

Building lectures and building bridges with socio-economically disadvantaged students

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Abstract

This paper is an empirical analysis of the first stage of an ongoing effort to introduce technology to enhance student learning in introductory corporate finance within a multi-campus and multi-mode regional Australian University. The engagement and performance of low socio-economic status (SES) students is of particular interest because approximately one-quarter of the university's enrolled students are classified low SES. A Tablet PC is used to facilitate a cooperative 'building' of each week's lecture in class and the recording of this process for delivery online. The analysis of the academic achievement of two cohorts of students in two different semesters—with the technology and without—forms the basis of the formal evaluation of the efficacy of the approach to date. The results indicate that there is a significant difference in retention (drop-out statistics) and academic achievement (examination performance, final grade and course progression statistics) between the 'Tablet PC' and 'control' semesters. The largest improvement was exhibited by the low SES students.

Keywords: Tablet PC, Socio-economic status, Academic achievement, Retention, Student engagement

Introduction

This paper presents the results of an analysis of the performance of two cohorts (2008 and 2009) of students in the introductory corporate finance course at the University of Southern Queensland (USQ). In 2008, a traditional approach was taken to the delivery of the course in both face-to-face and distance modes. In 2009, the delivery of lectures was undertaken with the assistance of a Tablet PC and the (live) lecture recording 'screencasts' produced using the technology were made available to all students.

The present study investigates the efficacy of teaching technologies by exploring the differences in student engagement and performance during the Tablet PC semester against the control or non-Tablet PC semester. However, rather than investigate these factors in isolation, this study focuses on the engagement and performance within the added dimension low, medium and high socio-economic status (SES).

The educational psychology literature identifies a relationship between SES and academic achievement. The interaction of variables and the ways in which SES may influence (directly and indirectly) academic achievement help to explain our results and illuminate some important possible paths for future research. However, it should be noted that the objective of this investigation is *not* to examine and identify a relationship between SES and academic achievement (which is the focus of much of the educational psychology literature) but rather to highlight some possible benefits to the use of teaching technologies within a context in which the students enrolled in a university course are characterised by a diversity of SES. Specific investigation of the association between SES, achievement and teaching technology deployment is a broader research program that requires careful consideration of particular points of measurement and methodology.

A research program that focuses on aspects of delivery of tertiary level education to low SES students is important for several reasons. Of course, there are many social justice and equity issues that can be brought to bear in justifying special focus on low SES students. In Australia, contemporary government policy intensifies the need for research and action with regard to tertiary education and low SES students. The Australian Government's (2009) 'Transforming Australia's Higher Education System' policy document, which was drafted in response to the Bradley

Review of Higher Education in Australia (Bradley et al. 2008), places significant emphasis on participation in higher education of people from low SES backgrounds. More than AU\$400 million of government funding has been allocated to support participation targets with the ultimate goal of having 40 percent of 25 to 34 year olds bachelor degree (or above) qualified by 2025 and low SES students constituting 20 percent of undergraduate enrolments by 2020 (Commonwealth Government 2009). The challenges facing the Australian university system are substantial. The role that technology can play in helping to overcome these challenges is an important research program for this reason. This paper represents some very preliminary steps and generates conclusions from a higher education institutional context where, already, more than 20 percent of students are from low SES backgrounds.

This paper is organised as follows. First, an overview of the literature is presented with focus on those studies that deal with the relationship between SES and academic achievement. Then, the approach taken to the delivery of introductory level corporate finance is described and the pivotal role played by the Tablet technology is outlined. The data is analysed after that, highlighting a substantial improvement in student performance during the Tablet PC semester mainly from low and medium SES backgrounds. Results are discussed and some directions for future research are presented.

Literature overview

There are two main streams of literature that are relevant to the background context of the present study. First and foremost, the 'educational psychology' literature examines the effect of SES on academic achievement directly or indirectly. These studies investigate sociological-psychological aspects of education, development and achievement, including the relationship between SES and self-efficacy (and achievement). Second, in the 'economics and sociology of education' literature, various aspects of education and education policy are examined from an economic and sociological perspective. These investigations examine the relationships between various SES-related variables and variables such as drop-out rates, choice of subjects and careers. Together, these two streams of research examine the complicated fabric in which SES and other aspects of education and student behaviour are intertwined.

Educational Psychology

The investigation of the relationship between SES and academic achievement has been explored on many occasions. The meta-analyses or reviews of the literature undertaken by White (1982) and Sirin (2005) highlight the extensive nature of the literature in this field of study. A relationship exists between SES and academic achievement but the relationship is sensitive to a variety of measurement and methodological factors. As Sirin (2005, p.438) explains, "...methodological characteristics, such as the type of SES measure, and student characteristics, such as student's grade, minority status, and school location, moderated the magnitude of the relationship between SES and academic achievement." The relationship is still clear and strong enough, however, to permit statements such as the following: "Socio-economic status differences in children's reading and educational outcomes are ubiquitous, stubbornly persistent and well documented" (Aikens and Barbarin, 2008, p.235). The relationship between SES and academic achievement is due to a complex interaction of a number of variables, it appears to be generally accepted that SES impacts to a considerable extent on various aspects of students' learning experiences.

Some of the most important insights generated by the extant investigations into this relationship are the ways in which SES affects academic achievement. In addition to measurement problems, the underlying relationship is a complex one to investigate (even if the other factors were absent). This is because the effects of SES are 'channelled' through family, neighbourhood and school contexts (Aikens and Barbarin 2008). These contexts are shaped by factors such as access to books and other resources (Evans, 2004; Duncan, Yeung, Brooks-Gunn and Smith, 1998; Whitehurst and Lonigan, 1998; Duncan, Brooks-Gunn and Klebanov, 1994); various familial interaction variables, including 'negative parenting', violence, separation and disruption (Evans, 2004; Raviv, Kessenich and Morrison, 2004; Emery and Laumann-Billings, 1998); and numerous extra-familial variables, including crime, low quality social networks, aggressive or disadvantaged peers, and low school and teacher quality (Evans, 2004; Bandura, Barbaranelli, Caprara and Pastorelli, 2001; Sampson, Raudenbush and Earls, 1997; Bandura et al. 1996; Federman, Garner, Short, Cutter, Levine, McGough and McMillen, 1996). SES influences the risk of exposure to all of these factors. The complex interaction and cumulative effects of these variables affects the academic achievement of students. This leaves aside the effect that SES can have on development (and, indirectly, on academic achievement) through its influence on physical and psychological health (Bradley and Corwyn, 2002).

By increasing the risks of exposure to crime, violence, disruption and other similar factors, it is easy to understand how SES might affect academic achievement. There are, however, many ways in which SES might indirectly affect academic achievement and overcoming the challenges presented by SES necessitates an understanding of these less obvious relationships. Caprara, Fida, Vecchione, Del Bove, Vecchio, Barbaranelli and Bandura (2008, p.527) state, "Diverse lines of evidence show that SES affects performance, in large part, through its impact on psychosocial processes rather than directly." For example, Miech, Essex and Goldsmith (2001) found that self-regulation, which refers to processes, such as the tendency to maintain attention on a task and to suppress inappropriate behaviour under instructions, serves as a moderator of the relationship between SES and adjustment to school. Bandura et al. (2001) examine the interaction of socio-economic conditions and other factors such as educational aspirations, perceived efficacy and scholastic accomplishments in contributing to career choice and development (see Bandura et al. 2001, p.200). The indirect influence of SES factors on academic achievement led Caprara et al. (2008) to control for SES in their investigation of self-regulatory efficacy and academic performance. Self-regulatory efficacy refers to a student's judgements of capability to perform successfully at designated levels (Schunk, 1991) and students' beliefs in their efficacy to regulate their learning activities and master academic subjects (Caprara *et al.* 2008, p.525). It plays a central role in academic development, and, thereby academic achievement, may be impacted upon by SES factors. It is necessary, therefore, to be aware of the ways in which indirect influences may be addressed. For example, particular delivery approaches within a university context may help to overcome or offset the negative impact of SES on variables such as self-regulatory efficacy.

The economics and sociology of education

Whereas the investigation of the relationship between SES and development, academic achievement, motivation and engagement has been undertaken by educational psychologists, another part of the important story concerning the relationship between SES and student choices and behaviour has been contributed to by sociologists and, to a certain extent, economists. This literature considers the effect of SES or related concepts on aspects of student choice and behaviour without focusing heavily on cognitive psychological variables or constructs. A large proportion of this research deals with the relationship between aspects of student choice and behaviour and economic resources or related factors (Bozick, 2007; Entwisle, Alexander and Olson, 2005; Marsh and Kleitman, 2005; Christie, Munro and Fisher, 2004; Werfhorst, Sullivan and Cheung, 2003). Whilst some of this literature overlaps with the contributions listed in the previous sub-section to the extent that the ways in which SES influences student academic achievement and engagement are addressed, the sociological components of some studies distinguishes them from those listed previously. For example, De Graaf, De Graaf and Kraaykamp (2000) investigated the role of financial and cultural resources (cultural capital) on students' educational attainment. Most recently, Meeuwisse, Severiens and Born (2010) examined the interaction of multiple variables in students' decisions to withdraw from higher education. They support the general theme that emerges in all of the studies reviewed herein: The interplay of variables that characterises the investigation of SES and aspects of students' behaviour, choices and outcomes is tremendously complex.

The complex interaction of SES and related factors and student achievement, motivation and engagement sits in the background of attempts by governments to frame and execute sound education policy and, more broadly, macroeconomic policy. The economics of education, which can be traced as a research program to the early 1960s (particularly, Schultz, 1961), encompasses investigations into the allocation and financing of education spending (Fernandez and Rogerson, 2003; Hoxby, 2001), the impact of education on the economic system, the economic impact of schools, colleges and universities on local communities (Siegfried, Sanderson, McHenry 2007), optimisation, allocation and choice problems (Ladd, 2002; Card and Krueger, 1996) and various points of theory that underlie and focus empirical investigations, including the status of education as investment or consumption and debates concerning human capital and screening (see Schultz, 1961; Blaug, 1968; Tramonte and Willms, 2009). Economists have also investigated various aspects of SES and education, including issues such as wage discrepancies between different groups (for example, O'Gorman, 2009 and Clotfelter, 1999, esp. p.8). Much of this work, particularly the now-classical contributions to the economics of education, has shaped the educational policies of many Western governments over the past five decades. It is easy to overlook the complexities that underlie macroeconomic educational policy.

The macroeconomics of education takes place against a backdrop of the actions of individual students and institutions. The Australian government's higher education policy is based on the premise that, "[higher education] fuels economic development, productivity, high skilled jobs and supports Australia's role as a middle power and

leader in the region” (Commonwealth Government, 2009). As explained earlier, a key feature of this policy is the wide participation in higher education by people from low SES backgrounds. The policy, which aims to ‘support high quality teaching and learning and improve access and outcomes for students from low socio-economic backgrounds’, necessitates effective utilisation of resources by universities in order to achieve access, outcomes and quality-related objectives.

The implications of the literature surveyed in this section may be summarised as follows. First, the effect of SES on student achievement, motivation, engagement and choice, is not clear-cut but a component of a series of complex interactions among many interrelated variables. Second, the direct, indirect and cumulative effects of SES are significant and must be considered important by institutions of higher education, particularly those whose student population consists of diverse backgrounds and higher proportions of low SES students. Third, students’ choices, such as the choice to drop-out or the necessity of part-time work, and students’ self-regulation and self-regulatory efficacy are influenced by SES or related factors. The present investigation presents the results of a preliminary trial of educational technology and an assessment of its effect on student performance and choice to drop-out. The context is a core course delivered within a university that is characterised by a high percentage of low SES students and students studying by distance. The literature surveyed above implies that this combination may be particularly conducive to high drop-out rates and low performance. It is the purpose of this investigation to present the results of some very first steps towards assessing the role that educational technologies can play in offsetting or overcoming the disadvantages associated with SES-related factors.

Building lectures with a Tablet PC

In this section, the approach to delivering the introductory corporate finance course is outlined. Introductory corporate finance at USQ—a multi-campus and multi-mode institution—is offered bi-annually. In semester 1 (March to July), the average number of student enrolments is 400. Of these, approximately 100 attend classes at the Toowoomba campus, 40 attend classes at the Springfield campus, 20 attend classes at the Fraser Coast campus and approximately 150 study by distance. The remainder of the students study a combination of distance mode and face-to-face teaching (undertaken by a local tutor) at USQ’s off-shore partner institutions in China and Singapore. Classroom teaching in a lecture theatre is supplemented or complemented by communication via the learning management system (LMS).

In semester 1 2008, the introductory corporate finance course was characterised by standard face-to-face lecture and distance (online) delivery of study material. Lectures were ‘traditional’ dot-point PowerPoint presentations fully prepared and delivered during the lecture as a standard slideshow. No recording of the lectures was made available. In semester 1 2009, a trial of Tablet PC technology was undertaken. The Tablet technology facilitated a number of innovations in the nature of the classroom lecture delivery and, importantly, the lecture ‘screencasts’ were made available online for all students to view. In this approach, emphasis is placed upon the building or construction of the lecture together with the students in the lecture theatre using only a basic framework of PowerPoint slides for structure and as a writing environment. This much more interactive approach, which is facilitated effectively by the technology, is not only valued by the on-campus and distance students but also creates an environment that is much more rewarding for the instructor.

The main innovation facilitated by the Tablet PC was the interactive construction of the lectures in class. Whereas the lectures were once fully completed before class and delivered as a complete product, the 2009 PowerPoint slides that were taken to class only consisted of the structure and not much detail. Two typical examples from 2008 (standard) and 2009 (Tablet) are presented in Figure One. The standard PowerPoint slides contain most of the points that will be made during the lecture. The reason for this approach was to provide a ‘static record’ of the lecture for the students studying by distance. On the other hand, the Tablet PC PowerPoint slides contain, for the most part, only slide titles and, on occasions, pictures to prompt discussion. As the lecture progresses the slides are ‘inked’ using the Tablet PC and the completed lecture gradually takes shape. Each action that takes place (audio and the inking) is captured using Camtasia Studio and a ‘screencast’ is produced and uploaded to the course site on the LMS. All students are then able to download, watch and listen to the lecture. This provision of a classroom experience to students studying by distance by itself is, of course, a valuable innovation.

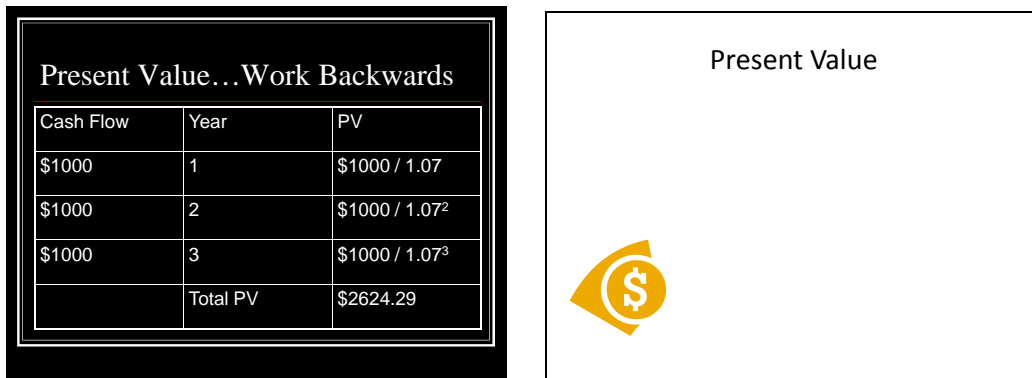


Figure 1: Standard and Non-Standard PowerPoint Slides

At the beginning of each lecture, students were provided with (paper) handouts of the slides that represented the building blocks for the lecture. Most of the slides had no more detail than the right-hand (non-standard) slide in Figure 1. The lecture proceeded with the instructor using the Tablet PC at the front of the theatre (always facing the students) and the Tablet PC screen and lecture slides visible to students on the large projection screen above the instructor. At each slide, the instructor could jot down some important points, equations, examples or diagrams (with audio fully recorded). Students completed or filled in their 'blank' handouts. On numerous occasions in any particular lecture, the instructor involved the students by calling for suggestions, explanations or results of particular calculations, and engaging students in discussion. In this way, the lectures were 'built' in class with the students and the construction was shaped and contributed to by their participation; see Figure 2 for an example.

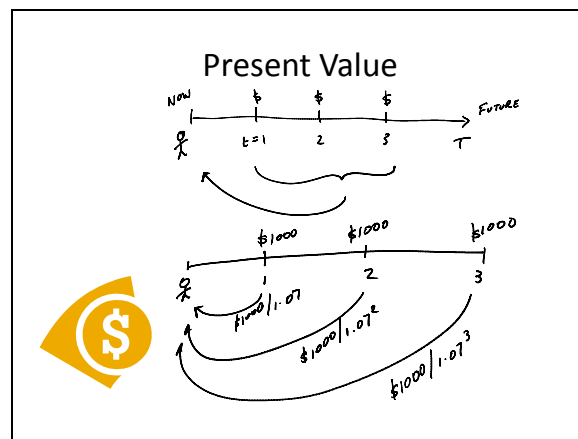


Figure 2: 'Inking' a Slide

With regards to teaching practice and issues such as engagement and interaction within a classroom environment, the approach described in this section involves considerably more student participation than the standard slide-show delivery. This may contribute to improvements in student performance and motivation in several ways, including the generation of a more positive classroom environment (Phillips and Loch, 2010). The online availability of the screencasts provides all students the opportunity to engage with the course at a much higher level and experience a number of important elements of the classroom experience. In the next section, student performance in semester 1 2008 is compared with performance in semester 1 2009. Emphasis is placed upon the performance of students designated low SES.

Student performance

The impact of the Tablet PC deployment and the approach to lecture delivery described in the previous section is assessed by comparing the performance of students in the non-tablet semester in 2008 with the performance of students in the tablet semester in 2009. During these two semesters, the course team, including the principal instructor, and type and level of difficulty of assessment, remained unchanged. The approach to delivering the

lectures at the main Toowoomba campus (and the availability of the screencasts) is the only significant difference between the two semesters. The educational psychology literature identifies many factors that contribute to student motivation, engagement and performance (see, for example, Miller, Greene, Montalvo, Ravindran and Nichols, 1996). It is likely that any improvement in these areas is the result of a complex interaction of a number of variables. The approach taken here in comparing performance across a ‘control’ semester and a semester within which a teaching innovation is trialed, mirrors that which has been taken in previous studies (see Sosin, Blecha, Agarwal, Bartlett and Daniel, 2004; Ball, Eckel and Rojas, 2006; Salemi, 2009). In the following sub-section, a summary is given of the formal analysis of failing grade distribution from (Phillips and Loch, 2010) across all campuses. The difference in exam performance is also shown, to provide a context for the main topic of this paper: evaluation of the impact of technology use on motivation and performance by socio-economic status.

‘Other failing grade’ distribution and examination performance

The data for this study is from semester 1 2008 and semester 1 2009. The data that is accorded a prominent place in the analysis is that which concerns: (1) course abandonment rates as measured by ‘other fails’; (2) progression rates (one minus the percentage of ‘total fails’); and (3) examination performance. A fail grade is given for genuine low performance when a student has submitted all assessment items and sat the exam but scored less than 50% of the total available marks. However, ‘other’ failing grades for non completion, not sitting the exam or no participation are given for incompleting studies. Course abandonment may be measured by the percentage of ‘other fails’. Because of the complex interplay of variables including students’ personal situations, reducing the number of ‘other fails’ is among the most difficult tasks for the university. “Significant differences in ‘other fails’ across semesters are likely to indicate substantial improvements or, conversely, problems with these facets of a course” (Phillips and Loch, 2009). Table 1 shows the distribution of ‘other fails’ for the two semesters.

Table 1: Other Fails 2008 and 2009; from (Phillips and Loch, 2010).

	2008 Total enrolments	Other Fails (% of Students)	2009 Total enrolments	Other Fails (% of Students)
Toowoomba (On Campus) Students	89	15.85%	99	6.12%
Fraser Coast (On Campus) Students	12	0.00%	13	0.00%
Springfield (On Campus) Students	24	40.91%	40	20.00%
Distance (External) Students	258	15.60%	254	12.70%
Total	383	16.67%	406	11.42%

Care needs to be taken when different cohorts are compared. However, the difference in ‘other fails’ across 2008 and 2009 is striking and cannot be entirely attributed to differences in the core characteristics of the two student cohorts. Final examinations are very similar in structure and difficulty and markers remained mostly unchanged across the two semesters (with the course instructor moderating the consistency of markers). The average examination performance is reported in Table 2.

Table 2: Examination Performance 2008 and 2009, from (Phillips and Loch, 2010)

	2008 Total enrolments	Examination Performance (Max. 100%)	2009 Total enrolments	Examination Performance (Max. 100%)
Toowoomba (On Campus) Students	89	38.35%	99	66.94%
Fraser Coast (On Campus) Students	12	57.71%	13	75.15%
Springfield (On Campus) Students	24	30.72%	40	58.17%
Distance (External) Students	258	35.58%	254	64.11%
Total	383	36.61%	406	64.56%

Socio-economic status

Attention may now be turned towards the performance and course abandonment statistics that characterise particular SES groups within the class. The classification of students in low, medium and high SES is undertaken using information provided by the Department of Education, Employment and Workplace Relations (DEEWR) and the Australian Bureau of Statistics (ABS). In the ABS Socio-Economic Indexes for Areas (SEIFA) (ABS, 2008), the Index of Education and Occupation (IEO) ranking of postcodes is of relevance to this study. The postcodes that comprise the bottom 25 percent of median household incomes of the population aged between 15 to 64 years, are considered low SES postcodes. The University receives a postcode/SES status assignment (low, medium, high, other (overseas)) for each student from the Department of Education, Employment and Workplace Relations (DEEWR) via the ABS, based on the postcode of a student's home residence. It is the Department's classifications that are, therefore, deployed in this analysis. It should be noted that the use of postcodes to establish SES is currently under review by the Australian government.

In 2008, there were 383 students enrolled in the introductory finance course at USQ. In 2009, there were 406 students enrolled. 'Partner' enrolments (where students are enrolled through an educational partner institution and are provided with 'local' tutoring) will be excluded in the following analysis, and without those there were 285 students enrolled in semester 1 2008 and 311 enrolled in semester 1 2009. More than one-third of these students are classified as low SES in 2009, and just under a third in 2008. The SES classification for all students in 2008 and 2009 is reported in Table 3:

Table 3: Student Enrolments by SES

Socio-economic Status	2008	2009
High	38	36
Medium	140	155
Low	92	104
Other [no info - overseas]	15	16
Total	285	311

In order to provide as much information as possible about the characteristics of the student cohorts, it is worthwhile examining the students tertiary entrance (highschool) scores (OPs or overall positions) and the distribution of OP scores across SES (OP Score is calculated as a value between 1 and 25, 1 is the highest score). Because many students at the University of Southern Queensland are mature age or enter via 'alternative pathways', a large percentage of students do not have an overall position. This information is presented in Table 4. Note that the percentages in the far right-hand columns are based on the number of students in each SES category. There are (from Table 3), for example, 155 students with medium SES backgrounds in 2009 out of which 38 received OP 11 to 15.

That is 25 percent of the total number of students in that SES category. The lower OP brackets are highlighted for each of the SES backgrounds in Table 4.

Table 4: OP Scores and SES.

Socio-economic Status		2008	2009	2008 (% by SES Category)	2009 (% by SES Category)
High	OP 1 – 5	3	4	8	11
	OP 6 – 10	6	8	16	22
	OP 11 – 15	10	10	26	28
	OP 16 – 19	1	2	3	6
	No OP	18	12	47	33
Medium	OP 1 – 5	24	33	17	21
	OP 6 – 10	39	40	28	26
	OP 11 – 15	34	38	24	25
	OP 16 – 19	7	5	5	3
	No OP	36	39	26	25
Low	OP 1 – 5	12	10	13	10
	OP 6 – 10	27	30	29	29
	OP 11 – 15	28	41	30	39
	OP 16 – 19	10	8	11	8
	No OP	15	15	16	14
Other	OP 1 – 5	3	5	20	31
	OP 6 – 10	4	4	27	25
	OP 11 – 15	5	2	33	13
	No OP	3	5	20	31

Previous studies provide ample reason for us to expect that students from socio-economically disadvantaged backgrounds will exhibit lower levels of academic achievement. The literature also provides reasons to expect that any relationship between (pre-university) academic achievement and SES is unlikely to be completely clear-cut. The data presented in Table 4 are in accordance with these expectations. Students with low SES backgrounds exhibit a much higher percentage of OP scores in the 11 to 19 brackets. Indeed, in 2009, 47 percent of students from low SES backgrounds have OP scores in these lower categories. This compares to 28 percent and 34 percent for medium and high SES background students respectively. The students from low SES backgrounds enrolled in the introductory corporate finance course have, generally, exhibited lower academic achievement prior to entry into higher education.

As can be expected, in light of the course abandonment and exam performance statistics already presented, the performance of students overall improved during 2009. To formally compare the non-tablet semester 1 2008 with the tablet semester 1 2009 in the context of SES, we focus on the progression rates for each SES group. The progression rate is one minus the percentage of total failing grades for the course. If ‘total’ fails are 60 percent, for example, the progression rate for the course will be 0.40. A higher progression rate indicates that students have both stayed with the course (no ‘other fail’ grade) and achieved a passing grade or higher. The progression rates by SES group are reported for semester 1 2008 and semester 1 2009 in Table 5. The progression rates by SES group and OP score for semester 1 2008 and semester 1 2009 are reported in Table 6.

Table 5: Progression Statistics by SES

Socio-economic Status	2008	2009
High	0.63	0.58
Medium	0.69	0.83
Low	0.68	0.90
Other [no info - overseas]	0.53	0.75

Table 6: Progression Statistics by SES and OP Score

Socio-economic Status	OP group	Progression	
		2008	2009
High	OP 1 – 5	1.00	0.50
	OP 6 – 10	0.67	0.75
	OP 11 – 15	0.50	0.60
	OP 16 – 19	0.00	0.00
	No OP	0.67	0.56
Medium	OP 1 – 5	0.79	0.91
	OP 6 – 10	0.77	0.90
	OP 11 – 15	0.59	0.79
	OP 16 – 19	0.43	0.60
	No OP	0.69	0.76
Low	OP 1 – 5	1.00	1.00
	OP 6 – 10	0.81	0.90
	OP 11 – 15	0.46	0.85
	OP 16 – 19	0.50	0.88
	No OP	0.73	1.00
Other	OP 1 – 5	0.67	0.80
	OP 6 – 10	0.25	0.75
	OP 11 – 15	0.80	0.50
	No OP	0.33	0.80

The statistics reported in Tables 5 and 6 are equally as striking as those regarding course abandonment and examination performance. Several features in Table 5 bear further comment. First, there is a substantial improvement between 2008 and 2009 among both medium and low SES background students. Second, the largest improvement is exhibited by the low SES students. Third, high SES students actually exhibited a slight decline (although probably not statistically significant and the sample size for high SES is small enough to be susceptible to cohort idiosyncrasies). Among the students classified as low or medium SES, there was an approximately 42 percent improvement in course progression when semester 1 2008 and semester 1 2009 are compared (weighted to adjust for increases in student numbers in 2009). Fourth, the largest improvements are in those lower OP-score categories within low and medium SES categories. Students exhibiting lower academic achievement prior to entering university and hailing from low and medium SES backgrounds have exhibited a much higher level of progression during the Tablet PC semester. The Tablet PC semester 1 2009 is characterised by a very substantial improvement in overall course progression. This is a very encouraging set of results.

Discussion and future research

Following the new approach to the delivery of the introductory corporate finance course, performance and engagement of students with low and medium SES backgrounds improved substantially, and more of these students stayed in the course and successfully completed it. The most important issue to discuss in this section is the obstacles that may have been offset or overcome by the utilisation of the technology and the lecture delivery approach that it facilitated. This question cannot be answered completely at this stage but its discussion sows the seeds for future research. Of particular interest is the way in which teaching technologies may interact with self-efficacy for self-regulated learning. Self-efficacy for self-regulated learning has received a great deal of attention within the literature. As pointed out earlier, self-regulatory efficacy may be influenced by SES factors and lower self-regulatory efficacy negatively impacts student performance. Within the general student population at USQ and, as highlighted in the previous section, within the particular group of students enrolled in the introductory corporate finance course, students from low SES backgrounds constitute a considerable portion of the student body. Many of these are enrolled for distance education and must balance the pursuit of higher education with various additional challenges (many of which, no doubt, are related to SES context).

In this environment, self-efficacy for self-regulated learning would seem to be of some considerable importance. There are several reasons why self-regulatory efficacy may be relevant to this discussion:

- First, studying relatively independently by distance education is likely to test students' self-efficacy and self-regulation. Caprara *et al.* (2008, p.532) highlight the importance of preventing 'erosion' in self-efficacy and self-regulatory efficacy: "[A] decline in self-regulatory efficacy foreshadows low academic performance and school drop out." Using technology to reach students studying in distance mode may be critical in overcoming the erosion of self-regulatory efficacy.
- Second, as Caprara *et al.* (2008, p.525) highlight, "[...self-regulatory efficacy has a] 'growing primacy in contemporary life.' Information technologies are globalising knowledge and altering educational systems.... In this new era, the construction of knowledge will rely increasingly on electronic inquiry." In an environment where technology is used to deliver higher education, determining how to use technologies effectively and in a manner that recognises this primacy, allows students to build their self-regulatory efficacy and broadens students' horizons beyond the limits set by SES, and social and peer groups may be of significant importance.
- Third, Caprara *et al.* (2008, p.527) point out that SES may influence academic achievement directly and indirectly through its impact on self regulatory efficacy. What might be considered thoroughly in future research, therefore, is whether the positive effects that have been observed in the present trial of Tablet PC technology are in some way due to the overcoming or offsetting to some degree of negative SES (and other) influences on self-regulated efficacy by the effective utilisation of teaching technology.

The efficacy of teaching technologies in improving student performance is still an open research program. Indeed, so is the study of technology, SES and academic achievement. There are numerous challenges facing researchers who seek to unravel the complex interaction and cumulative effects of many different variables. The extant research is small but enough information has been gathered to suggest that institutions and instructors attempting to overcome or offset the negative influence of SES may find some assistance in the appropriate and effective deployment of teaching technology. For example, Joo, Bond and Choi (2000) and Debowski, Wood and Bandura (2001) found that established relationships between self-efficacy and academic achievement apply with similar force in web-based learning contexts. It is possible that at least some portion of the positive outcomes generated for low and medium SES students during the Tablet PC trial described in this paper might be accounted for by considering the offsetting effects of the technology on the negative influences of SES on self-regulatory efficacy. The opportunity to experience elements (audio and video) of a positive classroom experience may offset (or help to overcome) the negative influences that other factors (including those stemming from SES context) may have on self-regulatory efficacy and academic achievement. It is in this way, perhaps, that the effective utilisation of teaching technology can help to improve student motivation, engagement and performance. Deeper inquiry into these issues is a task for future research.

Conclusions

This paper presents the results of a Tablet PC trial within an introductory corporate finance course at USQ. The Tablet PC facilitated the interactive construction of lectures in class and the distribution of screencasts to all students via the LMS. Of particular interest, both in light of Australian Government higher education policy and the particular demographics that characterise our institution, is the way in which teaching technology can be used to enhance the motivation, engagement and performance of students from low and medium SES backgrounds. The comparison of course abandonment statistics, examination performance and progression statistics point to a considerable improvement between the non-tablet semester 1 2008 and the tablet semester 1 2009. At least some of this improvement must be attributable to the change in delivery approach during 2009. Importantly, students from low SES backgrounds exhibited the greatest improvement in progression (staying with the course and obtaining a passing grade or better) in 2009. This result was mirrored by the medium SES students while the high SES students' progression remained fairly static. It is possible that the effective utilisation of teaching technologies helped to offset some of the challenges to self-regulatory efficacy (which is important for distance study) presented by SES and other factors. The investigation of this is a promising prospect for future research.

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