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The Influence of Advice in a Virtual Learning Environment

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Abstract

The influence of asynchronous discussion in a Virtual Learning Environment (VLE), Blackboard, on subsequent coursework grades was examined with 166 psychology students to determine whether asking questions of the tutor on-line, and/or reading the questions and the given advice, influenced the grades on the report they were writing. A repeated-measures quasi-experimental design was used, with and without Blackboard available, to control for confounding variables. The grades on the assignment with Blackboard available were significantly higher than those on the previous assignment (when Blackboard was unavailable). Students who never used Blackboard had significantly lower grades on the assignment than the students who had used it. There was a positive relationship between the number of messages read and the grade achieved on the assignment. Students who read the most discussion board posts wrote significantly better reports (up by 4%) than they had previously. No improvement in grades occurred for the people who read no posts at all. Both the students who asked questions and those who just read the questions and answers ('lurkers') ended up with significantly better grades than they had done before Blackboard was introduced.

Key words: Virtual Learning Environment; Blackboard; academic achievement; Asynchronous communication; e-learning; grades; outcomes; advice.

Introduction

Virtual Learning Environments (VLEs) are computer-based on-line learning environments that are becoming increasingly common in universities. They can provide not only learning resources such as reading materials, handouts and powerpoint slides from lectures, but also a discussion forum where students can talk to each other on-line, or post questions for the course tutor to answer. There are several benefits of an asynchronous discussion, for example the convenience of when and from where to reply, increased student support, and time to think about the material being discussed (for a list of studies and a summary of the benefits see the paper by Palmer, Holt, & Bray, 2008). VLEs are a rapidly developing area in education, and research has already indicated that they provide a valuable resource for learners (Roulston & Clarke, 2003).

Students seem happy to engage with on-line resources and research by Peat and Franklin (2002), with undergraduate biology students, showed that students engaged with both the on-line learning materials and the formative assessment opportunities, and that their learning was encouraged as a result. Recent research with nursing students undertaking a human anatomy and physiology module, found that although students generally found the VLE system easy to use, the frequency with which they used it did not correlate strongly with the final examination mark achieved (Green et al., 2006). Green et al. did, however, conclude that the VLE and the associated available resources were useful in supporting student learning.

In the medical education domain, de Leng, Dolmans, Muijtjens, and Van der Vleuten (2006) found that medical students perceived that the VLE supported face-to-face interaction in the discussion phase of a problem-based learning task, and that hyperlinks encouraged further reading of the materials. Jones, Cramton, Gauvin and Scott (1998), have similarly shown that VLEs can help students to work in teams that are geographically dispersed, and to understand virtual team working, which they argue will be essential in future years as commerce and education becomes increasingly virtual.

Rather than examining the impact that on-line text-based materials have on learning, the research reported in this article examines how VLE discussion boards can be used to clarify issues for students by discussions with their tutor on-line, and whether this use impacts on their grades. Students using Blackboard (a VLE) can ask questions online about the assignments that they are working on. These questions and answers are visible for all students on the module to see, thus reducing the number of questions that the tutor has to answer individually. It also provides the students with answers to questions that they would never have thought to ask on their own. Thus, through interacting with the discussion board, students have the opportunity to ask well thought out questions that they may not want to ask in a face-to-face situation with a tutor or in a seminar. The relative anonymity of the VLE, which can be totally anonymous if required, can provide a safe place for students to ask questions that they may be too shy to ask in person, especially if they perceive it to be a 'stupid' question. We hypothesise that using the VLE discussion board could lead to a better understanding of the material being studied and thus higher grades, and we aim to demonstrate empirically if this is the case.

There is some existing research on the impact of on-line discussions on students' grades. For example, Palmer, Holt and Bray (2008) studied engineering undergraduates

and concluded that the number of postings *made* to an on-line discussion had a significant positive impact on the students' final module grades. The number of postings *read*, however, did not influence grades, indicating that just 'lurking' was not enough to improve the work handed in. They concluded that it was the work done in preparing the postings that had lead to higher grades. Other research has shown similar findings, for example Davies and Graff (2005) found that business students who achieved higher grades were more active users of the discussion board. Similarly, Webb, Jones, Barker, and van Schaik, (2004) found evidence that posting questions improved grades, but in contrast they showed that passive participation (just reading and not posting) also had a positive impact on grades.

The obvious problem with such studies is that they are essentially correlational; examining relationships between VLE behaviour and grades. Determining causality is the problem in correlational studies. Thus, in order to remove the possible confounding effect of more motivated or higher achieving students using the VLE more often, a repeated-measures design will be employed in our study so that participants act as their own controls. By comparing students' grades after the introduction of a VLE discussion board with their grades on a similar assignment before it was available, we will be able to see clearly whether the use of the VLE discussion board to ask questions of the tutor and discuss issues with other students has had an impact on grades. The impact of passive reading and active posting will also be examined. The previous literature leads us to predict that both passive reading and active posting should increase grades.

Method

Participants

A class of 177 first year undergraduate psychology students, studying a statistics and research methods module, were offered the opportunity to join into a discussion board on a Virtual Learning Environment (VLE) (Blackboard, Release 6, on Windows 2003). Eight students did not submit the second assignment and three did not submit the first assignment, and thus were not included in the analyses, as there were no grades available. The analyses are based on the data from 166 participants (mean age = 19.16 years, SD = 1.99, 27 men and 139 women).

Design and procedure

A repeated measures quasi-experimental design was employed. Students' grades on the assignment (where Blackboard discussion was available) and on their previous assignment (where no Blackboard discussion was on offer) were recorded, as the dependent variables, thus participants served as their own control group. The number of questions each student asked on the discussion board, and how many questions and answers they read on it, were recorded using the Statistics tool to produce day-by-day data. We make the assumption that when a student accessed a message that they read it; we have no proof that they read the message, but since most messages were fairly short it seems a reasonable assumption that they read all of it. The assignments were structured lab reports, reporting relevant literature and analysing data using SPSS. The first investigated Locus of Control and stress using correlation analyses, while the second investigated liking and familiarity with repeated-measures t-tests. The module was a series of six two-hour lectures and four one-hour lab classes. The tutor was unknown to the students before the module began. The students had not used Blackboard before so were shown in a lecture how to use it and encouraged to take part in the discussion board to ask questions about the statistics being used and the topic of

the assignment. The questions and answers on Blackboard revolved around specifics of the second assignment, to develop a better understanding of the subject. At the time when Blackboard was not available, the students had access to the department's 'Help Desk' facility, where they could ask questions face-to-face with the demonstrators who had taught the lab class. Students were unaware that their use of Blackboard would be studied in relation to their grades for this study, in case it influenced their behaviour. Ethical approval was granted for the researchers to access the grades and data on Blackboard usage. The researchers explained about the study and debriefed the students in a lecture. Students were informed that their data would only be reported on a group basis, was confidential, and would be anonymized after collation, but that if they wished to they could withdraw their data from the study. Since all coursework and exams are marked anonymously students would not have feared any repercussions of withdrawing. In the event no one withdrew.

To ensure that any observed changes in grades were only due to the discussion forum, no other on–line materials were made available through Blackboard for the assignment (this also ensured that the Statistics tool was only reporting discussion board activity). Students posted questions about their assignment over the course of two weeks leading up to the deadline. There was no limit on the number of questions that they could ask, and they were not required to post questions. Postings to the board could be anonymous or not, but most students chose to be anonymous. Thirty two questions were asked and subsequently answered, mostly by the course tutor, giving around 60 posts/messages that could be read. The assignments were blind marked by markers who had not taken part in the Blackboard discussion, and were not marked by the tutor who had answered questions on Blackboard. The markers did not know who had taken part in the discussion and who had not.

Results

Over the two weeks there were 2938 hits on the message board. Thirty eight people chose not to use the discussion board at all, but 128 students did use it. Excluding the 38 people who never logged on, the average number of messages read was 23 (SD = 27.17), the median was 13 and the mode was 6. The number of messages read ranged from 0 to 129, as some people obviously re-read messages that they had already accessed.

Participants were categorised into 4 groups, via a quartile split, according to how many posts they read when Blackboard was available, with the resulting categories being: No Use (0–1 posts read, n = 46), Low Use (2–7 posts read, n = 40), Medium Use (8–22 posts read, n = 39), and High Use (23+ posts read, n = 41). We classed people who read one post as not having used Blackboard as they did not read both a question and an answer. A 2 X 4 ANOVA, with the 4 levels of reading Blackboard (between-subjects) and 2 levels of Blackboard (available/unavailable, within-subjects), was performed to assess their impact on the coursework grades. The grades on the assignment with Blackboard discussion available were significantly higher (M = 57.89%, SD = 7.77) than those on the previous assignment when it was unavailable (M = 56.25%, SD = 6.85), F(1, 162) = 7.729, p = .006, $\eta_p^2 = .05$. This could generally be due to students improving their statistical and report writing skills across the module, or could indicate that the VLE discussion did have an impact on learning and subsequent grades. The way to unravel this is to examine the impact of the VLE usage on the same students across time, via the interaction, which can be seen in Figure 1.



Figure 1: Average grades for assignments when students had access to a VLE discussion board and when they did not, split by how many posts they read on the VLE when it was available

The significant interaction in Figure 1 clearly shows that for the second assignment, when the Blackboard discussion forum was available, students who read more of the Blackboard posts achieved higher grades than those students who read less, but those same students did not achieve higher grades in the first assignment, F(3, 162) = 2.76, p = .04, $\eta_p^2 = .05$. Examining the assignment grades when Blackboard was available, using a one-way ANOVA, shows that significantly higher grades were achieved by the students who had read more than 23 discussion board posts (High usage) (M = 61.20, SD = 8.06), and those who read 8-22 (Medium usage) (M = 59.15, SD = 6.02), than those who read none (M = 54.50, SD = 7.43), F(3, 162) = 6.43, p < .001, $\eta_p^2 = .11$. Those students who had low usage (2–7 reads) did not differ significantly from the other groups' grades (M = 57.18, SD = 7.89).

The grades achieved when Blackboard was unavailable did not significantly differ between the students who later went on have High Blackboard usage (n = 41, M = 57.12, SD = 7.03), Medium usage (n = 39, M = 56.51, SD = 5.98), Low usage (n = 40, M = 56.97, SD = 7.48), or no usage (n = 46, M = 54.63, SD = 6.76), F(3, 162) = 1.25, p = .29. This tends to support the argument that it was *not* only the most academically capable students who chose to use Blackboard, and who would thus have obtained higher grades anyway.

Looking at the two groups of students who improved their grades via the Blackboard discussion, the Medium group (8–22 reads) improved their assignment grades by an average of 2.64%, t(38) = 2.28, p = .03, d = 0.37, while the students who read the most (23+ reads) improved their grades by 4.07%, t(40) = 2.84, p = .007, d = 0.44. Those

who did not use Blackboard did not improve their grades at all (-0.13%). This is clear evidence for the efficacy of the discussion board on grades. The higher grades when Blackboard was available, achieved by the High and Medium usage groups was not mirrored by them having higher grades when it was unavailable.

The previous analyses show that using the Blackboard discussion forum made an impact on grades, but did just reading the posts have an impact, or was asking questions necessary for improved grades? In terms of Blackboard usage, one student asked four questions, five people asked two questions, and 18 asked one question. Examining only the people who used Blackboard (when it was available), a 2 X 2 ANOVA [asked a question/didn't ask a question (between-subjects) X Blackboard available/unavailable, (within-subjects)], showed that there was no significant interaction effect on grades (see Figure 2), F(1, 118) = 2.43, p = .12. There was no significant difference between the two groups in how much they improved. Students who asked one or more questions raised their grades significantly by 4.62%, from M = 57.21 (SD = 6.39) to M = 61.83 (SD = 8.24), t(23) = 2.73, p = .012, d = 0.56. The 'lurkers', however, who didn't ask questions but did read them, also significantly raised their grades, from M = 56.79 (SD = 6.95) to M = 58.53 (SD = 7.23), t(95) = 2.11, p = .037, d = 0.22, a rise of 1.74%.



Figure 2: Average grades for assignments when students had access to a VLE discussion board and when they did not, split by whether they asked questions on the VLE when it was available

Discussion

The students used the discussion board a lot, but tended to read more than they wrote (as only 32 questions were asked, but nearly 3000 reading hits were recorded). Of course once the commonest questions, that many people shared, had been answered

then there was no need for subsequent people to ask them, only for them to read the answers. Figure 1 shows that the students who read the discussion board the most improved their grades the most. Previous research showed positive correlations between the number of messages read and grades achieved but causality cannot be determined by correlations; it could have been the case that students who were more academically capable and motivated read more of the messages but that they would have achieved higher grades anyway, even without the discussion board. The research in this paper controls for this problem to a large extent and it seems most plausible that the increase in grades is attributable to the Blackboard discussion and not down to motivational factors or the Hawthorne effect (as the students did not know they were being studied). It is possible that the more capable and motivated students did participate more in the discussion board, perhaps making up the High Usage group, but any extra motivation or ability that they possessed was not sufficient to have significantly raised their grades above the other students in the previous assignment, and thus arguably indicates that they would not have got the higher grades, that they did achieve in the second assignment, if the Blackboard discussion had not been available.

It seems, therefore, that the students were either learning from the messages or being guided by them, and that the more they read the better their assignments became, as they incorporated ideas and advice into them and their understanding increased. The increase in the marks is probably the result of communicating with the tutor, who was the one giving most of the advice. Admittedly, in this study the most motivated students may have reaped the most benefit from the discussion board, but that does not mean that other students could not benefit if they were encouraged or forced to take part in such an on-line discussion as part of their coursework.

Figure 2 shows that higher grades were achieved by students who asked questions in the Blackboard forum, and it seems likely that the students who asked questions were the ones who were most engaged with the assignment and who had thought most deeply about the details. Indeed, the student who asked the most questions was one of only two students who achieved the highest grade of 80%. The lurkers also achieved higher grades too, showing that having insightful questions asked of the tutor in an open discussion was clearly helpful to the students who hadn't asked questions.

In this study, unlike Palmer, Holt and Bray's (2001), we found that passive lurking *did* improve grades. There are differences between the two studies, for example Palmer, Holt and Bray's students were assessed on their postings whereas ours were not, and in ours the tutor provided much of the information, rather than students discussing issues with other students. In practice the students in our study mostly asked questions of the tutor, although if the tutor was delayed in answering then often other students had misled each other). Perhaps lurkers in our study took more note of the discussion information because the tutor was seen as an authority figure. It would be interesting for future researchers to see if similar grade increases are apparent when the same advice is given by someone identified as the tutor and someone not identified as a tutor. In practice some psychology departments ask demonstrators (often postgraduate students) to answer Blackboard questions for practical assignments, and their effectiveness at raising grades should be evaluated. Do the students weight advice differently according to the perceived source?

A limitation of this study is that it is a quasi-experimental design, as the presence or absence of Blackboard was manipulated but there was no random assignment to the conditions of how many messages were read or posted. That is, students decided for themselves whether to join the Blackboard discussion or not, and how much they used it, rather than being randomly allocated to take part, or not. This self-assignment of the participants to one of the four groups, rather than assignment by the experimenter, makes the causal nature of the results less certain, and this should be borne in mind when interpreting them. Although the results are persuasive they are not absolutely conclusive, but rival explanations for the observed data are weak in our opinion. The repeated-measures design enables us to see that the students' grades were not significantly different on the first assignment when there was no Blackboard, but on the Blackboard discussion board. What seems obvious from Figure 1 is that those students who chose not to join the discussion board maintained the same grades as before, while those who did join learned and improved their grades quite substantially.

The discussion board was reportedly popular among the students and they continued to use it for the assignments following the ones reported here, with more students logging on, more questions asked and more reading of messages. To enhance the already completed research, future researchers may want to interview students about their perceptions of VLEs, or perhaps examine the content of the messages in depth. Future research should also investigate why grades improved; did the students take a strategic approach to improve their grades, or was the discussion board keeping them engaged with the report - revising their work and thinking more deeply as messages were posted over many days? The nature of the material in the module studied (statistics and report writing), did not lend itself to in-depth discussions between the students, and the discussion was more of a question and answer session with the tutor. Thus this paper cannot claim to generalise its findings to modules where the discussions are more interactive and students' opinions can be expressed and debated much more fully. Having the Blackboard discussion forum does seem to have been an asset to the students on this module. It also enabled the tutor to answer lots of questions fully and in one place for the benefit of all students, rather than answering many separate repetitious emails from students, which had been the case in previous years.

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