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Eileen Webb^a, Alan Jones^a, Philip Barker^a & Paul van Schaik^a

^a University of Teesside, Middlesbrough, UK

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Using e-learning dialogues in higher education

Eileen Webb*, Alan Jones, Philip Barker & Paul van Schaik

University of Teesside, Middlesbrough, UK

Dialogue is arguably one of the most important components of any learning process. However, as student numbers increase and more emphasis is given to electronic delivery of courses, opportunities for effective dialogue may be missed. The technology to support e-learning dialogue is readily available, but design of the dialogue structures and understanding of learners' online communication behaviour requires further research. This paper reports on a study of the use of asynchronous discussion forums to support online dialogue in undergraduate learning and teaching in two groups of students. Initial empirical evidence, obtained from online communication behaviour data and assessment results, is presented to support a positive association between students' participation in e-learning dialogues and learning outcomes. Other factors that could influence effective exploitation of e-learning dialogues such as tutor intervention, students' perceptions, dialogue quality and learning outcomes are discussed, along with implications for the design of such systems.

Introduction

Much research into human learning supports the view that dialogue is important (Kolb, 1984; Mayes, 2001; Laurillard, 2002). Dialogue includes instructions from teachers, guidance and feedback. It also includes exchanges with fellow students, and other people, for example librarians or a partner. Just as importantly, dialogue (with oneself) forms the basis of reflection. With the increasing use of modern computer systems as delivery mechanisms, the importance of dialogue in learning and teaching processes needs further exploration. This paper concentrates on the use of dialogue in networked online learning environments (e-learning).

Many models used to explain learning processes emphasize the importance of dialogue. Educational research has shown that more effective learning takes place if learners are actively involved, rather than passive listeners. This has brought a move towards more student-centred experiential learning. One of the leading figures in this field was Kolb who

*Corresponding author: School of Computing and Mathematics, University of Teesside, Middlesbrough, Cleveland TS1 3BA, UK. Email: e.r.webb@tees.ac.uk

presented the cyclic model of experiential learning (Kolb, 1984). Kolb's model has four elements: active experimentation, concrete experience, reflective observation and abstract conceptualization. Active experimentation is the planning of a learning experience. Concrete experience is the participation in a learning episode. Reflective observation is the introspection of what has been learnt and interlocutory discussion with a teacher and other learners. Abstract conceptualization is internalization of the learning as an integral entity of previous learning. This sometimes requires re-appreciation of previous learning, colloquially called 'insight' or 'paradigm shift'.

The vicarious learner project (Mayes, 1995; McKendree *et al.*, 1998) made use of a learning cycle, which was termed the conceptualization cycle. This involved continually testing a student's conceptualization of a topic against some accuracy criteria. The cycle refers to the three main stages of a learning process as conceptualization, construction and dialogue. Fowler and Mayes (1999) extended the cycle to emphasize the importance of dialogue. They renamed the third stage as identification and viewed dialogue not as a separate stage but as integral to the whole cycle. Mayes (2001, p. 19) regards the dialogue as central to the whole cycle and refers to it as 'the force that moves the learner through each of the stages'.

In particular, with reference to higher education, Laurillard (2002, p. 87) characterizes 'the teaching-learning process as an iterative conversation' and goes on to describe her 'Conversational Framework' model. She emphasizes the need for dialogue in university education, by defining this framework as 'the core structure of an academic dialogue'. In the literature, the terms *dialogue* and *conversation* often appear to be used interchangeably. For the purpose of this paper, dialogue is used to refer to generic discussion—which may consist of many different topics. In contrast, the term conversation is used to refer to a specific communicative exchange on a particular topic.

Wenger (1998) comments on the fact that many institutions address the issues of learning based on the assumption that learning is an individual process. He suggests learning should be viewed as a social phenomenon and proposes a social theory of learning. This social theory emphasizes social participation within communities of practice, which are places where people develop, negotiate and share understanding. The primary focus is on learning as active participants and this participation combines doing, talking, thinking, feeling and belonging. For these communities to exist dialogue would seem, therefore, to be an essential component.

With the growing need to increase efficiency in teaching, more emphasis is now being given to electronic delivery of courses, resulting in new opportunities for dialogue. The Internet has become a mechanism to facilitate the transfer of many types of information from one computer to another and is rapidly becoming one of the primary means of communication. This computer-mediated communication between individuals is manifested in different forms such as one-to-one (e.g. tutor-to-student), one-to-many (e.g. tutor-to-group) and many-to-many (e.g. group-to-group). This communication may be *synchronous* (that is, it occurs in real-time, with all parties communicating within the same time frame) or *asynchronous* (where there may be a time lag between sending, receiving and replying to any given communicative event). The types of asynchronous technology available include email, list servers, discussion forums and bulletin boards. With these technologies the receiver of a message is not required to be connected at the same time as the sender of that message, but can respond to the communica-

tion at a later time. Synchronous communication methods include chat rooms, audio conferencing and video conferencing, which require participants to be connected at the same time (Alessi & Trollip, 2001). This study has concentrated on the use of asynchronous discussion forums. Obviously it is important to establish the underlying theories that explain the effect these technologies have on learning processes.

Wenger's social theory of learning refers to 'communities of practice'—which he suggests are an integral part of our daily lives (Wenger, 1998). Barker (2002) refers to people involved in an e-learning system and their interactions as the basis of an online learning community and suggests that these communities must provide communication mechanisms to promote knowledge and understanding through dialogue, discussion and debate. Purpose-built learning environments incorporating support for electronic communication, both synchronous and asynchronous, are increasingly being used to support learning. Salmon (2000, 2002a) refers to teachers in an online environment as e-moderators and has developed a five-stage model to enable structured development of online conferencing communities. She agrees that developing new kinds of online teaching and learning processes is at the forefront of information and communication technologies (Salmon, 2002b). For the purposes of this paper, dialogue employed in these technologies to support learning will be referred to as e-learning dialogue.

Increasing opportunities for e-learning dialogue suggest that it is important to understand how to design the dialogue mechanisms in an effective way, in order to enhance the experience of learners and promote learning. The development of skills to take part in e-learning dialogue within the people using these mechanisms should also be considered. This includes not only online tutors and e-moderators, but also student participants.

In order to enable the implementation of effective e-learning dialogue it is essential to understand the ways in which students interact with an electronic learning environment. There is an increasing interest in research into this area. Cook (2002) describes the challenge of identifying the relationships between theory, empirical work and implementation of learning environments. This suggests there is a need to investigate the ways in which students interact with e-learning dialogue. This is necessary in order that we can understand how electronic dialogue may be effectively used to promote learning.

Recent work in this area by MacKinnon and Aylward (2000), Polhemus and Shih (2000), Shotsberger (1999) and Sorensen and Takle (2001) has concentrated on the quality of dialogues and how they can be graded. Other work has included research by Carswell and Venkatesh (2002), who found partial support for the hypothesis that student perceptions of the technology are positively related to learning outcomes and intentions to further use the technology.

This paper is concerned with measurement of the use of e-learning dialogue and its association with learning outcomes rather than the content of the dialogue. The aim of this research is to analyse data from students' participation in discussion forums within university degree and Higher National Diploma (HND) modules and correlate this with assessment results. Based on the observations of one of the authors (E.W.) of the use of discussion forums by students, different types of interaction were noted. Students who participated in the discussion forums would seem to be successful in meeting the learning outcomes for a module, whereas those students who were disinclined to be involved tended to be less successful.

The following hypothesis was proposed: *participation in e-learning dialogue is positively associated with learning outcomes.*

An empirical evaluation of online communication behaviour

As part of our ongoing programme of research, this empirical study was conducted to find evidence for the hypothesis. Data were collected from two modules that were presented with electronically supported dialogue at the University of Teesside, School of Computing and Mathematics. Both modules (referred to as Module 1 and Module 2 below) used Blackboard (Blackboard United Kingdom, 2002), a virtual learning environment (VLE) capable of supporting asynchronous discussion.

Method

Research design. In the research work described in this paper, it was not possible to control the variables of interest. Therefore a non-experimental research design was used to investigate the relationship between learning outcomes at the end of the modules (as an outcome measure) and rates of participation in electronically supported dialogue (as predictors).

Data collection. From Blackboard it was possible to retrieve, per student, the numbers of accesses (we denote this by the variable *Accesses*) and the numbers of contributions (we denote this by the variable *Postings*) for each forum in which a student was involved. The *Accesses* could be used to identify how many times a student had accessed a discussion forum for a module. Each module did have several discussion forums, themed by different topics. An assumption was made that students accessed a discussion forum in order to read the contributions. The *Postings* detailed the actual number of contributions a student made to the forums during a module delivery. Details of students' results in the final assessment of the modules were also available. In the case of Module 1 this was in the form of a percentage mark. For Module 2 assessment results were in the form of Pass, Merit and Distinction.

Participants in Module 1. 'Exploiting the Internet' (EIN) was a large first-year, first-semester degree module for various B.Sc. and BA honours programmes, with 513 students enrolled in September 2001; 471 were male and 42 were female.

Learning Resources for Module 1. A main aim of this level 1 module was the exposition of facts and concepts in order to develop students' knowledge and skills to a predetermined level. The students started the module with a variety of skills and experience. An aim of the online dialogue was to allow them to share knowledge and experience for the benefit of the whole cohort.

The online resources for the module included lecture notes, worksheets, guidelines, self-assessment quizzes, external links, discussion forum facilities and assessment documentation. As part of the assessment for the module, students were required to make at least one valid contribution to the discussion forums associated with the module. Although the requirement to participate was incorporated into the marking scheme it contributed only 3% of the minimum

40 required for a pass grade. There was therefore some requirement to participate, providing some motivation for initial participation by students. A valid contribution was defined in the specification of the assessment to be one in which a student initiated a thread with a question or comment relevant to the module or responded to an existing thread with a relevant contribution.

The discussion forums contained links to a set of guidelines on contributing to and use of the forums. The moderator (E.W.) created new forums on appropriate topics relevant to student progression through the module and archived earlier ones at set times. In this way the discussion forums were structured in the same fashion as other parts of the module with appropriate pacing of activities. Although forums were moderated, it was apparent that many students quickly developed a network of peer support, answering each other's questions, suggesting alternative solutions and even offering peer critiques and review of each other's work.

Participants in Module 2. 'Advanced Multimedia Development' (AMD) was a small second-year module of an HND; it had 30 students enrolled in September 2001, 28 were male and 2 were female.

Learning Resources for Module 2. Because of the fewer number of students and the requirements of the learning outcomes of this level 2 module, the discussion forums were used in a different way. The learning outcomes for this module were concerned with evaluation of contrasting ideas, principles and practices, and increasing learners' independence.

The aim of the discussion forums for this group was to promote a deeper level of dialogue to meet the learning outcomes and to this end both the level and the type of contribution were assessed. Students were required to make relevant contributions to each of three separate discussion forums. In these forums, topics that had been introduced and discussed in lectures were continued and developed. Contributions were assessed on students' ability to respond and carry a conversation forward, their reference to external sources (e.g. books, research papers and Web sites) and their ability to understand and comment on these sources. Marking of the AMD in-course assessment was criterion referenced. Table 1 shows the relevant subset of the marking criteria relating to the discussion forum activity.

Results for Module 1

A preliminary analysis examined *Postings*, *Accesses* and assessment marks for fit between their distributions and the assumptions of multiple regression (Tabachnick & Fidell, 2001); in order to reduce extreme skew and kurtosis, a logarithmic transformation was applied to *Accesses*; and first a logarithmic and then a square root transformation was applied to *postings*. The transformed variables were used in all subsequent analyses. As the available data was interval level, Pearson's correlation calculation was performed. The *Accesses* and *Postings* were significantly correlated with marks, $r = 0.276$ and $r = 0.292$, respectively, both $p < .001$, as were *Accesses* with *Postings*, $r = 0.544$, $p < .001$.

A multiple regression analysis was used to investigate the relationship between marks as a continuous measure and *Accesses* and *Postings* as predictor variables. The multiple regression

Table 1. Partial marking criteria for the HND group (relevant to e-learning dialogue)

To achieve a PASS in this part of the assessment you must:

- Have made at least one relevant contribution to each of the three discussion forum conversations.

To achieve a MERIT in this part of the assessment you must:

- Meet the requirements for a Pass and
- Have replied to and continued a conversation with an appropriate contribution.
- Have referenced external sources.

To achieve a DISTINCTION in this part of the assessment you must:

- Meet the requirements for a Merit and
 - Have referenced external sources and offered relevant comment on the content of the source.
-

showed that 10% of variance in marks was accounted for by *Accesses* and *Postings* as predictors, $R^2 = 0.105$, $p < .001$, with both predictors significant, $t(445) = 3.115$, $p < .005$, and $t(445) = 3.760$, $p < .001$, respectively. These results show that, as hypothesized, both the passive use (as measured by *Accesses*) and the active use (as measured by *Postings*) of forums by students was significantly related to their learning outcomes.

The marks of the 65 students who did not make a contribution to any forum and did not access any forum (non-participants) were analysed separately. The distribution of marks showed that 60% of the marks were below 40 (fail grades), a further 23% was in the range 40 to 69 (D, C and B grades) and another 17% was 70 or higher (A grades).

Students studying the EIN module were asked to complete an evaluation survey for the module. A number of the questions related directly to the discussion forums. Of the 81 students who responded to the survey, 76% said they found the forums useful. Relating to the actual use of the forums, 14% said that they actively contributed, 60% said they used them to read and find information and 26% used them only to find the answer to a specific question.

Results for Module 2

A preliminary analysis examined *Postings* and *Accesses* for fit between their distributions and the assumptions of logistic regression (Tabachnick & Fidell, 2001); in order to reduce extreme skew and kurtosis both *Accesses* and *Postings* were logarithmically transformed. The transformed variables were used in all subsequent analyses. The data obtained for this module were based on grades and were therefore ordinal data. Spearman's rank correlation calculation was used. *Accesses* and *Postings* were significantly correlated with grades, $\rho = 0.486$, $p < .01$, and $\rho = 0.445$, $p < .05$, respectively, as were *Accesses* with *Postings*, $\rho = 0.766$, $p < .001$.

A logistic regression analysis was used to investigate the relationship between grades as a dichotomous outcome measure (rather than a continuous outcome measure) and *Accesses* and *Postings* as predictor variables. Prior to conducting the logistic regression, grades were converted into a binary variable with two categories. Category 1 consisted of distinction and merit grades and Category 2 of the remaining grades, pass and fail. The logistic regression showed that 20% of variance in grades was accounted for by *Accesses* and *Postings* as predictors, $R_L^2 = 0.199$, $p <$

.05. A Hosmer-Lemeshow test showed an adequate fit between a model with the two predictors and the data, $\chi^2(8) = 5.794$, $p = 0.670$.

These results support the hypothesis that both the passive and active use of forums by students was significantly related to their learning outcomes.

Summary of results

The results from the analysis support an acceptance of the proposed hypothesis. Participation in e-learning dialogue, whether active or passive, was positively associated with learning outcomes. Overall, the results from both modules demonstrated a relationship between learning outcome at the end of the modules (as an outcome measure) and rates of participation in electronically supported dialogue (as predictors).

In our research, students who participated have been described as either active or passive participants. Active participants were those who contributed to the forums either to reply to existing conversation strands, or to initiate new conversation strands to develop the dialogue further. The passive participants were the students who did not contribute, but would use the forums to read the contributions and find the information they required by 'lurking' in the forums. Preece (2000, p. 87) described a lurker as: 'someone who does not participate; he observes what is going on but remains silent'.

Lurking can also have more sinister connotations and is not regarded as a flattering term. Salmon (2000), however, links lurkers more with the term browsing and suggests it is a normal first step in a socialization process within computer-mediated communication. In the vicarious learner project, McKendree *et al.* (1998) take the idea a step further and have investigated the benefits to learners of being able to observe or 'listen in' to others actively participating in discussion. Therefore passive participants, although not actively contributing to the discussions, may benefit by observation. These results showed that, passive use (lurking) and active use (posting) combined tended to be associated with better results.

Discussion

The analysis in this paper has concentrated on *Accesses* and *Postings*. This has proved useful as an initial attempt to enable understanding of the relationship between electronic dialogue and learning outcomes. However, there are many other factors that influence effective use of e-learning dialogues and expected learning outcomes. These include the design of the dialogue system, moderation by the tutor, the students' perceptions of the system and the quality of the dialogue.

Our future work will include both qualitative and quantitative analysis of e-learning dialogue, similar to the approach taken by Carswell and Venkatesh (2002). It will investigate a more comprehensive range of variables that together with participation in e-learning dialogue, influence learning outcomes.

Discussion forums can be used for a variety of purposes. Salmon (2000) identifies various types of computer-mediated communication structure and suggests ideal student numbers for each. However, neither of the two distinct ways in which the forums were used as described here fit into any of Salmon's identified types. For the large EIN group the forums were initially designed to act as a 'frequently asked questions' facility, allowing students to ask questions and

clarify detail, and were organized around module topics. It was recognized that students, particularly those studying at level 1, tend to ask similar questions. Often, the same question may be asked repeatedly by different students, as they endeavour to understand and clarify the content of a module. Students on the module were encouraged to use the discussion forums to ask questions relevant to the module, to answer questions and to discuss their learning. The questions were contributed by the student cohort and wherever possible also answered by them, with the moderator ensuring accuracy and encouraging further discussion as appropriate. It was expected that questions would be repeated or asked in a different way, as the forums developed.

There was very little deep discussion. However, students used the forums in ways that were unexpected. Many students spent time helping each other and there were numerous examples of considered responses where students gave instructions or explanations to other students. The moderator copied and pasted examples of these responses into the 'Hints and Tips' section of the Blackboard presentation of the module to make it easier for other students to benefit, and to reuse this dialogue for future cohorts. This was necessary as students often found difficulty in locating particular contributions. This indicates a possible problem with the usability of hierarchical electronic dialogue structures as supported by Blackboard. A facility for both students and e-tutors to categorize selected contributions and the ability to view or copy selected categories could be a useful additional feature of discussion forums for educational use.

Students also tended to include hyperlinks to their work and invited critiques. In all cases the comments received were useful and often promoted further debate. Forums available for the module also included a technical forum and a general forum. The technical forum was used to engage in conversations with 'experts' in the area of web design. This allowed the more capable students to explore topics outside the remit of the module. The general forum was an area for students to socialize online. These forums were intended to provide a support facility for the module.

One of the considerations in the design of the EIN forums was the size of the group. It can be argued that a group of 500 is too large to allow for effective participation. This would undoubtedly be true if all participants were expected to be active in each of the forums, however, for EIN the forums were designed essentially as an information resource. This is reflected in the statistics with *Accesses* being much higher than *Postings*. The forums were designed specifically around topics within the module to ensure that students knew which forum to access for any particular question. The forums were moderated three to four times a week with older topics archived (although still available to read) on a regular basis.

In contrast the AMD group was smaller and consisted of only 30 students. They were expected to use the forums to engage in more reflective discussions with the aim of promoting deeper learning. Their contributions to the forums formed a part of the final assessment for the module. The focus of each of the three forums was linked to the main topics of the module and the conclusions of the discussions were expected to be reflected in the multimedia product they developed. In order to pass the module these students were required to be involved in the discussions and to contribute actively. It was apparent, however, that for some students the quality of the contributions tended to show a lack of thought and reflection on the subject. The impression was often given that contributions were only made because it was a requirement, so it was done in a perfunctory way. When the module assessments were marked, consideration was given to the fact that it was a new activity for many of the students. A pass grade was awarded provided

they had attempted the activity and had obtained at least a pass in the other assessment criteria for the module. Many of the students, however, actively engaged in the activity and this was reflected in their overall better grades for the module.

Other researchers (Salmon, 2000; Barker, 2002) have reported on the need to train online tutors and e-moderators. This is becoming widely accepted and there are many courses now available to facilitate this. It would therefore seem reasonable to suggest that students also need to be trained in the effective use of this technology, especially if it is to be used for module assessment purposes. For both the groups detailed in this paper the following process was adopted at the start of the module delivery. A lecture session was devoted to a detailed demonstration of the Blackboard environment including the discussion forum features. This was followed by an opportunity to contribute to a 'Welcome' forum, allowing students to experiment with reading and contributing. Students also had access to a document containing guidelines on contributing to and use of the forums. On reflection, this type of training may not be sufficiently adequate, considering that the experiences and expectations the students have are more likely to be for paper-based or face-to-face assessments rather than online. This would seem to be an area that requires further research.

Conclusions and further work

This paper has discussed two examples of using e-learning dialogues as an integral part of online learning environments. It is clear that the design of dialogue structures is important, as are skills of tutors and student participants. We have established that, where e-learning dialogues are used as an integral component of a taught module, students' participation in these dialogues is positively correlated with module learning outcomes. Our further work will include more detailed analysis of e-learning dialogues and their associated outcomes. This will be conducted by analysing not merely the numbers of accesses and contributions to forums (as in the current study), but by taking into account students' perceptions of the online learning environment and the quality of the contributions.

Our experience suggests that the constraints of the technical system, that is the discussion forums as designed within Blackboard, does not always allow sufficient flexibility for the design of dialogue structures. This is demonstrated in the example of the module leader's need to copy and paste examples of considered responses into a 'Hints and Tips' section to make it easier for other students to access it. Ideally, discussion forum systems should explicitly support the effective re-use of identified sections of dialogue.

Work to date has concentrated on students of full-time university courses within one institution. An important question to ask is whether the results of the study are typical only of students studying at the University of Teesside or are they transferable to other groups of students who are studying using this type of approach. Further research will aim to include data from other institutions.

Notes on contributors

Eileen Webb is a Principal Lecturer in Multimedia within the School of Computing and Mathematics at the University of Teesside. She is also currently studying for a Ph.D. in the area of e-learning dialogues for the support of learning and teaching.

Alan Jones obtained his B.Sc. at Glasgow University in Natural Philosophy and Ph.D. at Newcastle upon Tyne in Computer Science. After some time as a software engineer, principally on Air Traffic Control systems, he changed career towards education. Achievements here have been curriculum innovations for groupwork and assessment, industrially linked projects, and engaging small and medium business as learning communities for better exploitation of ICT. His research interests are creating learning communities within business and instructional design with virtual learning environments.

Philip Barker is Professor of Applied Computing within the School of Computing and Mathematics at the University of Teesside. His research group conducts studies into various aspects of human–computer interaction—particularly those relating to the use of computer-based technologies for the support of teaching, learning and training.

Paul van Schaik is a reader in Psychology in the School of Social Sciences and Law at the University of Teesside, Middlesbrough. His main research interests include human–computer interaction, virtual reality and psychological modelling of human behaviour.

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