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Technology-Mediated Active Learning in Information Systems Development Pedagogy: A Case Study

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Abstract

We describe the use of a newsgroup to support an active learning approach for teaching requirements analysis. The newsgroup was used for communication between students and a client to elicit requirements for a transaction processing system. The outcomes suggest that this technology is effective in supporting active learning. We offer recommendations for adopters of this approach.

Active Learning

Many educators believe that, in order to acquire knowledge and skills, students must be actively involved in learning. Active learning requires that students acquire and interpret information relevant to the task rather than be passive recipients of material given to them (Bonwell & Eison 1991). Moreover, active learning is enhanced if the student is required to apply the information gathered to an authentic activity (Kolb 1984).

In the past decade or so, advances in computer technology have strengthened an interest in active learning. Computer and communication technology provide mechanisms to involve students: students can use computers to participate in group decision making, collect relevant information, contact subject matter experts, and use computer simulated exercises (e.g., Nunamaker et al 1991; Tompson 1995).

In this paper we explore the use of technology to improve the authenticity of a task designed to apply what has been learned. The next section describes a systems development exercise in an undergraduate MIS course where students were required to use an Internet newsgroup to gather information from a client in order to develop a transaction processing system. Subsequently, we evaluate the outcomes of the project and discuss the prospects for this type of activity.

Course Projects in Information Systems Development

Active learning is highly appropriate for studying information systems development. The challenges of developing an information system from an initial set of specifications to a functional product are not easily learned by passive means.

One approach to practicing systems development is to do analysis, design, and/or implementation from a written narrative or case. However, written cases are of limited value for effectively teaching systems analysis and design principles, since they are inherently flat and linear, and are highly structured. One of the most important characteristics of a real analysis and design problem is that requirements are frequently

determined through iterative communications between analysts and clients. In addition, vagueness, conflict, and contradiction are aspects of real systems development projects which are difficult to simulate using written cases. Vagueness in a written case may lead to information asymmetry among participating groups. Groups that seek more information from the instructor may be at an advantage relative to those who work independently.

In view of the limitations of written cases in capturing the complexities of real-life systems development, a more effective way to promote learning is to have students do a real project for a real organization. Unfortunately, in many instances this is not feasible. Students in introductory information systems classes may not have the skills to participate effectively in real projects. Moreover, finding enough organizations to support team projects is a serious constraint.

We developed and implemented an alternative mechanism for role playing in a systems development project. Two hundred students (approximately 50 groups of four students) in an introductory information systems course were required to develop a database and transaction processing system for a hypothetical video store. Project requirements consisted of: a set of data flow diagrams; a relational database structure; and a set of forms to process transactions and produce reports. Students were required to build a working prototype using Microsoft Access. A short narrative describing the system requirements was posted to the course Web page. The narrative was deliberately incomplete and intended only to orient students to the nature of the business and the scope of the project. The complete system requirements were to be determined by interacting with a client.

An Internet newsgroup was set up to allow students to communicate with the client (a fictitious store owner played by the course instructors). The newsgroup provided consistent responses to students' questions regarding project specifications, and provided all students access to the evolving specifications (postings and responses were also archived on the course Web page).

The client had a high level of subject matter expertise, but was very naive from an information systems perspective. The following examples illustrate dialog between the students and the client. The first constitutes a request for clarification, and the second a technical question which should have been directed to the instructors.

1. **Student:** What do you do if you have more than one copy of a movie?

Client: I hadn't thought of that. I guess we really have no way of knowing. Why does it matter which copy someone has? They're identical movies. When a tape is returned, the employee on duty is expected to mark off the line corresponding to the rental so I guess we should know who has the late movie because that person's name has not been checked off.

2. **Student:** When employees offer information to customers about the selection of movies can they be regarded as a Data-store?

Client: I don't know what you mean by a "data" store. I have a video store.

Outcomes and Interpretation *Instructor's Perspective*

From our perspective, the approach used was more successful in promoting students' active learning than traditionally delivered cases because it was a better simulation of a real-world analyst-client relationship. Unlike a traditional case, the description of the system requirements was open-ended and incomplete, forcing students to determine what additional information was needed and formulate appropriate questions for the client. Most questions posted to the newsgroup reflected thought and preparation by the students.

Growing tension between students and the client as the project progressed also enhanced active learning. Tension is not uncommon in real systems development projects. We believe experiencing tension first-hand more effectively conveys one unpleasant reality of doing systems analysis than merely reading about it in a text or cases.

Active learning was further enabled by providing students access to all communications between other groups and the client. This required students to filter relevant information from noise. For example, although students knew that video ordering was outside the scope of the system, some nevertheless asked such questions as, "How do you place orders for videos?". In such cases, the client provided answers. As the volume of postings increased, some students highlighted the inappropriateness of some threads with hyperbole ("Do you have a pet?"). In our view, this was clear evidence learning was taking place.

Less direct evidence of active learning lay in the overall quality of projects. The sharing of information on the newsgroup eliminated ambiguity about the project requirements. Without this open communication, we believe there would have been greater variability in the final product since some groups may have misunderstood what was required, but may not have felt a need to consult with the instructor.

In addition to the improvement in student learning and performance, the use of the newsgroup provided benefits to the instructors. Foremost, the newsgroup provided an equitable means to disseminate information, allowing all students to benefit from a well thought out response to a question posted by a single group. In addition, this method allowed for far richer project requirements than traditional cases permit. Questions posted to the newsgroup indicated what students were and were not capable of, making it possible to tailor the evolving requirements to what could reasonably be expected.

There were also challenges in using this approach. Although the newsgroup provided a means to rapidly disseminate information, it was time-consuming for the instructors to

provide rapid responses to students' queries. Also, while the newsgroup was in many ways a good simulation, it could not convey aspects of face-to-face communication such as body language and tone of voice.

Students' Perspective

Student feedback on the project was collected using course evaluation questionnaires and by informal opportunistic discussions with students after the course was completed. In general, students reported that the use of a newsgroup to develop an evolving project definition was an approach they had not seen in other courses. Student feedback was essentially of two types: reaction to the structure of the project, and reaction to the use of a newsgroup for disseminating project information.

Some students did not like the ambiguity in the project requirements. This appears to have been a reaction to the explicit burden of having to elicit the project requirements by getting clarification and elaboration from the client. No students indicated that this approach enhanced their learning. However, this may simply be because they had no basis for comparing what was done in the course with other methods for teaching systems analysis.

There was also some initial difficulty in separating the roles of the store owner from those of the instructors. Consequently, some early questions ostensibly addressed to the client were really intended for the instructor. This caused some frustration and feeling that the instructors were "playing games" by refusing to answer technical questions contained in messages directed to the client. However, a clear separation of the roles quickly emerged as students tagged each post with the intended recipient (instructor or store owner). This is an indication that students learned there are boundaries to a client's expertise.

In terms of student feedback on the use of newsgroup technology to support active learning, several points are worth noting. First, there was considerable variability in familiarity with (prior experience) and ease of access to (computers, modems) the newsgroup. Students who had difficulties for either of these reasons sometimes perceived a lack of timely information.

Second, some groups were reluctant to ask questions on the newsgroup, fearing they would give away their good ideas to other groups. We did not anticipate this reaction, but in retrospect it appears to be a product of the competitive nature of the undergraduate business program at the school at which the project was carried out.

Finally, a small number of students perceived the newsgroup as an attempt by instructors to substitute face-to-face contact during regular office hours with electronic contact. This occurred despite clear indication from the instructors that the newsgroup and email were intended to supplement traditional forms of student-instructor interaction.

Conclusions and Recommendations

Overall, we believe our approach was successful in encouraging active learning about systems analysis: students were required to acquire and interpret information relevant to system requirements through an authentic activity (i.e., by communicating with the client via the newsgroup). We believe, however, that the approach can be made more effective in supporting active learning.

As noted above, students were intolerant of the ambiguity in the project requirements. We recognize that some students will feel uncomfortable with any ambiguity in what is expected from them. However, we expect that the level of discomfort can be managed by emphasizing early and often the importance of ambiguity to the realism of the exercise.

We also found that students experienced some initial difficulty in separating the role of the store owner from that of the instructor, and were sometimes put off when the client did not provide answers they expected from the instructor. These roles can be clearly distinguished by making the client more tangible to the students. This could be done by introducing the client (played by an volunteer unknown to the students) to the class at the beginning of the project.

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