Increasing Students’ In-Class Engagement through Public Commenting: An Exploratory Study

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Abstract—Student engagement is a pervasive and persistent goal for educators. In previous work we have reported that activities like public real-time commenting on videos can enhance student participation and engagement [4]. However, these events occur over a limited period of time. Thus a more challenging question is how to increase and sustain student engagement. In this paper we describe the iterative development of ClassCommons, a public commenting system with which students can post questions/comments that are shared through a public display in the classroom. The system was used in a senior undergraduate class in the spring semester of 2009. Our findings suggest that students were interested in this system. Students with different self-construal (independent vs. interdependent) appropriate this system for slightly different purposes. In the long run, we speculate that by having the teacher involved more in using this system (responding more quickly, helping structuring the discussions), it has potential for promoting sustained student engagement.

Keywords - Public display; active learning environment; student engagement

I. INTRODUCTION

Student engagement is a pervasive and persistent goal for educators. Studies have found that levels of engagement predict subsequent learning and development outcomes[1]; apparent engagement is also an indicator to instructors of students’ underlying motivation [2].

Providing an active learning environment may promote student engagement. In active learning, faculty serve as facilitators of learning, and students have the opportunity to initiate topics to discuss in class and they actively participate in thinking, asking and answering.

However, in many university classrooms students have little opportunity to be active participants. Instead they are often treated as passive information receivers. They listen to the lecture, take notes and leave at the end of class. Only the students who are confident and bold enough can benefit by actively answering teacher’s in-class questions and questioning the teacher when they feel lost. Further, in most classrooms the time spent on student-student interaction (group work, discussion) is no more than 20 percent [3], because teachers typically need more time to progress on their teaching goals, and must minimize the time allocated for students to learn and to explore together.

In prior work we have demonstrated that teachers can enhance student participation and engagement by interactive activities like public real-time commenting on videos [4]. However, an event like video commenting takes place over a limited period of time (e.g., in [4], the videos were viewed in two class sessions). A more challenging question is how to sustain student engagement in the many different activities and topics that arise during an 18-week course.

In this paper, we report the iterative development of ClassCommons, a system aimed at initiating and sustaining higher levels of student engagement. As a more concrete example of use, consider this ClassCommons design scenario: Jessica finds that she does not quite understand a concept just discussed in class, but she is too shy to raise her hand. Instead she uses ClassCommons to post a question on the public display. The teacher then addresses the question orally; meanwhile other students contribute to the discussion by posting their own thoughts on the public display. The system gives students another channel to communicate with the teacher and also with other students. They can easily initiate in-class interactions and they may appropriate the use of the system as they wish.

In the balance of the paper we first review related work on use of technology in the classroom and outside of class to facilitate learning. After this, we describe ClassCommons system and its iterative development. Next, our experiences using this system in one class are summarized. Finally, we discuss design implications for future endeavors.

II. RELATED WORK

Information and communication technology (ICT) can raise promising opportunities for educators if they are properly embedded in the learning context. Leveraging the increased availability of handheld ICT, researchers and practitioners have invested significant effort in building and evaluating Class Response Systems (CRS), with the general aim of enhancing in-class communication. Many variations of CRS have been proposed and studied [5]. For example, the instructor can raise a multiple choice question using the CRS system, students submit their responses by push some buttons on some handheld devices and the instructor chooses whether or not to display the result, perhaps also deciding whether contributions are attributed or anonymous.
CRSs have been successful to a certain degree. The benefits of CRS include increases in student engagement, better understanding of complex subject matter, and higher reported interest and enjoyment [5].

At the same time, several problems with CRSs have been discussed [5]. First, the interaction model is simple and limited. The instructor can not obtain a rich understanding of what students are thinking. Second, the interactions are only initiated by the teacher. While a touted benefit of using the system is to support students who are too shy to raise their hands in the class, it is the teacher who initiates the interaction; only then do students respond. Students continue to be relatively passive actors who react to teacher-initiated issues. Third, the interactions remain teacher-student interactions, not student-student interactions.

More recently, the development of note-taking systems has incorporated student-teacher interaction [6]. However, in these systems, feedback is simple and limited (for example, feedback about the speed is the lecture). We are interested in giving students more power to express themselves during the class.

The ClassCommons system described in this paper extends the CRS concept, allowing students to initiate topics. Instead of just pushing a button to send their responses, students can type what they wonder or think and share it with the teacher and peers. Though simple in concept, this is a rather bold idea in that any student has the same right as others (including the teacher) to “say” something. It will be interesting to see what kind of messages students post and what impact it has on students’ learning experience. None of the literature mentioned in the review has reported on an extension of this sort.

Another common ICT used in support of education is the online discussion. Class Commons differs from such forums in several aspects. First, discussion forums are usually used outside of class, while Class Commons aims to augment or complement in-class discussions. Second, the visibility of message content in ClassCommons is high: each message is shown on a public display that is always on, even though it may be peripheral at times (e.g., when students are engaged in a small-group interaction). This constant availability raises the potential for direct impact on students and teachers in the classroom. Other differences include the fact that the ClassCommons interaction is synchronous. Any time a new comment is posted, the teacher can choose to address it immediately in class; other students can follow up as well.

III. ITERATIVE SYSTEM DEVELOPMENT PROCESS

In this section, we first describe the architecture and configuration of ClassCommons. Since this is a new direction in classroom technology and pedagogy, we used the iterative development approach. In our approach, the first iteration was to minimally instruct the students what they should do, and to leave the appropriation of the technology up to them.

The ClassCommons system is designed for the collection, management, and real-time publishing of students’ comments, questions, and feedback during class. Students post their messages by accessing a web page. The messages are stored in a web-server that presents the messages on a public display. The system implementation uses a client-server architecture with three components: a client device (any device with web-browsing capabilities can be used, e.g., web-enabled PCs, laptops, mobile phones, etc), a central web server and a large public display.

A. An Advanced Usability Engineering Class UEC

The most recent trial of ClassCommons took place in a project-based usability engineering course (UCEC) in a large university in Northeastern United States; students were primarily seniors in an information sciences and technology program but there were a few junior-level students in the class. UEC had 45 students; 40 were males, 5 were females. The class met in a large classroom for 75 minutes on Mondays and Wednesdays. The instruction is delivered in workshop style, with participation by teacher and students.

B. Phase 1: The Initial System

Before the spring semester began, ClassCommons was deployed on a web server and every student enrolled in UEC was assigned a user id and a password. After logging in with these credentials, students were able to use the Web client to post messages; they could also view the history of messages using this application. The Web interface also displayed the names of the 10 most active students, in an effort to promote participation levels.

The public display visual interface was designed to attract students’ attention (Figure 1). A contrasting color design scheme was used, with a black background color and red text. The 10 most recent messages are displayed as a block on the public display. To increase the accountability of the messages, the name of the student making the post (in white) is appended to the beginning of the comment string. Every 30 seconds, the whole block is refreshed, with the block filling in from the bottom of the display to the top.

Students’ participation in ClassCommons fluctuated during the first twelve weeks (when this version was in place). Activity was steady in the first two weeks, with an average of about 27 messages per week. However in the following 10 weeks the number of posts declined, with an average of about 4.7 messages per week.

C. Focus group interviews to collect students’ feedback

To improve the commenting prototype and increase participation, we conducted a group interview with students in the 10th week. Eight students participated in the focus group; one female and seven male students. Two were active users (posting>15); three were modest users (posting<10); and three had never posted messages. The focus group lasted about 30 minutes. Generally, students found ClassCommons to be entertaining and to enable communication with teacher. They suggested improving the system in these two ways:

1. Concerns about real name but also mixed feelings about being anonymous: Students have mixed feeling about having their names displayed along with their comments. “For people who are shy, they do not want to post with their
names on there”. However, posting anonymously also “makes more mischief”. Anonymous posting is not appealing to students who want to have their names displayed. “You have no incentive to watch what you write”.

Expect immediate responses from the instructor: Students mentioned that since the public display “is behind his (the instructor’s) back most of the time” and “he (the instructor) is not really looking at it”, the instructor cannot respond to students’ questions immediately. Not being able to get immediate responses from instructor makes them feel “being ignored” and thus affects their willingness to use the system as a question-asking agent.

D. Phase 2: The Modified System

We made several improvements on the Class Commons system with respect to how the system is seen and used based on students’ feedback.

Public anonymity, private accountability (PAPA)[7]: Because some students prefer to post anonymously while still getting credit for posts, we added the PAPA feature, allowing students to choose an alias. As aliases we used the abbreviations for the 50 states of America. In the modified system, after students log into the system, they are directed to a page where they can choose from available aliases (Figure 2). For that session the alias is tied to that student. After the student logs out, the alias is recycled such that other students can use it in the future. If the student posts a message, his/her alias is displayed on the public display. At the same time, the teacher still knows to whom each alias is tied, achieving the goal of PAPA. Students who prefer not to use an alias can skip this step.

Redesigning the public display interface: To address the common dissatisfaction that the scrolling animation was distracting, we disabled the animation. In the new design, the whole page remains static as long as there is no new post. When a new post arrives, the display is popped down onto the stack, pushing the whole block down one message. The latest post is displayed in light yellow and in a slightly bigger font size. This change makes it much less distracting but it still can catch students’ attention.

In the 12th week (April 1, 2009), students began using the new system; it was used for five more weeks, at which point it was the end of the spring semester.

IV. Data Collection

We collected multiple forms of converging data, including pre- and post-surveys, usage logs, and the intermediate group interview summarized earlier. To contribute to research discussions about how different students might react differently to classroom ICT, we also included questions aimed at exploring how personal characteristics might influence students’ use and reactions to the technology. One characteristic of interest was self-construal [8].

Self-construal (independent and interdependent construal) reflects an individual’s sense of self in relation to other. People with independent self-construal view the self as stable and separate from others; they value self-promotion, autonomy, assertiveness, and uniqueness. People with interdependent self-construal, on the other hand, see the self as more flexible and intertwined with the social context, and value maintaining group harmony and fitting in. Studies have found that people with different self-construal are associated with different value systems, which may promote different behavioral processes[9]. We hypothesized that students who are more independent would be less likely to use the system because they may prefer to speak up directly to have their voiced heard, while students who are more interdependent will prefer to contribute in a more backgrounded and anonymous fashion.

V. Results

The Classcommons system was used during an entire spring semester. We observed a fluctuation in students’ participation rate along the way. The general pattern of contributions to ClassCommons was that within the first two weeks after the system (and again after the revised system) was introduced, participation rate was relatively high. But as time went on (and presumably the novelty wore off), students’ participation rate was reduced. 46.7% (21 out of 46) of the students posted to the system at least once. Altogether 185 messages were posted, with 93.5% (173) of the messages posted by students (i.e. rather than the teacher or teaching assistants). The average length of the posts was 8.55 words (standard deviation=7.89), with almost half (47%) shorter than 5 words. 23.3% of them were between 6 and 10 words; 20% are between 11 and 20 words; and 9.7% are more than 20 words in length. Another result worth noting is that although in the revised system, students who posted messages all chose to post with an alias instead of using their name.

Figure 1. Left: the Initial Public Display Design, right, the new design, the yellow message is the latest message

Figure 2. Interface for students to pick up an alias
A. Participation increases after the system improvement

Because the two ClassCommons prototypes were used for differing lengths of time, and because there seemed to be a novelty effect that gradually dissipates, we compared participation rates at two similar time windows – the first four weeks after each of the systems was introduced. One of these is from Week 1-4 (original); the second is Week 12-16 (revised; week 13 was ignored because the instructor was away and the system was not used). From week 1-4, a total of 64 messages were posted; from week 12-16 there were 83 messages. Four students who posted nothing using the first version did start posting with the new system. We found that in general, after the system was revised 15 out of 23 students increased their rate of message posting. It is difficult to know whether these increases were in fact due to the design changes (or whether those who decreased were also affected by the design changes). It may be that the system was perceived as more useful by some students and less useful by others; or it may be that other characteristics of the classroom setting (e.g., early or late in the semester) were important factors that influenced participation rates.

B. The effects of personal characteristics on system use

The interpretation that the PAPA redesign was perceived differently by different students makes it important to understand what underlying factors might be associated with these differences. Using data collected in the entrance survey, we investigated whether students’ self-construal [8] might influence their level of participation.

The 32 students who completed both entrance and exit surveys form the base of the self-construal analysis. We measured self-construal using 24 items adopted from [8]. The internal consistency was tested by computing Cronbach’s alpha coefficient which was 0.60 (independent scale) and 0.62 (interdependent scale) respectively; according to [10], alpha values over 0.5 are acceptable for a scale intended to measure psychological constructs. Students’ interest in this system (“The ClassCommons postings were interesting.”) and attitude toward anonymous posting (“Contributions to the ClassCommons discussion board should be anonymous”) were measured using a 7-point likert scale question respectively (1: Strongly Disagree, 7: Strong Agree). In general, the exit survey revealed that 61.9% of the students report some interest in this system; 65.6% like posting anonymously (using ratings greater than 4 in both cases).

To explore students’ reactions in more detail, we used regression methods to explore the relationship between students’ independent and interdependence values and the two scales probing general interest and anonymity. This analysis showed that students who are more interdependent prefer anonymity in the posting (p<0.05). We also found that students who are more independent are less likely to rate the system as interesting (p<0.01). Note that this contrast could be mirroring some of the items in the self-construal scale. For example, one item states “Speaking up during a class (or a meeting) is not a problem for me”. According to this scale, independent individuals would prefer to speak up directly, and thus might not need this system for communication.

To gain a further understanding of how students with different self-construal react to the system, we contrasted the 10 most independent students versus the 10 least independent students, to see if they posted different sorts of messages. Five of the 10 most independent students posted messages, for a total of 26 messages. However only two of the 10 least independent students have posted messages, for a total of 17 messages.

When we looked closely at these two sets of messages it did appear that students with contrasting degrees of self independence posted different messages. For those high in independence, most of the messages reported problems with the system or the course; indeed some of the messages are teasing about some deficits of the system as well as some other systems used for the course (e.g., “[The Bridge system is] effective at making our group lose content”). Other messages from this group include “Does anyone else feel like Bridge is not an effective collaboration tool?”, “Did anyone actually use Bridge for some of the collaboration purposes such as work negotiation, etc other than posting content to the wikis?”

In contrast, messages posted by students who are low independence are notably different. Most of the messages this group posted involve seeking help from others in the class or sharing information. Example messages include “reading guides? Outlines? Collaborative reading? What would help?”, “What would make people use it (the system)?” and “ConeTrees (twitter): Card Sorting: How Many Users to Test URL: http://tinyurl.com/c741ms”.

C. Seeing into the nature of the messages

To understand what value ClassCommons added to the class, we now offer a more qualitative analysis of the nature of the messages posted. Two researchers are involved in the coding process. The two researchers went through the messages independently and came up with a list of categories respectively. Then they compared the categories and set a formal message coding criteria. On the first level, messages were coded as class related (messages that were related to the class, no matter they were positive or negative messages) or non-class related (messages that were random and had nothing to do with the class going on). Within class related messages, the messages were then coded into 7 types (Table 1). After coding independently, the two coders compared their results, read through the difference and settle the divergences together. The inter-coder reliability was .80. The majority of the messages posted are class related (91.9%).

The most common messages were those reporting problems with either the course or the system, but these were closely followed by messages whose goal was to socialize or entertain (or perhaps to just “drive” the system), or more operationally to poll other students for opinions, generally about possible changes to the current course plan. The socializing messages often also served as an “ice-breaker” on
any given day, in that they were sometimes followed soon after by other more class-related comments. Note that if the two forms of sharing (reflections and information) are been combined into one overall sharing category, which would have made this the largest message type; we find this quite promising given our goal of promoting more interaction and active learning.

Table 1: Class Related Message Categories and Examples

<table>
<thead>
<tr>
<th>Message Type (%)</th>
<th>Example Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problems or suggestions (24.2%)</td>
<td>“powerpoint notes URLs aren’t working”; “The videos referenced in the quiz review were assigned for next class, not this one”</td>
</tr>
<tr>
<td>Greetings, slogans, fun (20.6%)</td>
<td>“LOL HAY GUYZ”; “Hello World”; “the keystone state has decided to secede from you clowns”; “Beat Sparty; Go Blue Baracudas”</td>
</tr>
<tr>
<td>Polling or voting (18.2%)</td>
<td>“Next Monday (3/23) is JAMPACKED with work: Quiz 7 + HW 7 + Group UI Design. Who wants to change this?”; “Class vote: who wants to move the case study due date up a few days (i.e. Wednesday instead of Monday)”</td>
</tr>
<tr>
<td>Information sharing (12.4%)</td>
<td>“ConeTrees (twitter): Card Sorting: How Many Users to Test URL: <a href="http://tinyurl.com/c74lms%E2%80%9D">http://tinyurl.com/c74lms”</a></td>
</tr>
<tr>
<td>Offering reflections, thoughts (12.4%)</td>
<td>“You can definitely succeed without this Usability Engineering stuff. Just look at Vista; “We can’t have too much creativity in this stuff. We’re designing interfaces, not making an episode of Robot Chicken.”</td>
</tr>
<tr>
<td>Seeking help, asking questions (10.6%)</td>
<td>“How many pages was your homework?”; “Reading guides? outlines? collaborative reading? what would help?”; “Can someone give a VERY simple example of bottom-up versus top-down?”</td>
</tr>
<tr>
<td>Countering spam (1.8%)</td>
<td>“Hey, Tom, take it easy”; “Spammers Suck”</td>
</tr>
</tbody>
</table>

The least common message type was those aimed at reducing the use of ClassCommons for inappropirate content. Note that these “Spam” messages are not included in Table 1 as we analyzed only the messages that were class-related. However the fact that fewer than 10% of the messages were non-class-related contrasts with our earlier study that took place over a briefer time in an introductory class [4]. It may be that the presence of non-class-related activity, as well as the smaller and more advanced course setting, helped to make this public channel more “well behaved”.

In brief, our in-depth analysis of the messages suggests that that ClassCommons gradually became a tool for students to contribute to class discussion and organization; at the same time the playful comments posted by students added on-going “fun” to the class which might also help to keep students engaged in class activities.

VI. DISCUSSION AND CONCLUSION

The ClassCommons tool augments face-to-face in-class discussion in two aspects. First, students and teachers can participate in the discussion simultaneously, reducing production blocking. Second, in traditional in class discussions some information exchange cannot take place. A public commenting tool helps to get such content noticed. Without ClassCommons, it is hard to imagine how those entertaining, ice-breaking messages could happen.

As we have shown in the focus group interview, students expressed a need for more instructors’ input. In the class exit survey, in response to the question as to how to improve the system in the future, the main suggestion is that students asked the instructor to interact more with them using the tool, e.g., posing topics or structuring the discussion. Further, the fact that different type of people might want to use this type of system for slightly different purposes raises another question for designers. What can designers do about that? It is a question worth pursuing in our future study.

There are some limitations with the study. We inferred students’ engagement from the messages posted and students’ reactions in class. To make a stronger argument about increased engagement, a controlled experiment will be conducted in the future.

ACKNOWLEDGEMENT

This research was supported by the National Science Foundation under award 0735440 from the Advanced Learning Technologies (ALT) program, and by the Edward M. Frymoyer Chair Endowment.

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