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STUDENTS' INTERACTION WITH ONLINE LEARNING ACTIVITIES: THE ROLE OF STUDY STRATEGIES AND GOALS AND COMPUTER ATTITUDES

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Abstract

In this paper we report on a study examining the impact of individual factors students bring to online learning on the nature and extent of their engagement. Whether computer attitudes, study goals and subject interest effect students' interaction with online coursework and how this influences learning outcomes is discussed. The results of the study suggest that designing online learning activities with opportunities for interactivity is not sufficient to engage students' interest. In our study many students chose not to attempt the online coursework even though the material was assessable. Those who did failed to take advantage of the opportunities for interactivity available to them in the program. However, the post-test scores on the knowledge test showed that these students did learn more about the subject as a result of completing the workshop. By understanding factors that influence engagement with online learning it is hoped to better understand how to structure and deliver these types of activities to maximize their impact on student learning. Determining how to encourage students to attempt online coursework in the first place and then to interact with the material more constructively is the next step needed to successfully integrate online learning activities into the curriculum.

Keywords

online learning, learning outcomes, study strategies, learning approaches, learning motivation

Introduction

Like many other universities in Australia and overseas, Deakin University has shifted to the use of online technologies, such as the Internet, to support teaching and course delivery. Holt, Rice and Armatas (2002) have previously reported on issues arising from the introduction of an online-supported and resource-based learning (RBL) approach in first year psychology at Deakin University. The evaluation of this new approach highlighted the need for all elements of the learning environment to be integrated, and clear guidelines to learning provided, for students to make the best use of the resources provided. The study reported here builds on this work by investigating students' interaction with online coursework that formed part of the RBL curriculum for first year psychology. The impact of individual factors that students bring to online (i.e. computer-mediated) learning contexts on the nature and extent to which students engage with the material was assessed. How attitudes to computers, study goals and approaches and interest in the subject matter influence student engagement with online coursework and how this influences the learning outcomes was also investigated. By understanding factors that influence engagement with online learning it was hoped to better understand how to structure and deliver these types of activities within an integrated RBL approach to maximize their impact on student learning.

Individual Factors

Individual factors believed to be important in influencing patterns of student engagement and interaction with online learning include study motivations and goals, study strategies, interest in and knowledge of the subject, and attitudes to computers. In classroom situations, students' motivational orientations influence how and what they learn, and have been associated with a set of goals referred to as mastery, performance, and work avoidance (Ames & Archer, 1988; Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997; Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; Meece, Blumenfeld & Hoyle, 1988). When mastery is the motivational goal, importance is placed on acquiring and developing new knowledge and skills. In contrast, when performance is the motivational goal, importance is placed on demonstrating competence and on comparison with others (Ames & Archer, 1988; Barron & Harackiewicz, 2001; Harackiewicz et al., 1997; Harackiewicz et al., 2000). When work avoidance is the motivational goal, the main concern is to use minimal effort to get work done (Meece et al., 1988). Students with a mastery goal orientation tend to have a higher interest in the class than students who don't (Harackiewicz et al., 1997; Harackiewicz et al., 2000). They also tend to prefer a challenge (Ames & Archer, 1988) and more active cognitive engagement (Meece et al., 1988). Mastery goals are associated with higher learning outcomes (Pearce & Ainley, 2002) although when both mastery and performance goal orientations are pursued, optimal outcomes are demonstrated (Ainley, 1993; Barron & Harackiewicz, 2001; Harackiewicz et al., 1997; Harackiewicz et al., 2000). Students who adopt work avoidant goals tend to engage less in their learning (Meece et al., 1988) and perform poorly compared to students who adopt mastery or performance goal orientations (Harackiewicz et al., 1997).

Just as students have specific goals they bring to learning situations, they also have preferred strategies that they use in learning contexts. Several preferred learning strategies have been identified; however, those that have been more frequently researched are 'deep' versus 'surface' learning (Biggs, 1993; Thomas & Bain, 1982) and elaboration, rehearsal, and lack of strategy (Harackiewicz et al., 2000). The deep approach to learning involves actively reorganizing material to aid understanding so that new material is related to previously acquired knowledge. In contrast, the surface approach to learning involves reproducing the material, in minimal time, in the format of the original presentation (Biggs, 1993; Thomas & Bain, 1982). Higher quality learning outcomes have been linked to the deep approach to learning (Ramsden & Entwistle, 1981; Thomas & Bain, 1982; Trigwell & Prosser, 1991; Watkins, 1983). Older students tend to adopt deep approaches to learning, while males favour a surface approach to learning (Watkins & Hattie, 1981).

Three other study strategies - elaboration, rehearsal, and 'lack of strategy',- have been identified (Christensen, Massey, & Isaacs, 1991; Harackiewicz et al., 2000). Elaboration involves attempting to learn by expanding and transforming new knowledge, while rehearsal involves repeating information without its cognitive transformation. Lack of strategy has been used to describe the approach of students who are not sure what to study or how to study. Harackiewicz and colleagues (2000) found that students who adopt elaboration strategies tend to focus on developing their skills, while students who use rehearsal strategies favour demonstrating competence; they also found that females report greater use of rehearsal strategies than males. In terms of lack of strategy, Harackiewicz and colleagues found that students who favour elaboration as a study strategy are less likely to be confused about how to study. They also found that students with strong mastery goals are more likely to use elaboration strategies, while those with strong performance goals are more likely to use rehearsal strategies.

Interest in, and knowledge of, subject content are two factors found to influence engagement with learning and learning outcomes (Alexander, Kulikowich & Schulze, 1994; Harackiewicz et al., 2000; Schiefele & Krapp, 1996; Snow, 1986). Students who report higher levels of interest in the subject being studied tend to achieve higher learning outcomes (Alexander et al., 1994; Harackiewicz et al., 2000) and persist with tasks longer, learning more as a result (Ainley & Hidi, 2002). Topic interest and prior knowledge of a topic predict recall of information presented, and interest in the subject is thought to increase both the quantity and quality of learning outcomes (Schiefele & Krapp, 1996).

These individual characteristics are often "explored...as though they are independent of the context of particular learning tasks" (Laurillard, 2002, p. 26), even though researchers have found such

characteristics to be context-dependent (Laurillard, 1979; Ramsden, 1979). This point is particularly relevant when considering online learning, which introduces a complication in the form of the possible adverse reactions that some individuals may have to working with computers. Computer anxiety refers to an individual's anxiety or fear regarding using computers (Carlson & Wright, 1993), while computer self-efficacy refers to an individual's perception of his or her own abilities with computers (Durndell, Haag, & Laithwaite, 2000; Johnson & Marakas, 2000) and is an assessment of the individual's self-confidence with computers. Computer anxiety can result in more negative evaluations and more thoughts not relevant to the task (off-task thoughts), and frequently results in negative behavior such as being distracted and avoidance (Smith & Caputi, 2001). Therefore, it is important to take into account the possible effects of computer anxiety and computer self-efficacy on learning, particularly as research shows that self-efficacy influences engagement with the task, and learner performance (Bandura & Schunk, 1981; Busch, 1995).

The Current Study

In conducting this study we had three objectives. The first was to find out the extent to which students make use of online learning activities provided for them in the course of their normal study routines. To do this, students' use of an online learning activity covering material to be assessed on the final exam was examined. Since this material was not available to students in any other form it was anticipated that students would be strongly motivated to complete this learning activity. The second objective was to determine whether there are systematic differences between those students who complete the online learning activity and those who do not. The factors on which we thought these two groups might differ were learning goals and styles, attitudes to computers and subject interest. The final objective was to look at how students interact with the online material and to determine whether particular learning goals and styles are associated with engagement with the online material and the impact of these individual differences on the learning outcomes. In addition to measuring students' learning goals, preferred learning strategies, and interest in Psychology, their preference for adoption of a deep or surface approach to learning and their attitudes to computers were also assessed. Behavioural engagement with the online coursework was measured using navigational logs. Comparison of scores on knowledge tests before and after completing the online learning activity was used to provide an indication of learning and level of cognitive engagement with the online material.

We expected that greater persistence and interaction with the material in the online coursework program would be related to stronger study goals. Stronger interest in psychology as a subject of study was also expected to be related to behavioural and cognitive engagement. More positive attitudes to computers were expected to be related to completing and engaging with the online material, with students who interacted more while online being less anxious and more confident using computers. Engagement with the online learning material - as measured by time spent in the workshop and interactivity patterns shown in the navigational log - was expected to lead to higher learning outcomes, as indicated by changes in knowledge test scores. We predicted that students who reported favouring elaboration as a study strategy would show greater use of the navigational tool to review material, while those favouring rehearsal as a study strategy would adopt a linear approach (i.e., screen by screen, topic by topic) to the material.

Method

Participants

A total of 79 university undergraduates enrolled in first year psychology at Deakin University volunteered for the study. Sixty-six completed only the first part of the study (i.e. only the questionnaire measures described next), while the remaining 13 completed all sections (i.e. questionnaire measures and an online coursework program). As is usual in this psychology course, females dominated the sample (N=64), with only 15 males participating in the study. Male participants were older (M = 30.2 years; SD = 14.20 years) than the females (M = 25.55 years; SD = 8.58 years), with the average age of the sample being 26.45 years (SD = 9.98 years).

Questionnaire measures

A questionnaire compiled to assess the student characteristics of interest in this study was completed by all 79 students. It began with items about demographic information and current level of computer use. Next followed the measures (detailed below) for approaches to learning, attitudes to computers, preferred learning strategies, interest in psychology and knowledge about survey methods for psychology.

The Approaches to Learning questionnaire (Thomas & Bain, 1982) consists of seven items, four of which assess adoption of the deep approach, and three the adoption of the surface approach to learning. Participants respond on a six-point Likert scale (1=not at all, 6=a great deal) to statements such as "To what extent do you attempt to understand the meaning of what you are studying?", with higher scores indicating greater use of an approach.

The Computer Attitude Scales (CAS) consists of 40 items that present attitude statements about computers and the use of computers (Loyd & Gressard, 1984). The CAS has four subscales each consisting of 10 items- computer confidence, computer liking, computer anxiety, and computer usefulness. The computer confidence subscale measures participants' confidence in their ability to use computers or to learn with computers. Attitudes about the enjoyment of working with computers are measured within the computer liking subscale. Participants' fear of or anxiety regarding computers is measured using the computer anxiety subscale. The computer usefulness subscale assesses participants' attitudes concerning the usefulness of computers both in present work and future work. For all items participants respond on a five-point likert scale (1=strongly disagree, 5=strongly agree), with higher scores on each scale being indicative of more positive attitudes towards computers.

The questionnaire developed by Harackiewicz and colleagues' (2000) was used to measure study strategies, goals, expectations, and interest in psychology. The study strategy measure is made up of three scales - elaboration, rehearsal, and lack of strategy - and items are scored using a five-point likert scale (1=strongly disagree, 5=strongly agree). The elaboration scale consists of five items that measure the extent to which students learn by transforming and building on new knowledge. The rehearsal scale, also consisting of five items, assesses students' reported use of repeating information without cognitive transformation. The third study strategy scale, lack of strategy, comprises three items that assess whether students feel they lack a study strategy. The study goals measure (Harackiewicz et al., 2000) is made up of five scales - mastery, performance, work avoidance, expectations regarding learning and interest in psychology - with all items being rated on a five-point likert scale (1=strongly disagree, 5=strongly agree). The mastery scale, consisting of six items, assesses the extent to which students place importance on developing new knowledge and skills. The performance scale also consists of six items, and assesses the extent to which students place importance on demonstrating competence. The work avoidance scale consists of three items concerning the extent to which students use minimal effort to get work done. A higher score on each of these measures indicates a preference toward that particular approach. The expectations scale consists of five items that assess students' expectations about their learning performance. A higher score on this scale is indicative of higher expectations of positive learning performance. The interest in psychology scale is made up of 10 items that assess students' satisfaction and enjoyment with studying psychology with higher scores indicating greater interest.

At the end of the questionnaire, students completed a knowledge-test consisting of 20 multiple-choice questions with four stems (worth one mark each, with no penalty for incorrect answers) that was designed to assess students' knowledge of survey methodology for psychology. No performance feedback was provided to students for the knowledge test. After answering each test question, students were asked to indicate how confident they were that their answer was correct, using a 4-point likert scale (1=not at all confident, 2=not confident, 3=confident, 4=confident).

Online coursework program

After completing the questionnaire and first knowledge test students were invited to complete an online coursework program about survey methods for psychology. The online coursework contained an overview and several topics relevant to the use of surveys for psychological research. Topics could be accessed in any order using a menu or sequentially by clicking on a forward arrow to view the next

screen. The coursework also included a glossary, interactive examples, and learning activities. The time students spent using the online coursework material and their levels of interactivity with the material (e.g., the order of topics accessed and what learning activities were completed) were recorded for analysis of their behavioural engagement with the online coursework. For those students who elected to complete the online learning activity, at the end of the program they completed a second knowledge test consisting of the same 20 multiple-choice questions from the first knowledge-test. Scores on the two tests were compared to provide information on what they had learnt about the online material. The online coursework material was part of the normal curriculum for the introductory psychology unit in which participants were enrolled and was assessable through examination later in the semester.

Procedure

Participants were recruited via the first year undergraduate Psychology website, which could only be accessed by students enrolled in the course and required a username and password to log in. After reading an explanation of the study, students who consented to participate completed the questionnaire at the same website. Following this, students were given instructions on how to access the online coursework material over the Web. At this point the majority of the students elected not to continue and did not complete the online coursework program. Those who did continue accessed the coursework on the Web and were given instructions about what they should do to complete this part of the study. Students were advised that the anticipated total time commitment was approximately 1-2 hours and that they could complete the coursework in their own time and at their own pace, and in as few or as many sessions as they wished.

Results

Data Screening

The sample was separated into two groups - those who completed all parts of the study (questionnaire measures, first knowledge-test, online coursework program, and second knowledge-test), and those who did not attempt the coursework but completed the questionnaire measures and first knowledge-test, hereafter referred to as completers and non-completers, respectively.

Reliability of the measures

All scale measures except the expectations scale showed adequate to good internal consistency. The expectation scale demonstrated poor internal reliability ($N = 79$, Cronbach's alpha = -0.28) and so was excluded from all subsequent analyses. Table 1 shows the reliability data for all other scales.

Measure	*Cronbach's alpha (N = 79)*	*Completed workshop*		*Did not complete workshop*	
		Mean	*Standard deviation*	*Mean*	*Standard deviation*
Computer confidence	0.81	3.67	0.56	3.51	0.75
Computer anxiety	0.93	4.10	0.70	3.81	0.96
Computer usefulness	0.81	4.18	0.29	4.06	0.62
Computer liking	0.78	3.14	0.65	3.18	0.74
Mastery	0.91	4.29	0.46	3.87	0.98
Performance	0.90	3.15	0.84	2.14	1.10
Work avoidance	0.60	2.66	0.34	2.71	0.58
Deep approach	0.87	4.69	0.73	4.33	1.10
Surface approach	0.66	4.13	1.04	3.99	1.10
Elaboration	0.84	4.05	0.22	3.64	0.85
Rehearsal	0.68	3.37	0.76	3.14	0.75
Lack of strategy	0.89	1.82	0.82	2.43	1.10

Table 1. Summary statistics for Computer Attitudes, Motivational Goals, and Study Strategies

Computer Use

Almost all participants had a home computer and Internet access at home (92%). Participants reported spending on average 7.34 hours per week using a computer for study purposes, with the computer being used mainly for the Internet, word processing, and email. No significant gender differences were found for any of the computer use variables.

Learner Characteristics and Pre-Test Measures

Means and standard deviations for computer attitudes, motivational goals, and study strategies for completers and non-completers are presented in Table 1. To determine if there were differences between the two groups with respect to their attitudes to computers, a multivariate analysis of variance (MANOVA) was conducted using scores for the four scales from the CAS (computer anxiety, computer liking, computer usefulness, computer confidence) as dependent variables. There was no main effect of group, indicating that there was no significant difference between completers and non-completers on the measures of attitudes to computers. A second MANOVA was conducted with scores for measures of mastery, performance, work avoidance, elaboration, rehearsal, and lack of strategy as dependent variables to determine if there were differences between the completers and the non-completers with respect to learning motivations and study strategies. This analysis showed that the only significant difference between the two groups was that the mean scale score for lack of strategy for non-completers was significantly higher in comparison to completers, $F\,(1,77) = 8.6$, $p < 0.01$, indicating that students who did not complete the online coursework were less certain about how and what to study for this unit. Completers reported slightly higher interest in psychology ($M = 4.28$) compared with non-completers ($M = 3.85$); however, a *t*-test for independent samples showed that this difference was not significant. A MANOVA showed no significant difference between the two groups of students for scores on the deep and surface approaches to learning. Together, these analyses show that the only systematic difference between those who completed the online coursework and those who chose not to was on the "lack of strategy" measure.

Psychology knowledge and confidence

The means and standard deviations for completers and non-completers for their scores for the first knowledge test and their mean confidence in their answers to questions on the first test are detailed in Table 2. The mean confidence scores indicate that both completers and non-completers tended not be confident that their responses were correct. A MANOVA revealed no significant differences between the two groups on confidence in answers to questions on the first knowledge test, and scores on the first knowledge test. Only 8 of the 13 students who completed the online coursework workshop also completed the second knowledge test. To see whether these students' scores and their confidence in their answers increased from the first to the second knowledge-test, two paired samples *t*-tests were conducted. While confidence in their answers did not increase significantly, there was a significant increase in completers' scores from the first to the second knowledge-test, $t(8) = 2.41$, $p < 0.05$, indicating topic learning had occurred.

	Completed workshop		*Did not complete workshop*	
Measure	***Mean***	***Standard deviation***	***Mean***	***Standard deviation***
Mean confidence in answers to first knowledge-test	2.41	0.90	2.50	0.50
Scores on first knowledge-test	15.33	3.39	14.49	2.60
Scores on second knowledge-test	16.67	2.95	-	-

Table 2. Summary statistics confidence measures and Pre-Test Scores

Engagement with Online Learning

Students' behavioral engagement was explored through navigational logs that showed how they interacted with the material. The mean time spent using the online coursework program was 38.65 minutes. Females spent almost twice as long in the workshop ($n = 9$, $M = 45.00$) as males ($n = 4$, $M = 23.40$). However, there was no significant correlation between time in workshop and scores on the first or second knowledge-test scores, nor with interest in psychology. Those who completed the online coursework progressed through the online material in a linear manner, viewing topics sequentially. No student used the topic menu, instead relying exclusively on the forward and backward arrow keys to move from screen to screen. Where topics contained learning activities, knowledge quizzes, or other interactivity, students accessed these in the order in which they appeared. For example, glossary entries were mainly accessed in the order they appeared within text on the screen, and students typically clicked on buttons or used rollovers to reveal additional information using a left-to-right, top-to-bottom pattern. Very few participants deviated from this sequence, except to refer to a previous screen in the program, and this generally occurred at the point of a learning check. Of those who completed the online coursework, the majority completed the online material in one session. Where more than one session was logged, the student accessed the overview screen in the first session then logged out, returning at a later time to complete the entire workshop in one sitting.

Discussion

Major Findings

There were two major findings of interest from this study. The first is that the majority of students who consented to be part of the study elected not to complete the online coursework. The second is that all those students who did complete the online coursework adopted the same approach to working with the material in the online learning activity. These findings are not consistent with the expected pattern of results. The prediction that greater persistence and interaction with the material in the online coursework program should be related to stronger study goals was not supported. No significant differences were found for the goals of mastery, performance, and work avoidance between those who completed the coursework and those who did not. However, those students who completed the online coursework scored significantly lower on the lack of strategy measure, indicating that they were more confident and less confused about how to approach studying for the psychology unit in which they were enrolled. Presumably, completing the online learning activity was consistent with this study strategy. This result suggests that the decision to complete the online coursework was dependent on the extent to which students felt confident they knew how and what to study for the unit in which they were enrolled. Those students who reported a higher tendency toward lack of strategy may not have known how to approach the material in the online workshop or how to study it, and so did not complete the task. For this psychology course, the material in the workshop was examinable and only available through the online coursework program. Therefore, it is particularly concerning that a large majority of students did not attempt the task.

It was expected that stronger interest in psychology would be related to behavioural and cognitive engagement. Contrary to this expectation, interest in psychology was similar for those who completed the workshop and those who did not, suggesting that interest was not a factor in participants' decisions to complete the coursework or not. Furthermore, it was expected that more positive attitudes to computers would be related to completing and engaging with the online material, with students who spent more time with the online learning activity being less anxious and more confident using computers. This hypothesis also was not supported, as there were no differences between those who completed the workshop and those who did not for computer anxiety, liking, usefulness, and confidence. Thus, attitudes to computers did not appear to play a role in the decision to engage with the online learning activity.

Engagement with the online learning material - as indicated by time spent in the workshop and interactivity patterns shown in the navigational log - was expected to lead to higher learning outcomes, as indicated by changes in test scores from the first to second knowledge-tests. To the extent that students who completed the workshop improved their second knowledge-test score, interacting with the online workshop appeared to assist learning of the topic material. The students who did not complete

the workshop did not have the benefit of this improvement, despite having the same level of topic knowledge at the first knowledge test as those who subsequently completed the workshop. Presumably, had they completed the online coursework, these students could also have made the same learning gains demonstrated by the students who did complete the coursework.

With respect to patterns of navigation and interaction with the online material, it was predicted that students who reported favouring elaboration as a study strategy would show greater use of the navigational tool to review material, while those favouring rehearsal as a study strategy would adopt a linear approach (i.e. screen by screen, topic by topic) to the material. Contrary to this expectation, all students navigated through and interacted with the material in a similar manner. Their approach was very systematic in that they accessed screens sequentially and completed learning activities and exercises appearing on-screen in a pattern of left to right, top to bottom.

Although students' interest in, and knowledge of, subject content has been found in several studies to influence their engagement with learning and their learning outcomes (Alexander et al., 1994; Harackiewicz et al., 2000; Schiefele & Krapp, 1996; Snow, 1986), it does not appear that interest in the material influenced the decision to complete the online workshop as there was no significant difference in the interest scores for students who did and who did not complete the online coursework. In addition, in this study, interest in the subject was not associated with higher scores on the second knowledge test. There were also no significant differences in the scores on the first knowledge test that might explain why some students completed the online coursework and others did not. No performance feedback was provided for the first knowledge test, so students were left to make a judgment about whether they knew the material or not based on how confident they were with their answers to the questions on the test. The confidence scores obtained for the first knowledge test were used to assess the extent to which students felt that they had given the correct answer for a question. For completers and non-completers the mean confidence scores indicated that both groups had little confidence that their responses to questions on the first knowledge-test were correct. Despite this lack of confidence, the majority of students in this study elected not to complete the online coursework and attempt to learn more about the topic, even though the material was assessable in the final exam. Attitudes towards computers also did not influence the decision to complete the online coursework program. All participants reported quite positive attitudes towards computers and their use, with no significant difference between those who completed the online learning activity and those who did not. In this study, computer attitudes seem to have had little influence on whether or not students completed the online learning task.

An obvious factor influencing students' decisions to complete the coursework is whether they experienced technical problems using the coursework. However, technical issues are unlikely to explain the usage patterns seen in this study as the unit co-ordinator was not aware of any students reporting difficulties accessing or using the coursework program during the time the study was conducted. Furthermore, if students had experienced problems using the coursework this would have been recorded in the audit trails for each session. With the exception of two students, each student who started the coursework also finished it entirely and did so in one session. This suggests that students who wanted to complete the coursework were able to access it without difficulty and complete the material in one attempt.

In order to understand the learning experience for those students who completed the online workshop, measures of behavioural and cognitive engagement were examined. An average of just under 40 minutes was spent working with the material in the online coursework program, with females spending almost twice as long with the material than males. This was considerably less than the anticipated time commitment indicated to students at the start of the program. The time commitment may have been a factor in the decision by students not to complete the online workshop as the explanation of the study provided to students at the start included mention of how long it was expected the online coursework would take to complete. However, since the material was examinable and part of the course curriculum, students were expected to complete the workshop as part of their normal study routine. The students who did complete the workshop tended to complete the task in one sitting instead of several attempts. That students preferred to complete the task in one session suggests that study materials and activities need to be structured so that they can be completed in one session and within students' preferred time frame.

Students who completed the online coursework were found to interact with the material presented in a very fixed, linear pattern, despite having control over their navigation and how they interacted with the learning material. The linear and sequential approach adopted by the students extended to their interactions with the learning activities and screen sequences. This pattern of interaction suggests that students treated the online material as "text on screen", despite a high level of interactivity in the program and the topic menu affording students the freedom to negotiate the material as they wished. If this pattern is a reflection of students' preference for traditional print, which in itself is very linear, designers of online learning environment need to address the question of how to set up online workshops so learners take a more constructivist approach to learning. Computer-based learning environments can offer the potential for greater user responsiveness and interactivity (Laurillard, 2002). When multimedia (e.g. video and audio) and interactivity (e.g. activities that the learner completes and that provide immediate and individualized performance feedback) are part of the online experience, the potential for engaging the learner's interest and producing quality learning outcomes is greatly enhanced. However, if the patterns of interaction seen in this study are typical, it does appear that the challenge will be to create learning environments that students cannot treat in a fixed, linear fashion, but rather demand a more interactive learning approach for success.

The results of this study have important implications for the way lessons and learning activities are structured and delivered for these first year psychology students. Whether students feel confident they have a study strategy appears to influence whether or not they complete online learning tasks. In contrast, computer attitudes seem to have little influence on this decision. For this task it appeared more important that students view completion of the task as being consistent with their study strategy. Whether this extends to learning activities of any type and is not just confined to online learning remains to be determined. Only a small number of students elected to complete the online coursework, which restricted the analyses that could be performed. However, the sample reflected real-world practices. The students who agreed to participate also chose how they would work through the online material and whether or not they would complete all parts of the task. As the information presented within the online material was part of the students' normal coursework, they were aware that it was assessable. Given this, it is likely that the low completion rates for this learning task would have had implications for students' academic progress. It would be interesting therefore to find out how those students who reported a higher tendency toward lack of strategy approached other study tasks and what effect this has on their learning.

Summary

The findings from this study have shed light on the extent to which these first year psychology students use online learning activities as part of their normal study routine, as well as indicating the factors that influence their level of interaction and learning outcomes. That only a small number of students actually went on to complete the online learning activity suggests that the first challenge is to look at how to encourage students to actually attempt the work. The key to this seems to be the context in which the activity is placed. Rather than making the material assessable in the final exam, some sort of more immediate incentive, such as making the material pre-requisite knowledge for other assessment such as a written report, seems to be needed. Once students attempt the learning activity, strategies need to be in place to encourage them to interact with the material constructively. For example, requiring students to adopt a problem-solving approach (e.g. design a survey tool for a given research scenario) could be used to encourage students to interact more extensively with the material as it would require students to search for, synthesise and integrate information to complete the task. This could also have the added benefit of helping students develop applied knowledge. These findings also highlight the importance of students' confidence in their study strategy. This is another issue that needs to be addressed if students are to develop the skills necessary to become effective, independent learners.

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