



An Online Learning Platform for Teaching, Learning and Assessment of Programming

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ABSTRACT

Assessment can be seen as the engine that drives student course activity, online or off. It is particularly important in encouraging and shaping collaborative activity online. This paper discusses three sorts of online collaborative activity—collaborative discussion, small group collaboration, and collaborative exams. In each of these areas, it provides both theoretical grounding and practical advice for assessing, and so encouraging, collaboration in online courses.

Keywords—Online Collaboration, Assessment, Course Discussion, Small Group Work, Collaborative Exams.

1. INTRODUCTION

The Internet is becoming the actual medium of interaction, communication, and collaboration and the working space within which learners and teachers engage in “unique and irreplaceable learning opportunities” which may only exist in online environments (Burbules & Callister, 2000, p. 277). Teachers, who are at the center of an increasing demand and pressure to teach online, are being challenged to rethink their underlying assumptions about teaching and learning, and the roles they take as educators (Wiesenberg & Stacey, 2008). The growing interest in online education challenges higher education institutions to rethink their cultural, academic, organizational and pedagogical structures in adapting to a new culture of teaching and learning (Howell, Saba, Lindsay, & Williams, 2004). Similarly, the drastic increase in the number of online programs and course offerings is changing the role of the teachers and the nature of teaching, with an increasing number of faculty and support staff required for online teaching (Bennett & Lockyer, 2004).

The experiences of early adopters have created a discourse around online education focusing on the definition of online teacher roles and competencies (Bennett & Lockyer, 2004; Lee & Tsai, 2010; Major, 2010; Natriello, 2005). The notion that teaching online requires the creation of new skills and sets of pedagogies has led researchers to study the roles that online instructors take in online education environments (Anderson, Rourke, Garrison, & Archer, 2001; Berge & Collins, 2000; Goodyear, Salmon, Spector, Steeples, & Tickner, 2001; Graham, Cagiltay, Lim, Craner, & Duffy, 2001; Guasch, Alvarez, & Espasa, 2010; Salmon, 2004).

Although the studies on the roles and competencies of online teachers added richness to the online teaching literature, research related to the experiences of faculty who participate in online education in higher education has been limited (Conceição, 2006). Moreover, the roles and competencies suggested for online teaching have had limited impact on the professional development programs that address teachers’ needs, individual dispositions, external social

demands and capabilities within their unique teaching contexts. Despite the swift growth in online learning in higher education, the literature still lack the critical look at the existing research on teachers' roles and competencies with respect to online teaching.

2. EXISTING SYSTEM

Many theoretical and empirical analyses emphasize the importance of active participation and collaboration among students in promoting the effectiveness of online learning. However, in most online courses, traditional instructor-centered examination remains the primary means for assessing student performance, and collaborative learning is undervalued and so marginalized. In a large part, this is because the assessment of collaboration requires a radical rethinking of assessment methodologies. Three issues are involved: the variety and kinds of goals for online collaboration, the complexity of assessing both individual and group behaviors, and collaboration on assessment itself. The first issue is how various are the kinds and learning goals of online collaboration and so how difficult it is to address the assessment of collaboration generally. Some examples of the diversity of focus among collaborative activities in online environments are the collaborative construction of knowledge bases [9, 10], the collaborative investigation of scientific phenomenon [11, 12], group engagement in game-like learning tasks [13] or simulations [14], peer review and evaluation of learning products [9], online peer mentoring [15], collaborative analysis of case studies [16], and collaborative discussion groups [17, 18]. Even within these various groupings, one single sort of assessment will not be appropriate because learning goals vary from implementation to implementation. For example, Nachmias, Mioduser, Oren & Ram [19] distinguish between structured and emergent collaboration schemes. In the latter sorts of collaboration activities, assessment must also emerge.

The second issue is that collaboration is a complex activity which involves both individual and group effort. To encourage collaboration, both aspects must be assessed. Johnson and Johnson [20, 21], for example, contend that the key to successful cooperative learning is maintaining both individual accountability, in which students are held responsible for their own learning, and positive interdependence, in which students reach their goals if and only if the other students in the learning group also reach theirs. The way to ensure individual accountability and positive interdependence, according to Johnson and Johnson, is to assess both individual and group learning.

A simple example of this kind of assessment using summative testing is to give each student a grade based on some combination of their test score and the average score for their group. Another frequently used scheme is to give a common assessment for a group project and have group members rate their peers' contributions which are then averaged for individual grades. Unfortunately, these kinds of grading protocols are not often seen in online courses where the common approach is to assess either individual effort e.g., (online discussion participation) or group products (collaborative projects).

The third issue is the role of collaborative assessment. Some argue that if collaboration is an essential feature of successful online learning, then assessments as well as activities should be collaboratively designed. Some recent procedures have been described that incorporate student active participation and collaboration into the assessment process itself. Participation and collaboration have been integrated into various phases of collaborative assessment, such as collaborative development of the grading scheme [22], collaborative question composition [23], collaborative question answering [24], collaborative examinations [25], and peer and self-grading [26, 27].

3. ASSESSING & ENCOURAGING COLLABORATIVE DISCUSSION

Online discussion has been an object of interest to researchers for at least two decades because of the potential it holds to support learning. Many researchers note that students perceive online discussion as more equitable and more democratic than traditional classroom discussions because it gives equal voice to all participants [28, 29]. Online asynchronous discussion also affords participants the opportunity to reflect on their classmates' contributions while creating their own, and to reflect on their own writing before posting it. This creates a certain mindfulness and reflection among students [30, 31, 32]. In addition, many researchers have noted the way participants in online discussion perceive the social presence of their colleagues, creating feelings of community [33, 34, 35, 36, 37]. Indeed, an increasing number of studies have examined the perception of interpersonal connections with virtual others as an important factor in the success of online learning [38, 39, 40, 41, 42]. Such findings have led educators to conclude that asynchronous online discussion is a particularly rich vehicle for supporting collaborative learning.

Assessment can be done by counting things like the number, regularity, and length of contributions. The problem with this approach is that if students know this is the basis of grading, they may simply load the class discussion with items that are not very thoughtful or original, or perhaps not even on the subject. For example, many instructors use tools that automatically count the number of messages written by a student as a proxy for that student's participation [47]. However, care should be taken to avoid counting superficial posts [48]. One way to detect these 'low value' messages is to judge the reaction of other students. If students are not responding to messages written by a certain student, then either the postings are of little value, or they are too verbose and the other students are not taking the time to read and respond to those messages. Either way, responses to web conference messages can act as a proxy for the value of the student interaction.

4. ASSESSING & ENCOURAGING SMALL GROUP COLLABORATION

In collaborative learning, the common goals are educational and generally culminate in the creation of an educational product. Small group collaborative learning has been shown to result in higher achievement, less stress and greater student satisfaction, and greater appreciation for diversity [20, 21, 55, 56, 57, 58]. Some educators suggest that it may be particularly important and well suited to the online environment as a way of incorporating the social aspects of learning into a virtual environment [28]. Indeed, there is research which suggests that collaborative learning may be very effective online [9, 10, 17, 59]. For example, Hoag and Baldwin [60] found that students learned more in an online collaborative class than in a face-to-face classroom comparison, but that they also acquired greater experience in teamwork, communication, time management, and technology use. On the other hand, some research also suggests collaborative online learning must be carefully managed to be successful when small group projects are employed [45, 61].

First, learning the course content must be an outcome of small group work or why include it, and so it is important to carefully consider what kinds of content can best be learned collaboratively. Students learning to solve problems in a range of content areas can benefit from considering multiple approaches to solutions by working toward collaborative ones. Students learning research and writing techniques can similarly benefit from collaborative endeavors. Such activities can be assessed by assessing their products, but it often helps to break larger tasks into smaller pieces that are also assessed.

At the same time, learning to collaborate with others is an important skill in itself. Thus it is important to consider what collaborative skills one considers most important and develop ways of

assessing them. Curtis and Lawson [58], for example, identified the following behaviors as supportive of collaboration:

- Giving and receiving help and assistance
- Exchanging resources and information
- Explaining or elaborating information
- Sharing knowledge with others
- Giving and receiving feedback
- Challenging others contributions
- Advocating increased effort and perseverance among peers
- Monitoring each others' efforts and contributions.

These behaviors can be noted and assessed by instructors monitoring the discussion.

5. INTERACTIVITY, COLLABORATION, AND ONLINE LEARNING COMMUNITY

Many researchers have defined what a learning community looks like in an online environment and have stressed its importance from different perspectives. Yuan and Kim (2014) stated that a learning community was the creation of a sense of belonging by a group of learners, where learners trusted one another, constructed knowledge, shared useful information, established connections by getting to know one another, set up common objectives for learning, and believed that their needs would be fulfilled. Cox and Cox (2008) contended that asynchronous, threaded discussions can be effective in creating a collaborative learning environment as well as interpersonal and group dynamics.

Online learners benefit greatly from online learning communities in the following ways: (1) because of their connectivity with one another, they are able to share knowledge and fulfill common goals, which can reduce students' dropout rates; (2) the relationship and interaction between the instructor and learners and among peer learners can increase student performances and their satisfaction of the course; and (3) learners can receive supports and help from their peers, and at the same time they can add their knowledge base through their interactive actions (Yuan & Kim, 2014). Yuan and Kim (2014) provided the following guidelines for the development of an online learning community:

- The effort to build a learning community should start at the beginning of a course and continue throughout the term.
- Both students and instructors should be involved in building the learning community.
- Asynchronous and synchronous technologies should be both used to create a shared space in which students and instructor interact.
- Various strategies should be employed to stimulate discussions.
- Both task-oriented discussions and social interactions should be encouraged.
- Students should be assigned tasks that require collaboration.

6. CONCLUSION

In this paper, we have argued that the assessment of collaborative learning in online courses is critical to its success. We have acknowledged that assessing collaborative learning is difficult because it requires radically rethinking traditional evaluation techniques. However, we believe such rethinking is also critical because collaboration among students has been repeatedly shown to enhance the effectiveness of online learning. In the body of the paper, we have explored issues surrounding the assessment of three categories of online collaborative learning—collaborative discussion, collaboration in small groups, and the collaborative design of assessments themselves—and given suggestions for developing such measures as well as examples of evaluations successfully used in online courses. Across these discussions, a general approach to developing assessments of collaborative learning can be discerned. The first step in the process

involves specifying the explicit learning goals one wants to achieve through collaborative activities. It is important here to choose goals deemed critical to the success of the desired learning activity, and to consider both content learning and the development of collaborative skills, process and outcome goals, individual and group learning. The next step is to identify specific behaviors that can provide evidence of achieving the selected goals and to assign values to each corresponding to their perceived importance to the collaborative activity. One good way to do this is to develop rubrics which provide finely-detailed characterizations of student performance of each identified behavior at multiple levels with differential values assigned to them. If you choose to have students develop their own assessments, it is important to help them create equally explicit evaluation criteria, perhaps by supplying them with templates to support such development.

In that vein, it is terribly important to clearly communicate assessment procedures to students through course documents available at the beginning of a course and accessible throughout it, and through ongoing and timely feedback using the criteria outline in these documents. In sum, online learning changes not only the nature of teaching and learning, but also the nature of effective assessment processes. Learning and student assessment are not two distinct phases of the course process, but rather, assessment not only guides and motivates the learning, but also can be part of collaborative learning and community building in ALN. Recognizing this evolution in assessment practices, documenting and sharing procedures and rubrics that work and conducting empirical research to evaluate the relative effectiveness of different online practices for assessing collaborative learning, should play a prominent role in ALN research.

7. FUTURE SCOPE

In the future, we are going to introduce advanced code analysis mechanism that can inspect students' code according to software quality metrics. We encourage that students can write code with good qualities in addition to writing code that meets assignment requirements. Moreover, we also want to develop a team project feature that allows instructors to form teams and assign team projects.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.

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