Finding the "Learning" in Biology Students' Use of Learning Management Systems

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Abstract: This study investigated how students used Learning Management Systems (LMS) to interact with each other, collaborate, and co-construct knowledge without mediation by the instructor. Results indicate that students successfully used the LMS to interact and, to a significant extent, collaborate with each other, but there was very little evidence of knowledge co-construction within the LMS. The results suggested that the ease and availability of face-to-face meetings as well as limitations with the technology were influencing factors.

Introduction

Contemporary conceptions of learning emphasize social, distributed, and collective forms of interaction between students (e.g., Brown, Collins, & Duguid, 1989). Computer-supported collaborative learning (CSCL) researchers have demonstrated the value of peer interactions via online environments and elaborated many of the conditions under which students can use technology to profit from working together (e.g., Dillenbourg, 1999). Thus it becomes increasingly important for educators to build opportunities for student peer interaction into their curriculum *and* to provide students with the tools for social interaction that have the potential to lead to collaborative and constructive learning outcomes. Web-based Learning Management Systems (LMS) are nearly ubiquitous in higher education today. Although most LMS are used for the distribution, management, and retrieval of course materials, these systems can also incorporate functionality that supports interaction between students and instructors and among students (West, Waddoups, & Graham, 2007). While there has been a significant amount of research on the kinds of communication tools found within LMS (see De Wever, Schellens, Valcke, & Van Keer, 2006), there has been little research on how students use the collection of LMS tools to socially interact with each other and arrive at common goals with their peers.

The research study described in this paper was primarily focused on how LMS support peer learning. The context for this study was an undergraduate biology course that had a required group project. In focusing on the group assignment, three research questions were investigated: (a) what types of peer interactions between students take place within LMS, (b) what factors influence the types of peer interactions between students within LMS, and (c) how LMS can be improved in order to better support student learning.

Defining Student's Online Social Processes

In this study, students' online communication within LMS was characterized as one of three forms of interaction: basic interaction, collaboration, or knowledge co-construction. Basic interaction can be defined as "sustained, two-way communication among two or more persons" (Garrison, 1993, p. 16). For this study, basic interaction was defined as **any kind of communication that took place online within LMS tools.** Collaboration is often defined as "a coordinated … activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (Roschelle & Teasley, 1995, p. 70) in which the group members collectively negotiate the final outcome or deliverable product (Dillenbourg, 1999). Thus, in this study, basic interaction was further distinguished as collaboration when **students used LMS tools to engage in interaction that served to develop and/or sustain shared ideas about a collective problem.** Knowledge co-construction refers to the types of Vygotskian social interactions with other people that allow individuals to build their understanding about the world. Just as not all peer interaction is collaborative, not all collaborations automatically lead to knowledge creation; collaborators must engage in conversation in which participants' viewpoints are articulated, accommodated, and challenged by group members in order to construct new meanings that are retained and elicited at a later point in time (Murphy, 2004). In this study, knowledge co-construction was thus defined as **collaboration between students within LMS tools when either new information was conveyed from one student to another and retained by the receiving student or a new understanding was elicited by students through their collaborative interactions.** Within this study, collaboration and knowledge co-construction were defined as specific forms of social discourse of the more general construct of peer interaction and were limited to the content of students' online messages.

Setting, Participants, and Methodology

This study was conducted during one semester at a public American Midwestern four-year university. Students from one upper-division undergraduate laboratory course in Biology were asked to participate. As part of this course, students completed a group project of writing a mock grant proposal to the National Institutes of Health (NIH) on any unpublished biological topic of their choosing. Students worked independently or in self-selected

groups of 2-6 students. Overall, there were 32 groups formed for the group project, twenty-one of which voluntarily decided to use the LMS to create their own site (82 students, average group size: 4 students).

The content of all communication between site participants within LMS was collected. An online survey (n=56, 44% response rate) was also administered after students turned in their group project. In order to analyze students' peer-to-peer communication, online messages were combined or separated into individual "units of meaning" based on the natural breaks in students' conversations and messages to each other (Henri, 1992), resulting in a total of 397 peer-to-peer message units. Next, each message unit was coded in order to classify the type of peer interaction that took place. Finally, a second type of coding examined the content of the message units. There were a total of 627 "topic" codes assigned with each of the 397 message units assigned a maximum of three codes (27 different coding categories).

Results

The majority (60%) of the 397 peer-to-peer message units within LMS were identified as collaboration, followed by basic interaction (37%), and knowledge co-construction (3%). While the median number of message units was 11.5 per student group, there was a wide disparity in the number of message units for each student group ranging from 4 units to 120 units. The majority of topic codes assigned to message units coded as basic interaction discussed face-to-face meetings (35%). Message units coded as collaboration were assigned a wide variety of topic codes, the most popular of which was biology concepts and procedures (17%). Half (50%) of the message units coded as knowledge co-construction also concerned biology concepts and procedures and, in addition, also contained evidence of new learning.

Nearly three quarters (74%) of LMS users reported using their site at least a few times per week. Over three quarters (82%) of students also reported that they met face-to-face at least once every week suggesting that LMS use was not a substitute for meeting. When asked what students discussed at face-to-face meetings (52 total comments), most of the students (n=47) replied that they divided work or went over certain portions of the grant proposal and that they did so because it was easier than meeting online.

Discussion and Conclusion

The results show that every group that used the interactive LMS tools had at least one collaborative exchange on their site, and about half of those groups had more collaborative messages than interactive messages. There was an abundance of basic interaction and collaborative messages found within students' online messages, providing support for potential student learning within this technology. However, there was very little evidence of knowledge co-construction in students' online communications. That is not to say that students did not learn from each other or from this course assignment, only that evidence of such learning was not found in the majority of messages within LMS. There were several possible factors that may have influenced whether students engaged in collaboration or knowledge co-construction within LMS including the high rate of face-to-face meetings and problems and limits of the LMS technology.

While LMS do have many of the basic tools to support students' knowledge co-construction, those tools lack the necessary features to guide, facilitate, and scaffold students successfully. LMS should therefore incorporate some basic scaffolds to facilitate student collaboration and knowledge co-construction for projects like the one investigated in this study. LMS are complex, multifaceted systems that require continued design improvements as well as attention from instructors, instructional designers, and researchers in order to achieve their potential as a technological facilitator for student learning.

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