression results reported in this paper.

performance sub-samples (low mid-semester, low final exam and low WAM) and those enrolled in option B (10% class mark). Accordingly, there is partial support for Hypotheses two, concerning basic threshold concepts.

[INSERT TABLE 4 HERE]

The positive and significant effects of completion of a screencast on the accounting equation topic for low performing and less participative students may be a reflection of the challenges they face when understanding introductory accounting and/or their dedication and commitment levels. Students who are generally lower performing and less participative may have a preference for more surface learning approaches in their accounting studies (Marton and Säljö, 1976). Despite the very foundational and basic threshold nature of the accounting equation topic, the results indicate that the screencast assignment has the potential to lead to higher performance by facilitating a more student centred active approach to learning, and consequently, higher engagement and associated performance for students normally adopting surface based learning approaches (Biggs, Kember, and Leung, 2001). The foundational threshold nature of the accounting equation would suggest that a good understanding is very important for successful progression in the subject. Therefore students who are potentially less dedicated and committed, and who normally adopt a surface learning approach would benefit from completing a screencast on the accounting equation. Unsurprising, higher performing students and those who are more participative in class (reflected by option B enrolment), who often adopt deeper approaches to learning (Marton and Säljö, 1976), do not show any significant increases in performance in the accounting equation component of the final exam.

The effect of completing a *financial statement screencast* on student performance in the final exam concerning this topic is presented in Table 5 below. The screencast assignment

completion dummy variable (financial statements) coefficient for the complete sample is positive and statistically significant. Students in the low mid-semester and final exam sub-samples benefit positively and significantly from assignment completion, while those in the high mid-semester and final exam sub-sample do not. However, students across all WAM and assessment options sub-samples benefit significantly from screencast assignment completion. Accordingly, there is partial support for Hypotheses two, concerning topics broader in scope.

[INSERT TABLE 5 HERE]

Similar to the implications of accounting equation screencast completion, it appears students who perform lower in their accounting exams (mid-semester and final results), benefit positively and significantly from completing the financial statement screencast assignment. Accordingly, despite the financial statements topic being broader in scope than the accounting equation, it is still an introductory accounting topic, therefore, only those students that are generally lower performing in the subject significantly benefit. However, the contrast in the performance implication results for students in the different WAM and assessment option sub-samples doesn't hold. Students appear to benefit positively regardless of their overall academic performance (WAM) and class participation (assessment option), with the coefficients very similar across these sub-samples. These sub-sample results indicate students' approaches to learning appears to be situation dependent, consistent with suggestions in the literature (Marton and Säljö, 1976). In particular, students' views of accounting mean they may adopt a surface learning approach to their accounting studies, which may not be completely reflected by other subject studies and general class participation patterns. The student centred active approach to learning facilitated by the screencast assignment appears to be of value to students more broadly (reflected by the WAM and assessment option sub-samples) concerning topics broader in scope.

The screencast activity appears to specifically encourage a deeper learning approach, through a more active assignment activity, leading to higher engagement and student performance concerning topics broader in scope (Biggs, Kember, and Leung, 2001).

Despite our prior testing indicating no significant bias towards better performing students completing the screencast assignment (reported in Table 3 earlier), the possibility still exists that there is some variation between the students that did and did not complete the assignment. Accordingly, all regressions based on the complete sample and all sub-samples, are re-run with the exclusion of students that did not complete the screencast assignment (Table 6 and Table 7 below). The results are consistent with the prior results which include both screencast participants and non-participants, with the exception of a few variations.[9] First, the screencast completion dummy coefficients are higher across both sets of topic models. Second, the screencast completion dummy variation becomes statistically significant in the accounting equation model for the high mid-semester sub-sample and in the financial statement model for the high final exam sub-sample. These variations may be explained by the fact that there is a greater diversity of student motivations and study patterns in the complete sample, given the inclusion of non-participants leading to more noise in the regression results. However, the variations are limited and don't change the main implications of the full sample results reported earlier.

[INSERT TABLE 6 & 7 HERE]

[9] The descriptive statistics and frequencies for the sample of screencast completion only students are consistent and not substantially different to those reported in Table 2. Given this consistency, this again indicates that bias according to students selecting the screencast assignment is not a concern.

In certain semesters, students who did not register to complete the assignment by the first deadline (week seven) were provided a second opportunity to register at a later stage of the semester. Given there may be differences in the motivations and learning approaches of these students registering in the second round, we re-run all the regressions, excluding second round registration students from all samples and sub-samples. The results are largely consistent with the prior results reported in this section, indicating that date of registration does not affect the implications of the screencast assignment completion on associated performance in the final exam.[10]

Given the threshold nature of the accounting equation and financial statement topics, it is of interest to examine the broader implications of screencast completion. Accordingly we re-run these regressions and substitute the dependent variable with overall final exam results. The final exam relates to all content covered in the subject and students' understanding of accounting equations and financial statements may be an important foundation driving overall performance. Our results across the complete samples and sub-samples, including those relating the screencast completion only students, provide limited support for screencast completion on the accounting equations and financial statements driving overall final exam performance. The screencast completion dummy coefficients, and in particular the significance levels, are substantially lower and statistically insignificant at conventional levels in most cases.[11] Therefore, while screencast completion does have a significant direct impact on focal topic performance in the final exam,

[10] In the interests of conserving the length of this paper, the results tables for first round only students are not included. They are available from the authors upon request.

[11] In the interests of conserving the length of this paper, these results are not included. They are available from the authors upon request.

overall financial exam performance appears to be affected by understanding a range of topic areas beyond the scope of topics we examine in this study.

5. Conclusion

This paper explores one solution responding to the need for more innovative approaches and enhanced constructive alignment in accounting education, particularly in the introductory accounting subject, which many students view as boring and difficult (Marriott and Teoh, 2012). Further, this paper addresses calls from the profession and literature for greater engagement of students in introductory accounting studies through more active student centred activities as a means to develop student attributes and enhance performance (Palm and Bisman, 2010; Howieson, 2003; Hancock *et al.*, 2010; Wells *et al.*, 2009). Student-generated multimedia, such as the screencast assignment detailed here, provides a way of engaging accounting students, aligning learning with user-generated online content that students are commonly engaged with outside of their studies (Albrecht and Sack, 2000; Fouché, 2013). Since this represents the first example of a student-generated screencast accounting assignment, and only the second example of screencasts in the accounting literature (Marriott and Teoh, 2012), we believe that it is an approach that should be explored more fully by accounting educators.

We examine graduate attribute development by analysing student perceptions of the screencast assignment relating to communication, creativity and multimedia skills. There is a clear increase in students' confidence and perceptions of their communications skills when completing the assignment. Development of this attribute is valuable at such an early stage of students' studies, given its importance from the perspective of the profession where typically there is limited opportunity for development of particularly oral communication skills (De Lange,

Jackling, and Gut, 2006). Second, the assignment appears to facilitate the development of creative skills through the flexible medium of screencast technology and choice students have when producing screencasts. This contrasts with more traditional activities and assessment methods, not aligned with such creative development (Palm and Bisman, 2010). Third, the assignment provides students with an important introduction to developing multimedia skills, an area we found students perceived they were lacking. The assignment appeared to challenge students lacking in multimedia skills, including screencast production. The introduction and development of these attributes at the introductory accounting level indicates the value of the screencast assignment beyond the content related performance implications. This is particularly the case in the context of the high student numbers at the introductory study level, where for economic reasons there are limited opportunities to introduce and develop graduate attributes, despite being an important part of the general learning objectives in the domain of accounting studies.

Our results provide some important findings concerning the performance implications of optional screencast assignments and indicate a more tailored and proactive approach to applying the screencast assignment could maximise student benefits. More specifically, students who are generally lower performing across their university studies and less participative in class, which may reflect their surface approaches to learning, appear to benefit in terms of content related performance when completing a screencast based on narrow and specific topics – the accounting equation in our study. In addition, lower performing students, based on introductory accounting subject performance, also benefit in terms of topics broader in scope – financial statements in our study. However, screencasts based on broader topics appear to benefit students more generally, regardless of prior university performance and participation levels. This finding is likely the

result of students' general motivation concerning accounting studies, preferring surface based learning approaches. Our findings are largely consistent when excluding non-screencast assignment participants and students registering in a later round from our samples, indicating our findings are robust. These varying performance effects associated with the diversity of students studying introductory accounting and their study dedication, commitment and learning approaches, indicates that the prescription of screencast assignments and associated topics would be more optimal in some cases with reference to the prior and emerging performance of the student.

In conclusion, we demonstrate the screencast assignment has a range of learning outcomes, in particular associated with graduate attribute development for which there have been long standing calls to address (De Lange, Jackling, and Gut, 2006; Kavanagh and Drennan, 2008; Tempone *et al.*, 2005; Hancock *et al.*, 2009), as well as final exam performance. Our results indicate that there is variation in the learning outcomes and benefits students experience when completing the assignment, which appears to be associated with their individual development needs in terms of communication, creativity and multimedia skills, and content related performance. This variation appears consistent with the flexibility of screencast technology for such an active student centred learning approach. Future research in this area could further examine the learning outcomes of this technology in accounting education, and more broadly, the process of implementing more proactive and tailored approaches to extra credit assignments in university study. Attention may also be given to assigning particular topics to specific students based on a pretest identifying potential weaknesses, although such an approach may limit the creativity and interest generated by student choice.

Appendix

Appendix 1: Assignment Briefing

Topic

This assignment aims to apply the knowledge you have learnt in this subject to create a screencast that creatively and correctly explains an accounting concept to your fellow students.

Requirements

You are to create a short, standalone screencast explaining an accounting concept. Choose one of the following concepts (or an aspect of one concept) as the topic of your screencast:

- Accounting equation
- Accounting for receivables
- Accounting principles (choose one)
- Accounting ratios (choose one)
- Adjusting entries
- Cost of goods sold
- Cost volume profit analysis
- Earnings management
- Financial statements
- Internal control
- Inventory costing methods
- Journal entries
- Manufacturer costing
- Trial balance

Length Maximum 180 seconds (content beyond this limit will not be viewed when marking). Note the emphasis is on the **quality** of information provided, rather than quantity.

Registration To participate in this assignment students **must** register. To register click on the "Screencast" tab online, then click "Screencast Assignment Registration" and complete the form. Registration closes at the end of week 7.

Marks Maximum 10 bonus marks. These are added to the student's mark for the subject.

Due Date Final screencast must be submitted by end of week 10.

Submission You are to ensure your screencast is freely accessible by an online link. To submit your screencast click on the "Screencast" tab on the subject Blackboard page, then click "Screencast Assignment Submission" and complete the form. Copy the online link to your screencast in the relevant field. Please note you are required to complete all questions in the submission form before you can submit your screencast.

Assessment

The screencasts will be judged by a panel of accounting and multimedia experts. To assess and mark each screencast, the following criteria will be used:

	Assessment criteria
Content (4 marks)	Communicates the accounting concept correctly
Creativity (4 marks)	Presents the accounting concept in a novel and memorable manner
Multimedia skills (2 marks)	Effective and simple communication using clear and audible sound and easy to read visuals

Appendix 2: Examples of student generated screencasts

- **Accounting equation**
  URL: http://screencast.com/t/K5UsVPul
  Entertaining and informative overview of the accounting equation; assets = liabilities + shareholder's equity. Discussion is illustrated with an example utilising the statement of financial position.

- **Cost of goods sold**
  URL: https://www.youtube.com/watch?v=8BwPrFWpCjQ&feature=youtu.be
  Covers the different inventory costing methods (FIFO, LIFO, average cost and specific identification) with a very memorable and entertaining song and clear visual support.

- **Financial statements**
  URL: http://www.screencast.com/t/SASNwjRqLCs
  Engaging and entertaining explanation of financial statements. Clear visual support and links illustrated between the financial statements.

- **Internal control**
  URL: https://www.youtube.com/watch?v=I7aCHIJw_Aw
  Good overview of internal control and in particular control activities which are well explained in the context of the example provided.

- **Journal entries**
  URL: http://screencast.com/t/oUQMdMwRRb6Y
  Review of main concepts, as well as providing a memorable analogy between journal entries and relationships. Uses a one journal entry example format to simplify key ideas.

Appendix 3: Performance (dependent) variables – final exam multiple choice questions (MCQ)

No.	Accounting equation questions	Financial statement questions
1	The accounting equation is: a. Revenues = Net profit – Expenses b. Revenues – Expenses = Net profit c. Assets = Liabilities + Shareholders' equity d. Assets + Liabilities = Shareholders' equity e. Assets + Shareholder's equity = Liabilities	The purpose of an independent external audit of financial statements is to: a. Predict future financial performance and expected returns. b. Verify financial statements are compliant with generally accepted accounting principles. c. Decide on the final numbers to report in financial statements. d. Ensure a business is compliant with tax obligations. e. Analyse the current worth of a business.
2	Assume that in one accounting period liabilities increased by $6,000, assets increased by $16,000, and net profit was $22,000. The owner must therefore have: a. Contributed $10,000 b. Received dividend $10,000 c. Contributed $12,000 d. Received dividend $12,000 e. Cannot be calculated from the above limited information.	Which of the following statements regarding the statement of cash flows is true? a. The statement of cash flows analyses the changes in consecutive balance sheets in conjunction with the income statement. b. The statement of cash flows is organised to present classifications for total cash inflows and cash outflows. c. The statement of cash flows analyses only the changes in current assets and current liabilities. d. The statement of cash flows is an optional financial statement. e. All of the above.
3	Samir Star, an entrepreneur, began the year with total assets of $120,000, liabilities of $70,000, and owners' equity of $50,000. During the year, he earned revenue of $110,000 and paid expenses of $30,000. He also invested an additional $20,000 in the business and withdrew $60,000 for living expenses. How much is the equity of the firm at year-end? a. $90,000 b. $120,000 c. $130,000 d. $160,000 e. $100,000	If Net Sales Revenue is $980,000, Gross profits are $260,000, and Operating expenses are $280,000, what is the Cost of Goods Sold (COGS) and net Profit or Loss? a. COGS $260,000 and Profit $20,000 b. COGS $980,000 and Loss $280,000 c. COGS $720,000 and Loss $20,000 d. COGS $700,000 and Profit $280,000 e. None of the above

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Tables

TABLE 1
Pre- and post- assignment completion form data

Item	Question	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Mean (1 – 5)
1	I feel confident about explaining accounting concepts to others (pre-completion)	1.8%	10.9%	44.0%	38.0%	5.4%	3.343
2	I believe my screencast communicates the accounting concept clearly (post-completion)	0.8%	0.4%	6.7%	53.2%	38.8%	4.286
3	This technology prevented me from being creative (post-completion)	20.8%	47.1%	21.6%	8.3%	2.2%	2.239
4	Using a new technology allowed me to be more creative than if I had been asked to do a more standard accounting assignment (post-completion)	0.9%	3.3%	15.0%	47.3%	33.5%	4.093
5	I had to take existing ideas that I had learnt and combine them in new ways to make my screencast (post-completion)	0.2%	2.4%	20.9%	61.4%	15.1%	3.889
6	I had to consider different ways of presenting the accounting concept in my screencast (post-completion)	0.2%	1.9%	16.8%	63.8%	17.3%	3.961
7	I found it difficult to use this technology effectively (post-completion)	14.8%	37.5%	28.2%	15.7%	3.7%	2.559
		None at all (1)	Low (2)	Moderate (3)	High (4)	Very high (5)	Mean (1 – 5)
8	Indicate the degree of experience you have with multimedia production (pre-completion)	10.6%	26.5%	45.0%	14.8%	3.2%	2.735
9	Indicate the degree of experience you have in making screencasts (pre-completion)	52.8%	26.2%	17.1%	3.4%	0.6%	1.728
			Selected			Not selected	
10	What did you like about the screencast assignment? (post-completion)						
a	It allowed me to be creative		45.5%			54.5%	
b	It was a chance for me to use new technology and multimedia		37.3%			62.7%	
11	What did you dislike about the screencast assignment? (post-completion)						
a	I experienced difficulties in using the technology		28.3%			71.7%	
b	Recording the video and voice together was difficult		27.8%			72.2%	
c	It was difficult being creative		20.9%			79.1%	

TABLE 2

Descriptive statistics and frequencies for complete sample* (*n* = 5,032)

Panel A: Descriptive statistics – continuous variables					
	Min.	**Max.**	**Mean**	**Median**	**Std. Dev.**
Accounting equation performance^	0.000	1.000	0.544	0.667	0.243
Financial statement performance	0.000	1.000	0.716	0.667	0.272
Age	17.000	45.417	19.932	19.083	2.578
Mid-semester result	0.500	40.000	20.577	21.000	8.435
Time period	0.000	5.000	2.414	2.000	1.699
WAM	17.333	93.167	65.076	65.571	9.391
Year of study	0.000	9.500	0.467	0.000	0.944

Panel B: Frequencies – dummy variables	**Binary codes**	
	0	**1**
Screencast completion (accounting equation)^	1,407	137
Screencast completion (financial statements)	4,537	495
Accounting major	4,078	954
Campus	1,228	3,804
Gender	2,473	2,559

*The statistics reported in this table are based on the non-normalised variables. Where appropriate, the variables are normalised, consistent with the assumptions of OLS regression.

^Descriptive statistic and frequency reported for the 2012 student sample (*n* = 1,544), given that the variables are only used in this sample for the purpose of the regression analysis. All other descriptive statistics and frequencies are based on the full sample (*n* = 5,032) given both the descriptive statistics and frequency proportions for 2012 student sample do not substantially differ from those reported above.

TABLE 3

Screencast assignment bias testing: performance effects

	Accounting equation performance effects (n = 1,544)		**Financial statements performance effects** (n = 5,032)	
Independent variables	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Screencast assignment completion dummy	-0.018	-0.717	0.007	0.503
Accounting major dummy	0.131***	5.171	0.018	1.303
Age	0.024	0.868	-0.029*	-1.935
Campus	-0.008	-0.302	-0.026*	-1.886
Gender dummy	-0.217***	-5.126	-0.060***	-4.427
Mid-semester result	0.078**	2.493	0.165***	9.960
Time period	0.192***	6.350	-0.184***	-13.791
WAM	0.132***	4.331	0.139***	8.253
Year of study	0.025	0.831	0.028*	1.859
Adjusted R^2	0.081		0.120	
F-stat	16.204*** (0.000)		76.268*** (0.000)	

***Significant at the 0.01 level; **Significant at the 0.05 level; *Significant at the 0.10 level (2-tailed)

TABLE 4

Effects of screencast completion on accounting equation final exam performance

Sub-sample	Screencast completion dummy (accounting equation)	Accounting major dummy	Age	Campus	Gender dummy	Mid-semester result	Time period	WAM	Year of study	F-stat	Adj. R square
	Coefficient (t-stat)										
All students	0.053**	0.129***	0.021	-0.008	-0.131***	0.076**	0.187***	0.127***	0.027	16.703***	0.084
(*n* = 1,544)	(2.148)	(5.127)	(0.772)	(-0.316)	(-5.282)	(2.421)	(6.302)	(4.203)	(0.891)		
Low mid-semester	0.069*	0.096**	-0.037	0.010	-0.127***	0.086**	0.199***	0.088**	0.019	7.408***	0.078
(*n* = 681)	(1.867)	(2.549)	(-0.908)	(0.246)	(3.374)	(2.193)	(4.549)	(2.174)	(0.436)		
High mid-semester	0.024	0.155***	0.074*	-0.042	-0.150***	0.080**	0.140***	0.126***	0.028	10.252***	0.094
(*n* = 808)	(0.707)	(4.502)	(1.938)	(-1.179)	(-4.404)	(2.097)	(3.565)	(3.401)	(0.706)		
Low final exam	0.093***	0.095***	-0.028	0.004	-0.098***	0.025	0.212***	0.038	0.048	7.146***	0.064
(*n* = 811)	(2.731)	(2.740)	(-0.758)	(0.109)	(2.828)	(0.637)	(5.113)	(0.995)	(1.184)		
High final exam	0.004	0.122***	0.107**	-0.030	-0.145***	0.018	0.125***	0.087**	-0.006	5.823***	0.056
(*n* = 726)	(0.118)	(3.252)	(2.592)	(-0.766)	(-3.947)	(0.417)	(2.882)	(2.122)	(-0.122)		
Low WAM	0.101***	0.123***	-0.026	-0.040	-0.113***	0.063	0.190***	0.035	0.064	7.424***	0.072
(*n* = 747)	(2.843)	(3.393)	(-0.640)	(-1.050)	(-3.193)	(1.575)	(4.581)	(0.893)	(1.450)		
High WAM	0.010	0.133***	0.056	0.032	-0.145***	0.067*	0.158***	0.116***	0.003	8.826***	0.082
(*n* = 794)	(0.290)	(3.717)	(1.512)	(0.813)	(-4.205)	(1.676)	(3.649)	(3.050)	(0.076)		
Option A	0.079**	0.416***	-0.001	0.004	-0.136***	0.110***	0.207***	0.109***	0.051	12.234***	0.103
(*n* = 883)	(2.467)	(4.419)	(-0.025)	(0.099)	(-4.178)	(2.689)	(5.164)	(2.790)	(1.266)		
Option B	0.019	0.104***	0.048	-0.027	-0.122***	0.026	0.158***	0.147***	-0.002	5.195***	0.054
(*n* = 661)	(0.500)	(2.644)	(1.161)	(-0.622)	(-3.179)	(0.528)	(3.500)	(3.127)	(-0.053)		

***Significant at the 0.01 level; **Significant at the 0.05 level; *Significant at the 0.10 level (2-tailed)

TABLE 5

Effects of screencast completion on financial statement final exam performance

Sub-sample	Screencast completion dummy (financial statements)	Accounting major dummy	Age	Campus	Gender dummy	Mid-semester result	Time period	WAM	Year of study	F-stat	Adj. R square
	Coefficient (t-stat)										
All students	0.050**	0.018	-0.027*	-0.024*	-0.062***	0.163***	-0.191***	0.139***	0.028*	77.996***	0.121
(*n* = 5,032)	(3.733)	(1.296)	(-1.819)	(-1.753)	(-4.597)	(9.907)	(14.196)	(8.429)	(1.848)		
Low mid-semester	0.065***	-0.012	-0.037*	-0.028	-0.086***	0.121***	-0.185***	0.161***	0.037*	31.509***	0.100
(*n* = 2,471)	(3.371)	(-0.608)	(-1.752)	(-1.415)	(-4.425)	(5.924)	(-9.586)	(7.741)	(1.718)		
High mid-semester	0.032	0.040**	-0.002	-0.028	-0.047**	0.062***	-0.203***	0.093***	-0.001	18.309***	0.062
(*n* = 2,361)	(1.590)	(1.963)	(-0.082)	(-1.329)	(-2.313)	(2.827)	(-10.002)	(4.184)	(-0.044)		
Low final exam	0.073***	0.000	-0.002	0.007	-0.053***	0.143***	-0.195	0.087***	0.020	25.003***	0.079
(*n* = 2.507)	(3.756)	(-0.017)	(-0.088)	(0.323)	(-2.682)	(6.836)	(-9.983)	(4.057)	(0.904)		
High final exam	0.022	0.004	-0.021	-0.023	-0.036*	0.038*	-0.190***	0.042*	0.006	12.130***	0.038
(*n* = 2,503)	(1.105)	(0.182)	(-0.942)	(-0.138)	(-1.789)	(1.693)	(-9.522)	(1.855)	(0.273)		
Low WAM	0.054***	0.025	-0.009	-0.029	-0.077***	0.177***	-0.184***	0.105***	0.047**	32.387***	0.101
(*n* = 2,515)	(2.857)	(1.285)	(-0.409)	(-1.476)	(-4.031)	(8.694)	(-9.620)	(5.154)	(2.154)		
High WAM	0.048**	0.012	-0.039*	-0.025	-0.057***	0.108***	-0.197***	0.063***	-0.008	20.714***	0.066
(*n* = 2,511)	(2.447)	(0.586)	(-1.821)	(-1.220)	(-2.879)	(4.932)	(-9.963)	(2.879)	(-0.348)		
Option A	0.047**	0.012	0.005	-0.019	-0.065***	0.185***	-0.142***	0.147***	0.000	31.910***	0.125
(*n* = 1,956)	(2.181)	(0.560)	(0.193)	(-0.877)	(-3.016)	(7.138)	(-6.276)	(5.764)	(-0.005)		
Option B	0.053***	0.020	-0.046**	-0.027	-0.057***	0.153***	-0.195***	0.135***	0.039**	46.772***	0.118
(*n* = 3,076)	(3.073)	(1.163)	(1.163)	(-1.481)	(-3.316)	(7.163)	(-11.371)	(6.335)	(2.025)		

***Significant at the 0.01 level; **Significant at the 0.05 level; *Significant at the 0.10 level (2-tailed)

TABLE 6

Effects of screencast completion on accounting equation final exam performance (screencast completion students only)

Sub-sample	Screencast completion dummy (accounting equation)	Accounting major dummy	Age	Campus	Gender dummy	Mid-semester result	Time period	WAM	Year of study	F-stat	Adj. R square
	Coefficient (t-stat)										
All students	0.113***	0.102**	0.020	0.009	-0.133***	0.025	0.248***	0.180***	0.055	8.410***	0.101
(*n* = 597)	(2.860)	(2.507)	(0.473)	(0.203)	(-3.366)	(0.480)	(4.841)	(3.768)	(1.133)		
Low mid-semester	0.107*	0.122**	-0.019	-0.029	-0.182***	-0.054	0.279***	0.127*	0.006	3.987***	0.097
(*n* = 252)	(1.751)	(1.977)	(-0.291)	(-0.439)	(-2.942)	(-0.858)	(3.738)	(1.943)	(0.076)		
High mid-semester	0.100*	0.092*	0.057	0.031	-0.085	0.145**	0.226***	0.172***	0.073	5.697***	0.114
(*n* = 331)	(1.892)	(1.708)	(0.951)	(0.552)	(-1.605)	(2.410)	(3.452)	(3.027)	(1.171)		
Low final exam	0.190***	0.135**	0.022	0.007	-0.138**	-0.056	0.272***	0.092	0.087	6.492***	0.135
(*n* = 317)	(3.568)	(2.521)	(0.381)	(0.126)	(-2.555)	(-0.889)	(3.986)	(1.530)	(1.354)		
High final exam	0.032	0.052	0.004	0.011	-0.126**	0.060	0.195**	0.159**	0.032	2.549***	0.048
(*n* = 279)	(0.528)	(0.839)	(0.060)	(0.176)	(-2.113)	(0.873)	(2.592)	(2.429)	(0.416)		
Low WAM	0.186***	0.116**	-0.034	-0.020	-0.105*	-0.006	0.281***	0.101*	0.072	5.315***	0.116
(*n* = 297)	(3.375)	(2.047)	(-0.562)	(-0.337)	(-1.871)	(-0.102)	(4.075)	(1.666)	(1.024)		
High WAM	0.029	0.086	0.082	0.043	-0.155***	0.062	0.171**	0.175***	0.023	4.089***	0.085
(*n* = 300)	(0.513)	(1.449)	(1.353)	(0.688)	(-2.744)	(0.909)	(2.346)	(2.763)	(0.343)		
Option A	0.152***	0.123**	-0.024	-0.058	-0.089	-0.062	0.298***	0.219***	0.120	5.720***	0.129
(*n* = 288)	(2.658)	(2.163)	(-0.381)	(-0.863)	(-1.564)	(-0.848)	(3.784)	(3.213)	(1.603)		
Option B	0.069	0.069	0.081	0.043	-0.145**	0.132*	0.237***	0.138**	-0.004	4.143***	0.084
(*n* = 309)	(1.234)	(1.173)	(1.340)	(0.733)	(-2.602)	(1.754)	(3.393)	(2.051)	(-0.063)		

***Significant at the 0.01 level; **Significant at the 0.05 level; *Significant at the 0.10 level (2-tailed)

TABLE 7

Effects of screencast completion on financial statement final exam performance (screencast completion students only)

Sub-sample	Screencast completion dummy (financial statements)	Accounting major dummy	Age	Campus	Gender dummy	Mid-semester result	Time period	WAM	Year of study	F-stat	Adj. R square
	Coefficient (t-stat)										
All students	0.071***	0.006	-0.023	-0.030	-0.080***	0.133***	-0.163***	0.145***	0.036	29.044***	0.096
(*n* = 2,367)	(3.581)	(0.279)	(-1.032)	(1.425)	(-4.052)	(5.390)	(-8.189)	(5.860)	(1.560)		
Low mid-semester	0.106***	-0.032	-0.015	-0.035	-0.100***	0.052*	-0.146***	0.214***	0.026	12.829***	0.088
(*n* = 1,103)	(3.570)	(-1.102)	(-0.464)	(-1.170)	(-3.409)	(1.675)	(-4.932)	(6.778)	(0.804)		
High mid-semester	0.041	0.033	-0.012	-0.027	-0.069**	0.067**	-0.188***	0.067**	0.036	7.561***	0.048
(*n* = 1,180)	(1.414)	(1.138)	(-0.376)	(-0.904)	(-2.410)	(2.162)	(-6.474)	(2.107)	(1.063)		
Low final exam	0.085***	0.001	0.019	-0.026	-0.075**	0.122***	-0.150***	0.110***	0.015	9.719***	0.062
(*n* = 1,181)	(2.983)	(0.036)	(0.592)	(-0.856)	(-2.586)	(3.893)	(-5.178)	(3.424)	(0.456)		
High final exam	0.051*	-0.003	-0.047	-0.012	-0.073**	0.045	-0.167***	0.061*	0.045	5.151***	0.031
(*n* = 1,172)	(1.722)	(-0.092)	(-1.461)	(-0.384)	(-2.502)	(1.379)	(-5.639)	(1.840)	(1.319)		
Low WAM	0.084***	0.047*	0.012	-0.032	-0.109***	0.122***	-0.163***	0.140***	0.041	13.455***	0.087
(*n* = 1,183)	(2.966)	(1.653)	(0.374)	(-1.084)	(-3.884)	(4.114)	(-5.746)	(4.673)	(1.256)		
High WAM	0.060**	-0.027	-0.040	-0.044	-0.064**	0.102***	-0.159***	0.039	0.020	6.795***	0.042
(*n* = 1,183)	(2.064)	(-0.923)	(1.292)	(-1.448)	(-2.197)	(3.105)	(-5.435)	(1.210)	(0.606)		
Option A	0.100***	-0.002	0.052	-0.020	-0.122***	0.101**	-0.167***	0.190***	-0.029	11.243***	0.113
(*n* = 724)	(2.773)	(-0.060)	(1.257)	(-0.542)	(-3.413)	(2.309)	(-4.419)	(4.387)	(-0.680)		
Option B	0.061**	0.012	-0.047*	-0.033	-0.063***	0.142***	-0.155***	0.128***	0.058**	18.771***	0.089
(*n* = 1,643)	(2.537)	(0.478)	(1.797)	(1.313)	(-2.649)	(4.740)	(-6.486)	(4.266)	(2.125)		

***Significant at the 0.01 level; **Significant at the 0.05 level; *Significant at the 0.10 level (2-tailed)