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What is the impact of online resource materials on student self-learning strategies?

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Key words: self-learning strategies, online environment, Tobit regression, online engagement, student performance.

Abstract

The purpose of this paper is to examine how students are incorporating online resources into their self-regulated learning strategies. The process of developing these learning strategies and the importance of these strategies has been widely researched, but there has been little empirical research into how the students are affected by online environments. This preliminary study focused on the relationship between the use of online resources and the students' overall outcome in the subject. The data were collected from first year on campus (n=105) and distance education (n=258) students) after completing their introductory marketing subject. The data were analysed using correlations, simple regression and Tobit regression to assess online activity and student outcomes. Our results indicate that the use of these online resources has a significant and positive effect on the students' grade. This finding suggests students are incorporating online environments into their learning strategies which results in higher grades. Moreover, in practical terms the results imply that teachers can help to facilitate student self-learning strategies by creating encouraging and resource-rich online environments.

Introduction

Self-regulated learning strategies are independent behaviours that students adopt for themselves in order to learn. A principal assumption about self-regulated learning is that it is distinguishable from other forms of learning because it is intentional and requires a conscious effort by the student (Boekaerts and Cascallar, 2006). The concept of self-regulated learning strategies can be defined in terms of the relationship between the student and their control over their strategic behaviours and learning environment (Zimmerman, 1989). That is, the student identifies and performs actions that can help them to learn. For example, a student may deliberately summarise a textbook chapter as a revision strategy. These deliberate behaviours can be affected by their engagement with their learning environment. In this research, the learning environment consists of a virtual space. As with most virtual (online) learning environments the contents of the space can be added to by all participants and it is through this interaction that learning occurs (Vrasidas and McIsaac, 1999). For instance, online environments can contain interactive media resources such as videocasts and live chats that give the students an opportunity to interact with their teacher and other students. Given this, students can deliberately engage with tools like these in the online environment as part of their self-regulated learning style.

The purpose of this preliminary study is to examine if students are adopting online resources as part of the self-regulating strategies and if this adoption is having an effect on their academic achievement. To examine student's online engagement and learning strategies, a first year marketing subject offered in on and off campus modes, is analysed. Using regression analysis (n=105 on campus and 258 off campus students) the link between online engagement and student outcomes is assessed. The use of a first year subject provides context to examine if students are adopting online aspects to enhance their learning strategies.

Self-regulated learning strategies and first-year university students

Going to university is a point of transition for most students. It can be a time when some students become overwhelmed by their environment. Teachers cannot assume that first-year students have self-regulating strategies or that the learning strategies that they do have are going to be effective in this new environment. Students may have unconscious strategies that they have relied on in the past to learn content which has led to positive academic achievement. However, those strategies may be insufficient when transitioning into a new environment such as from school to university (Boekaerts and Cascallar, 2006). Because these strategies are unconscious the student may not understand why a style that worked for them previously no longer helps them to achieve good grades.

During the students' initial period of adjustment there are many demands that can affect their academic performance. For example, the student needs to balance their study processes, such as being conscientious and in control, with their social needs (McKenzie, Gow, and Schweitzer, 2004). Another important issue that affects student performance during a period of transition is self-efficacy (Zimmerman, 1989; Peltier, Hay, and Drago, 2005). Self-efficacy is the belief that a student can produce a desired result. It is the student's own sense of their capacity to do something (Zimmerman, 1989; Peltier et al., 2005). Studies in self-efficacy and self-regulated learning have shown that high-efficacy students will perform better and engage more with environmental cues (e.g. asking the teacher for help) than average or low-efficacy students (Eilam and Aharon, 2003). This suggests that the student's own belief in their ability to achieve their goals encourages them to develop learning strategies that incorporate environmental support.

Early psychologists argued that self-regulation is a combination of habitual process and reflective actions, social interactions and formal environments (Fox and Riconscente, 2008).

That is, for the learner some processes have become unconscious and some are deliberate and that these learning processes are affected by other people and the situation. Academics have argued that automatic learning strategies are important because they liberate the mental processes. This enables the student to focus on problem-solving and mastery of content (Bargh and Chartrand, 1999). For example, the components of driving a car (changing gears, brake, and accelerator) need to become automatic so that people can focus on the driving environment (pedestrians, other cars). This suggests that the actual self- regulated learning strategies should become habitual as soon as possible so the student can focus on what they need to know in terms of the task.

Moreover, being able to consciously and critically reflect on learning processes can help students learn on a deeper level and is a valuable generic skill (Peltier et al., 2005). Thus, it is important that students actually understand and reflect on their learning processes. For students to reflect on their learning processes they need to engage in self-monitoring and corrective actions (Zimmerman, 2002; Young, 2005). For example, students need to manage their learning processes and change their behaviours if they realise these processes do not work. This suggests that without a period of deliberate and focused reflection, students may be unable to identify the weaknesses in their strategic approach to learning. To this end, there is a need for students to engage in meta-cognition processes (thinking about thinking) so they can understand their own intellectual processes (Dinsmore, Alexander, and Loughlin, 2008; Fox and Riconscente, 2008). However, meta-cognition is often not automatic; academics need to create structured processes to help the student to develop the reflective process of thinking (Kramarski and Mizrachi, 2006; Kramarski and Dudai, 2009). Given that meta-cognition is considered an important skill for self- regulated learners to develop, researchers has been examining the effect of developing meta-cognitive skills on students' performance.

That is, if students do develop this skill, will it help them to learn more and do better in their studies? Kramarski and Dudai (2009) provided evidence to suggest that students who have been instructed to follow a structure that focuses on developing meta-cognition perform better than students who are just self-regulating their learning process. This suggests that students who develop this skill will become better learners. The implication is that academics need to focus on designing the online environment and the facilitating instructions to help students to develop this high level skill.

Research into the common self-regulating strategies that students have adopted has found that self-consequences (giving yourself a treat or punishment) for achievement and organising and transforming information (arranging ideas in their own way) are popular techniques (Nota, Soresi, and Zimmerman, 2004). For students, engaging in an online environment, we propose that the self-regulating strategies would also include activities such as downloading resource material, checking for new content and engaging in online discussions. Thus, for students, a structured environment filled with content and processes can help them to engage in reflective processes.

The environment

Zimmerman's interdependent tri-component model of self-regulated learning strategies included the person, their academic behaviours and the environment (Zimmerman, 1989). To be self-regulated the individual must be aware of how their behaviour and the environmental context will affect their learning. For instance, going to a library to study is both a behavioural and environmental strategy that can help the student to learn. From a social behavioural learning perspective, self-regulated learning strategies are embedded within the interactions of the individual and the environment (Dinsmore et al., 2008). This suggests that the other people, who are involved in the environment, are important in the learning process.

The online environment offers both the teacher and learners a space to share knowledge and interact with each to facilitate the learning process (Vrasidas and McIsaac, 1999). To this end, the online environment can be an essential component for developing self-regulated learning strategies as the teacher can offer strategic learning approaches and the student can engage in socially reinforced learning behaviours.

The adoption of an online environment can create many issues for academics and students. These issues include; managing the technological capacity of system and users' ability (Palmer and Holt, 2009), understanding the importance of presence (virtually availability) and interactivity without the traditional social interaction cues (Wilson and Stacey, 2004), significant differences in tools and application of tools that are inconsistent and confusing (Weller, Pegler, and Mason, 2005) and media rich environments that are complex and result in information overload (Jereb and Smitek, 2006; McGill and Hobbs, 2008; Palmer and Holt, 2009). In short, the elements in the environment can actively work against students and academics; participants may not know how to engage in the environment or the technology fails to perform as anticipated. The participants also need to learn virtual social behaviours in order to interact appropriately such as understanding that using capitals is regarded as shouting.

However, there are numerous online environmental elements that can aid the students' reflective meta-cognitive processes. Researchers argue that effective online environments contain feedback and encouragement (Zimmerman, 1989; Artino and Stephens, 2009a; Atici and Polat, 2010) they also need to be engaging, stimulating (Young, 2005) and a place for open discussion where students can express their doubts, explore alternatives and experience a sense of community (Vrasidas, Zembylas, and Chamberlain, 2004; Peltier *et al.*, 2005). In this way, online environments can give students a sense of control as they can engage in independent learning and yet still feel part of a group (Vrasidas and McIsaac, 1999; Dettori,

Giannetti, and Persico, 2006). In summary, the online environment must encourage the student to move beyond just receiving information; the student must do something. This kind of strategy encourages students to spend time searching for the answer, which can lead to reflective or critical thinking.

One way academics can create a positive environment, which encourages reflective thinking, is by scaffolding formative tasks and processes (Dabbagh, 2003; Boekaerts and Cascallar, 2006; Nicol and Macfarlane-Dick, 2006; Reingold, Rimor, and Kalay, 2008). Scaffolding is a developmental structure designed to guide and support students through the learning process. Moreover, scaffolding can be removed as students become more proficient and autonomous learners (Ludwig-Hardman and Dunlap, 2003). Scaffolding can assist students on many levels of engagement from technical support (how to do something), to content support (necessary information to answer question), procedural support (stages to use as milestones for achievement) and encouraging meta-cognitive behaviours (reflecting and rationalising actions) (Reingold et al., 2008). Within the learning environment, scaffolding provides extension, support, motivations and guidelines. Moreover, scaffolding in the online environment can enable asynchronous learning as the student can use this structure rather than relying on interaction with other students or the teacher. The scaffolds of the online environment used in this research will be discussed in the methodology section.

Goals and motivations

Significant variables that affect the students' meta-cognitive processes and the development of self-regulating strategies are their own goals and motivations. Self-regulation is a deliberate choice to achieve specific goals (Elliot and Sheldon, 1997; Young, 2005) and students may employ different strategies depending on their learning intention (Peltier *et al.*, 2005; Boekaerts and Cascallar, 2006; Muis and Franco, 2009). Students can have both

personal motivations that are task orientated (such as meta-cognition and rote learning) and social motivations that are performance orientated (such as time management, self-affirmation and engaging with others) (Wolters, 1998; Riveiro, Cabanach, and Arias, 2001). This suggests that social and academic goals are both important to students regulating their learning processes to achieve good grades.

In addition, because students can have simultaneous goals ranging from learning content to making friends and/or competing with others (Covington, 2000) they need to have a hierarchy of goals and identify which goals are more salient to their overall intentions (Riveiro *et al.*, 2001; Boekaerts and Cascallar, 2006). This hierarchy of goals becomes particularly important when the student tries to create a balanced approach to university life. For example, for some students the goal is to form stronger bonds with other students. The student's social goals help them to develop positive online learning strategies (Moore, 1989; Jung et al., 2002) and promote deeper learning (Artino and Stephens, 2009b). In this instance, the student's main goal is to understand the social interaction process. This suggests that one goal of self-regulated learners can be to create an effective learning environment. Once the first goal is achieved the student can then focus on other goals.

Reflective students who have developed self-regulated strategies may change those plans if they do not achieve their goals (Eilam and Aharon, 2003). In other words, self-regulated learners are thinking about the processes they use to achieve their goals. Self-regulated learners are also willing to change their strategies if they find they cannot reach their goals. For example, a student whose goal is to merely achieve a pass grade throughout the subject will have a different learning strategy from a student who wants to achieve higher grades. The student seeking higher grades may continue to engage in particular learning strategies as long as they get high grades, if the grades fall, then the student may change to another learning strategy to achieve their goals.

In summary, reflecting on self-regulated strategies can help the student to reach their academic goals. The student needs to monitor and be prepared to alter their self-regulated learning strategies if they become aware (e.g. by receiving a less than desired grade) that the strategy is not helping them to learn. However, effective self-regulated learning strategies should become automatic and habitual processes for the student so they can focus on understanding the content and their social needs. To this end, the role of the academic teaching first year classes may be to introduce students to the process of self-monitoring and self-regulating learning strategies. The objective of this preliminary research was to explore the impact of online environment tools to (a) examine whether the students are adopting these resources into their self-learning strategies and (b) to see whether the students who adopt these resources are achieving higher grades.

Hypotheses and Methodology

Thus there are five research hypotheses to investigate online subject environments, student interactions with these environments and student results. Essentially we are investigating whether students use the online environment as part of their learning strategy during the earlier part of their university studies. To do this there are five hypotheses, which relate to online involvement, engagement and subject outcomes. Using a first year subject where the students have limited experience with subject websites we were able to extract data on the frequency of student engagement through their subject content read online and the students downloads of the content. The number of visits to the subject website is used as a proxy for online engagement with subject materials. While the downloads referred to as e-content read demonstrates that students are downloading content indicating a higher level of engagement

with the online materials. We were able to use student grades as a measure of results, with assessment and total overall performance.

The hypotheses are displayed in Figure 1, which is the conceptual model for testing.

The context for the research is a marketing principles subject, which is offered in a distance and an internal mode. The subject has a website which is where the data is drawn. The subject is a first year core subject with students from a range of business (e.g. accounting and marketing) and non-business (e.g. agriculture and psychology) academic backgrounds. The students have limited experience at university and subsequently have little experience with university subject online environments.

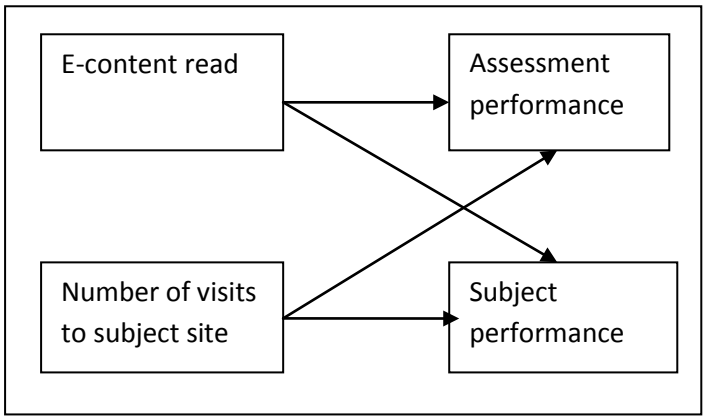
The subject website houses a resources section which was the unit used in this analysis. Within the resources section for both the internal and distance students materials were provided to assist students. The resources were scaffolded in terms of content support such as weekly lecture slides and procedural support materials such as exam technique files, technical support such as guidelines for online discussions and meta-cognitive support such as rationales for assessment tasks and group relationship building tasks. Students have access to all documents in the resources folder. No attempt was made to disaggregate materials to see if certain materials have a greater effect on outcomes. The nature of the data does not allow for this, forcing a limitation of the results.

Students were informed about the research through a survey information sheet. Students were told that their activities and interactions with the online environment would be the subject of a study to assess the online environment and performance. The specific undertaking of the research was available to students upon request. However, students were not specifically informed that we would match activities and outcomes to ensure that students' behaviours were not influenced.

The two independent variables, e-content read and site visits, are used to explain the dependent variables in this research. The independent variable e-content read is the number of downloads that a particular student has undertaken. This independent variable is downloads which are taken from the subject site and contain education material such as report writing guides, lecture slides and other subject related materials. The second independent variable, site visits, refers to the number of times a student visited the subject's website. Both of the independent variables are continuous variables.

There are also two dependent variables included in the analysis. The first dependent variable is subject performance. This is measured as the total final mark that a student received as the sum of all assessments in the subject. The second dependent variable is a single assessment (consistent for both sample cohorts). The single assessment is a written report.

Figure 1: Conceptual Model for Testing



The final area of testing is to see if students at different levels perform differently. That is, do students who attain higher grades actually get more value from online interactions? This may shed light on a student's performance and their involvement with online environments at different levels of student outcomes. Thus, answering the question, are higher achieving students in terms of grades more engaged with the online environment?

There are five hypotheses to be examined in this research, relating to e-content read (downloads), subject site visits and subject outcomes. In short, adopting online engagement into a students learning strategy should lead to positive outcomes for the student. It is also anticipated that students of varying competencies will also have different levels of adoption and success at this integration. The five hypotheses are as follows:

Hypothesis 1: E-content read has a positive influence on an individual's total subject performance

Hypothesis 2: E-content read has a positive influence on an individual's subject assessment

Hypothesis 3: Number of subject site visits has a positive influence on an individual's overall subject performance

Hypothesis 4: Number of subject site visits has a positive influence on an individual's subject assessment

Hypothesis 5: Online engagement has different effects for students with different grade outcomes

To test the hypotheses, regression analysis was considered. As a first step, Pearson Correlation was used specifically to identify whether the independent and dependent variables are suitable for further analysis using regression. Regression analyses the relationships between independent variable(s) and a single dependent variable. The objective

of regression analysis was to see if the independent variables explain variation in the dependent variable (Hair et al., 2010). In this case we will use a combination of regressions. Firstly, simple regression was used, followed by Tobit regression.

There were two sources of data for the regression, a distance cohort and an on-campus cohort. Both classes were marketing principles and were differentiated by the mode of study. The first data group was distance education mode with a sample of 258 cases, and the second data group was an on-campus mode which had 105 cases. The two different samples were used to understand whether the mode of offering influenced the performance of the e-resources. Paired data was used, with students who did not have one of the variables recorded removed. That is, if a student had not completed any assessment items; they were removed from the sample. Therefore, all cases are complete with students having a report grade, exam grade and a total grade.

Results

Before moving to the correlations and regressions we will briefly review some descriptive statistics. For the distance students average number of subject site visits was 123.367 with a maximum of 486 and the e-content read was 41.111 with a maximum of 243. For the on-campus education mode cohort the average subject site visit was 118.322 with a maximum of 878 and the e-content read average was 40.078 with a maximum of 200. Thus the distance students are visiting and downloading slightly more than the on-campus students. In terms of total site visits and e-content read the distance education cohort had 11,103 total site visits and 3700 e-content downloads. For the on-campus education mode total visits were 10,649 and downloads were 3607.

The next area of analysis was correlation all of the variables to be included in the research. The findings indicated that correlations were high between each of the variables included. The correlation results are included in Table 1.

Table 1: Correlation Results for Subject Site Visits, E-content Read, Assessment Item and Total Mark

Distance Education Mode				
	Reads	Visits	Assessment	Total Mark
E-content Reads	1			
Site Visits	0.954**	1		
Assessment Item	0.158*	0.185*	1	
Total Mark	0.234**	0.268**	0.731**	1
On-campus Education Mode				
E-content Reads	1			
Site Visits	0.954**	1		
Assessment Item	0.219*	0.215*	1	
Total Mark	0.298**	0.278**	0.588**	1

(All constant's significant (0.001))

Each of the correlations is significant and positive. The most highly correlated are the number of visits and the content read. Site visits and e-content read for both cohorts have small but significant correlations with assessment and the total mark awarded for the subject. As a result of these findings, we cannot run a multiple regression, as one of the basic tenets of multiple regression is that the independent variables must not be correlated (Hair *et al.*, 2010). However, we can use a simple regression and an interaction variable to counter this issue.

The second area of analysis was the simple regression, using amount of e-content read and number of subject website visits as independent variables and subject outcome as the dependent variable (H1 and H3). With the distance education sample both e-content read (β=0.086) and site visits (β=0.039) were significant (p=0.01) predictors of subject performance. With the on-campus sample the e-content read (β=0.099) was significant (0.01) as was site visits (β=0.038). As expected the R-squares for each of the three significant regressions was small. Moreover, the constant is quite large. Each of the three also had a significant f-test. The results of these four regressions are included in Table 2.

Table 2: Simple Regression to Determine Subject Performance

Mode	Independent	Constant	Beta	P-value	R-square	F-test
Distance	E-content read	59.42	0.086	0.003	0.055	0.003
	Site visits	58.42	0.039	0.001	0.072	0.000
On-campus	E-content read	59.47	0.099	0.004	0.089	0.004
	Site visits	58.90	0.038	0.008	0.077	0.008

(All constant's significant (0.001))

The second group of regressions uses the same independent variables e-content read and subject site visits; but has the second dependent variable assessment performance (H2 and H4). For the distance education mode both content read (β=0.012) and subject website (β=0.006) visits had a significant effect on assessment result. For assessment performance, like the subject performance results with the on-campus mode both content read (β=0.016) and subject website visits (β=0.007) were significant. As with the subject performance the R-square's were low. For assessment performance each of the four single regressions also had a significant F-test result. A summary of these results are included in Table 3. The assessment

tasks were marked out of 20 for distance education and 15 for on-campus education modes, hence the difference in constants.

Table 3: Simple Regression to Determine Assessment Performance

Mode	Independent	Constant	Beta	P-value	R-square	F-test
Distance	E-content read	12.768	0.012	0.049	0.025	0.049
	Site visits	12.589	0.006	0.021	0.034	0.021
On-campus	E-content read	8.495	0.016	0.039	0.058	0.038
	Site visits	8.362	0.007	0.042	0.046	0.042

(All constant's significant (0.001))

As shown in Table 1, the independent variables are significantly and highly correlated. Thus we created an interaction variable, whereby the product of the two independent variables used to assess their combined influence on the dependent variables. The purpose was to see whether when combined the independent variables have an influence on subject assessment and overall performance. For assessment, the F-test was insignificant, and the interaction variable was insignificant. This indicates that when combined e-content read and subject site visits into an interaction variable, it has no significant effect on assessment. However, in contrast to this the effect was significant for on-campus and distance modes on total subject performance. Both the F-tests and variable were significant for both modes of education. Thus, we can conclude that the interaction variable is significant in only influencing the subject total performance. Even then, the beta weight is considered to be quite small. The results are included in Table 4.

Table 4: Interaction Regression

Mode	Dependent	Constant	Beta	P-value	R-square	F-test
Distance	Total Mark	61.724	0.0001	0.038	0.0276	0.0381
	Assessment Item	13.169	0.00001	0.236	0.0091	0.2358
Distance	Total Mark	61.986	0.0002	0.027	0.0540	0.0275
	Assessment Item	8.853	0.00004	0.057	0.0407	0.0567

(All constant's significant (0.001))

Following on from the correlation and simple regression, the Tobit regression was the next technique used to examine the hypotheses. Tobit regression allows the dependent variable to be censored. Hence, in this case we can treat the dependent to create a range of regression output, creating an improved understanding. The dependent variable used was total mark gained by the student and the independent variables were again content read and number of visits to the subject website. The assessment marks were not used for the Tobit regression. This is because they do not have a large enough variation for the dependent variable to give insight. The dependent variable, total mark was censored according to pass, credit, distinction and high distinction. Thus, we are able to see if a student's content read and subject site visits play a more important role. The findings for the Tobit regression are included in Table 5.

Table 5: Tobit Regression findings for Content Read and Subject Site Visits on Total Subject Mark

Distance Mode E-content Read (IV)					
Total mark range (DV)	Constant	Beta	P-value	Chi-square of equation	Pseudo R-square
50-65	62.889	0.072	0.026	0.021	0.009
66-75	62.412	0.061	0.036	0.029	0.010
76-85	63.923	0.060	0.024	0.017	0.026
50-100	61.857	0.062	0.006	0.006	0.007
Distance Mode Subject Site Visits (IV)					
50-65	61.936	0.032	0.011	0.009	0.012
66-75	61.421	0.029	0.013	0.009	0.014
76-85	62.736	0.031	0.007	0.002	0.042
50-100	60.937	0.028	0.001	0.001	0.011
On-campus Mode E-content Read (IV)					
50-65	63.812	0.111	0.091	0.068	0.011
66-75	61.763	0.082	0.019	0.012	0.022
76-85	33.811	0.258	0.106	0.004	0.131
50-100	60.478	0.099	0.004	0.004	0.014
On-campus Mode Subject Site Visits (IV)					
50-65	62.966	0.045	0.093	0.0727	0.011
66-75	61.59	0.029	0.043	0.0342	0.0154
76-85	30.639	0.108	0.114	0.007	0.1149
50-100	59.894	0.035	0.007	0.006	0.0123

For the distance mode both the e-content read and the site visits were insignificant for the high distinction (86-100) cohort. Both the variable (p-value) and the Chi-square of the overall equation were insignificant. For all of the other Tobit regressions the overall equation and variables were significant. For the whole group (50-100) e-content read (β=0.062) had a higher beta weight than subject site visits (β=0.028), which indicates for all of the students that passed, downloading content had a greater effect than simply visiting the site. This was also true for the pass, credit and distinction censored groups. Thus, for distance students we can argue that downloading content and visiting the site has an effect on total subject performance, albeit small. This suggests that to influence the grade the student has to do more than simply visiting the site.

For the on-campus students there were three cohorts that were insignificant. For pass (50-65), distinction (65-75) the independent variables relationship with the dependent variable was insignificant. For the pass cohort the Chi-square test was also insignificant. Moreover, not enough students received high distinctions (85-100) to give meaningful results. Hence they were excluded from the results. Essentially, only the credit (65-75) on-campus subject site visits was significant with regards to the cohorts. For the full group however, the relationship between site visits and content read was found to have a significant effect on subject performance.

Discussion

We set out to examine if students in a first year subject were incorporating the assets of the online environment into their learning. Of those who were included in the sample both the on-campus and distance education mode students were engaging with the subject website. For distance student in one semester they averaged near 123 visits and 41 reads, while the on-campus student's had118 and 40 respectively. Very few of the students had not engaged with

the online environment. This indicates in a prima facia manner that students are adopting online elements into their learning strategies.

There is evidence in our findings to suggest that the students' engagement with the online facilities has a significant effect on their outcomes. As suggested by Vrasidas et al. (1999) actively engaging with online tools enhances the students' learning outcome. This is because the student must be an active participant. This implies that merely visiting the online environment is not sufficient to help the students learning strategies— the learner must do something. To increase the value on the online environment for students, academics need to build in opportunities for the students to engage in activities and tasks that help to facilitate their self-learning strategies. This is endorsed by the fact that e-content read had a larger effect on outcomes than subject site visits in this research.

With regards to the hypotheses which related to the positive effects of a student's subject site visits and e-content read, relative support has been found for the hypotheses. Through the use of simple regression we found that subject site visits and e-content read have a significant and positive influence on both assessment and total subject performance. E-content read and subject site visits were correlated, thus preventing the use of multiple regression. Therefore, an interaction variable was created to test if the combination of subject site visits and e-content read influenced subject assessment and total performance. The findings here indicated that the combined effect only significantly influenced total subject performance. The effect on subject assessment performance was not significant. Thus, we have support for Hypothesis 1 and Hypothesis 3 and at best limited support for Hypothesis 2 and Hypothesis 4. For Hypothesis 5 some evidence was found, it does appear that some students have differing levels of benefit gained from online engagement. But looking at the beta weights it

would appear there is little difference between students who got a pass, credit, distinction or high distinction.

The impact of the environment is an important theoretical component for self-regulated learning strategies. As Zimmerman (1989) argued, the way the student engages in the environment affects their academic outcomes. For this research, the environment was an online space with either a traditional on-campus or distance environment. Within the online environment the student can engage with each other, the academic and resources materials. Our findings indicate that the mode of education, whether distance or on-campus, has some bearing on the significance of e-content read and subjects site visits influence on outcomes. For on-campus classes the results were non-significant. This suggests that the online environment is not the primary learning environment; perhaps these students find the traditional classroom environment a more important factor. In contrast, for students who are studying through distance education, the online environment and resources are statistically significant influences on student outcomes. This implies that the online environment tools become more useful when students do not have the traditional classroom. So the distance students choose to engage in the online facilities making it part of their environment and strategy. In a practical sense, this suggests that academics with distance classes can make use of the online facilities to help students achieve better academic outcomes, as the students are adopting these resources into their learning strategies.

From the Tobit regression, we can see that there is little variation for students who get higher marks and those who obtain lower marks. Here we looked at a student's eventual subject total mark and examined if they had engaged more with the online environment. The beta weights vary little across the different grades, with pass, credit and distinction all similar.

While admittedly the pseudo R-square is more of a comparative measure, there is also little explanation of variance in the dependent variable. Thus, where the e-content read and subject site visits had little variation across the different results they were explaining.

However, there does appear to be differences between the on-campus and distance modes across the cohorts, augmenting our previous findings. The Tobit regressions indicate higher beta weights and significance for the distance cohort than for the on-campus students. It would appear that no matter what grade the student finished with, distance education mode had higher beta weights. Also, there is a more significant relationship between subject site visits and content read and the various grades awarded. So, subject site visits and content read for distance students has a greater effect on outcomes than for the on-campus students.

Above all, the findings indicate that subject online environment, while significant, has a limited effect on the performance outcomes of students. From the simple regressions, the interaction regressions and the Tobit regressions we can see that the effect of the online environment is small. High constants and small beta weights indicate that the effects of logging on and downloading content from the subject site matter little in the whole scheme of the subject. It would appear that the emphasis on the online environment might be somewhat overplayed.

Further research could relate to the types of material download, gender, past student performance, year of study, and technical orientation. All of these aspects may help to create a broader picture of what students are using to work through subjects. All of these factors are beyond the scope of this study.

Conclusion

The purpose of this study was to examine online resources and student learning strategies and ultimately measure what role online resources play for students. The paper began with an

outline of student self-regulated learning strategies in terms of the role of the environment and the students' goals and motivations. Following this we tested the role of the online environment in student's strategy and its affect on the students' outcomes for an assessment item and the subject overall.

Self-regulated learning strategies are independent learning behaviours that students adopt in order for them to learn (Boekaerts and Cascallar, 2006). That is, the adoption of certain behaviours intentionally in a strategic manner to attain the desired learning outcome (Zimmerman, 1989; Boekaerts and Cascaller, 2006). We argued that the use of online subject websites to read and interact would form part of a student's strategy. For example, a student may use the subject site to obtain material to better their work. Or a student may use the subject site to try and save time through an optimising strategy. The findings of this research suggest that the strategies need to be active; the students must do something to gain a benefit from the online environment.

We found that students do use the online facilities to varying degrees and with varied success. The first result reported indicated that on average distance students use the online environment more than their on-campus counterparts. The distance students have higher numbers of visits and more e-content read (downloads). Moreover, the number of site visits and e-content read have a greater effect on assessment and subject performance than for the on-campus students.

Perhaps the most interesting point is to view the findings of this research as a rational economist, rather than a marketer – is the investment of time and money by institutions and individual academics really worth it? It is this question that future research needs to answer.

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Figure 1: Conceptual Model for Testing

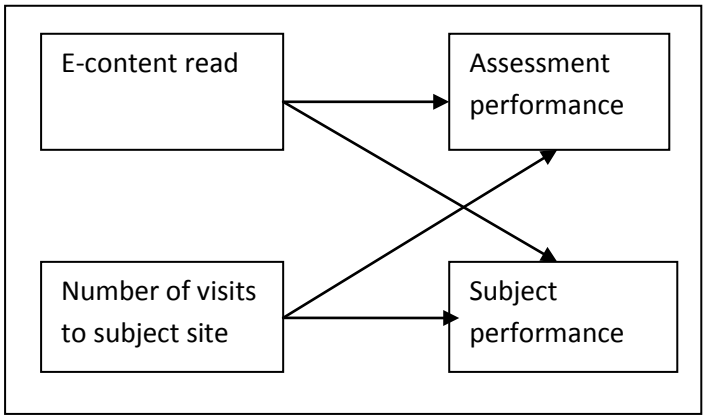

Table 1: Correlation Results for Subject Site Visits, E-content Read, Assessment Item and Total Mark

Distance Education Mode				
	Reads	Visits	Assessment	Total Mark
E-content Reads	1			
Site Visits	0.954**	1		
Assessment Item	0.158*	0.185*	1	
Total Mark	0.234**	0.268**	0.731**	1
On-campus Education Mode				
E-content Reads	1			
Site Visits	0.954**	1		
Assessment Item	0.219*	0.215*	1	
Total Mark	0.298**	0.278**	0.588**	1

(all constant's significant (0.001))

Table 2: Simple Regression to Determine Subject Performance

Mode	Independent	Constant	Beta	P-value	R-square	F-test
Distanc	E-content read	59.42	0.086	0.003	0.055	0.003
e	Site visits	58.42	0.039	0.001	0.072	0.000
On-	E-content read	59.47	0.099	0.004	0.089	0.004
campus	Site visits	58.90	0.038	0.008	0.077	0.008

(all constant's significant (0.001))

Table 3: Simple Regression to Determine Assessment Performance

Mode	Independent	Constant	Beta	P-value	R-square	F-test
Distanc	E-content read	12.768	0.012	0.049	0.025	0.049
e	Site visits	12.589	0.006	0.021	0.034	0.021
On-	E-content read	8.495	0.016	0.039	0.058	0.038
campus	Site visits	8.362	0.007	0.042	0.046	0.042

(all constant's significant (0.001))

Table 4: Interaction Regression

Mode	Dependent	Constant	Beta	P-value	R-square	F-test
Distance	Total Mark	61.724	0.0001	0.038	0.0276	0.0381
	Assessment Item	13.169	0.00001	0.236	0.0091	0.2358
Distance	Total Mark	61.986	0.0002	0.027	0.0540	0.0275
	Assessment Item	8.853	0.00004	0.057	0.0407	0.0567

(all constant's significant (0.001))

Table 5: Tobit Regression findings for Content Read and Subject Site Visits on Total Subject Mark

Distance Mode E-content Read (IV)					
Total mark range (DV)	Constant	Beta	P-value	Chi-square of equation	Pseudo R-square
50-65	62.889	0.072	0.026	0.021	0.009
66-75	62.412	0.061	0.036	0.029	0.010
76-85	63.923	0.060	0.024	0.017	0.026
50-100	61.857	0.062	0.006	0.006	0.007
Distance Mode Subject Site Visits (IV)					
50-65	61.936	0.032	0.011	0.009	0.012
66-75	61.421	0.029	0.013	0.009	0.014
76-85	62.736	0.031	0.007	0.002	0.042
50-100	60.937	0.028	0.001	0.001	0.011
On-campus Mode E-content Read (IV)					
50-65	63.812	0.111	0.091	0.068	0.011
66-75	61.763	0.082	0.019	0.012	0.022
76-85	33.811	0.258	0.106	0.004	0.131
50-100	60.478	0.099	0.004	0.004	0.014
On-campus Mode Subject Site Visits (IV)					
50-65	62.966	0.045	0.093	0.0727	0.011
66-75	61.59	0.029	0.043	0.0342	0.0154
76-85	30.639	0.108	0.114	0.007	0.1149
50-100	59.894	0.035	0.007	0.006	0.0123