The Application of Social Presence to Improve Retention in Online Problem-Based Course

D.W. Gore, P.E.
Middle Tennessee State University, Murfreesboro, TN, USA

Abstract—**The single most important factor that contributes to retention in an asynchronous online course is student self-discipline. The author has been teaching an Engineering Economy problem-based course as both an "on-ground" (in-classroom) and as an online course and noticed very early after the course changed to an online format that the student dropout rates increased significantly. Students have stated their primary issue in the online course format was the need for self-discipline to meet the course deadlines for assignments and tests to keep from getting behind. The use of online video meetings has increased the "social presence" of students with each other along with the instructor and has had a positive impact on those students needing more social presence to bolster self-discipline. Most studies in this area of social presence involve student surveys as a measure of overall course satisfaction based on classroom collaborative learning versus online collaborative learning. This study differs in that results-based retention (or dropout) data is collected and statistically analyzed over a six-year period.**

Index Terms: **problems-based course, online retention, distance learning, social presence.**

I. INTRODUCTION

The traditional course in Engineering Economy consists of the traditional methods of economic analysis in engineering, including time value of money, equivalence, economic measures of worth, selection rules for alternatives, corporate income taxes & equipment depreciation, inflation and uncertainty. At Middle Tennessee State University (MTSU), the in-classroom version of this course has evolved from a problems-based format in 2005, to an online format with optional in-class problem sessions in 2008, and then to its current online format with optional online video problem sessions in 2010. (Problem sessions were required to be "optional" to maintain the integrity of the course as an online course rather than as a "hybrid" course that is defined as having both asynchronous online and synchronous components which are either online or are in-class).

To meet the requirements of a new distance-learning program in the MTSU Engineering Technology Department's Construction Management area the course was changed from the in-class version to the first online distance learning version. This online version was accessible by all students either on-campus on off-campus. Obviously, the distance-learning students could not attend the optional problem session on campus so the final online version was initiated that involved use of video conferencing problem sessions which were available to everyone regardless of location.

After each online format was started, it was observed that the retention rate changed noticeably, and it was decided to see how the formats, specifically the degree of collaboration from one format to another, may have affected retention (or dropout) rates. A brief discussion of the different course formats is covered in this paper before the data and analysis is presented.

II. BACKGROUND: COURSE FORMAT EVOLUTION

A. Classroom format with enhancements

In order to improve student learning of rather complex materials in a semester's time, the Engineering Economy course was changed to a problems-based course in summer 2005 based on the model described at the Middle Tennessee State University (MTSU) Information Technology Division (ITD) Faculty Institute by Notre Dame University [1]. Further course enhancements using technology-based learning exercises were included in the course in summer 2006 as the result of a roundtable discussion at MTSU hosted by the Learning, Teaching & Innovative Technologies Center (LT&ITC) and presented by reference [2]. To solidify the course for all learning styles a more traditional classroom overview was suggested at this roundtable by reference [3] and was also added to this course in the summer 2006. As a result, lectures with supporting materials were provided online with interactive online learning exercises so that classroom time was spent as a problem-solving lab. In class the overall concepts were reviewed very briefly without a detailed lecture, and then the students would work in small teams and collaborate to solve the assignment homework problems with input from other students with input from the instructor as needed.

The use of the problems-based team learning and classroom interactive PC-based exercises as well as interactive instructor-led problem solving is highly recommended for those courses where problem solving is critical. The use of PC-based software, such as Captivate®, is recommended to improve student learning both online and in-class since it is "user friendly" and customizable for interactive learning using self quizzes.

There was no significant improvement in reducing low grades (D's or F's); however, there was a significant decrease in the student dropout rate during the two years this in-class teaching format was used [4], possibly due to the increased social presence through collaborative learning in small groups as discussed later in this paper.

Retention measurements do not include initial drops that occur at the first of the semester due to the influence of non-related factors such as the normal "drop or add" activity caused by student re-balancing coursework, or desire to take another course instead of Engineering Economy. The retention rate measurement is the percentage of students taking the final exam that

completed the course as opposed to those students who completed the course and received a grade (D or F), but did not take the exam. These students are counted as "dropouts" who most likely gave up due to lack of staying current with assignments and quizzes. This figure is shown in Table 1 as 95.2% average retention rate over 2 years for the in-class format.

B. Online format with optional in-class meetings

The next logical step was to go completely online with the problem sessions described in (*A*) as "optional" for those students desiring the in-class interactivity and social presence. Two major issues surfaced during the 2-year period this format was used:

1) Since the course was 100% online, many students either could not attend the in-class problem sessions due to schedule conflict with other classes, or could not attend due to distant location from campus, or did not want to schedule and attend a non-required class meeting.

2) Due to low attendance the student team interactivity was very limited and the instructor was usually working with students one-on-one to help the student with his or her specific problem. This method proved inefficient since the instructor would have to repeat the same information to each student having the same problem.

It became clear that there was a problem with retention since there were a noticeable increase in the number of students that would apparantly "give up" and not take the exam as compared to the in-class collaborative format. With face-to-face communication, reference [5] noted that students are able to enjoy the verbal and nonverbal cues that provide instant feedback. Distance education removes these instant cues and can create a cold environment. Reference [6] noted that participant attrition rates are often negative due in large part to the feeling of isolation. Reference [7] research supported that many online learners were frustrated by the methods of communication and technical impediments to social interaction among peers. Reference [8] states the reduction of social interaction was a factor that negatively impacted student satisfaction in distance education. As a result of the high dissatisfaction among students, reference [9] provided support for the high attrition rate among online learners.

Over the same number of semesters as in (A) the average semester retention rate dropped 6.3% from the 95.2% previous in-class format to 88.9% using the online format with the optional in-class problem sessions as shown in Table 1.

The solution to potentially improve this rate was to return to the social presence and sudent collaboration enjoyed in the in-class format, by putting the problem sessions online rather than in-class and to mitigate the issues found with the optional in-class meetings. This solution is the subject of much discussion in the online community. The primary research question is: Is there a difference in satisfaction with the course between the group of learners who chose an online collaborative format and the group who chose a face-to-face collaborative format [10]?

C. Online format with optional online meetings

For the past two years, the online course has been modified to have optional online problem sessions with the results also indicated in Table 1. The results in retention rate improved slightly, over the online course with optional in-class meetings, but still not as good as the in-class format. The question of significance of this data was analyzed with the results illustrated in section III, *B*.

TABLE 1.

RETENTION % BY SOCIAL PRESENCE

Semester	Social Presence		
	A. In-Class 2005-07	***B. Online: In-class meetings 2008-09***	***C. Online: Online meetings 2010-12***
1	100	79.2	97
2	88	85.7	94.1
3	94.1	95.7	100
4	95.5	94.4	85.2
5	100	88.2	90.5
6	93.8	90	84.4
Average %	95.2	88.9	91.9

Offering this format also has its obvious disadvantage that the online meetings are optional. Typically more than half of the students could not attend meetings due to conflicts with other classes that required attendance at the same time the optional online meetings were scheduled. These meetings were recorded and were available for students to learn content but without the social interaction desired. Even though attendance was lower than desired, it was much better than the online meetings with the optional in-class meeting format (see II, *B*) which typically had very low attendance of 10 to 20%.

Online meeting class participation was facilitated by the instructor and encouraged by including extra points for students that presented their solutions online to other students. Most students prefer using the chat function over the audio or video (which is working out well for a profoundly deaf student who is in the summer 2012 class). Formal discussion areas for students to prepare for these weekly online meetings were made available to enhance small group student interaction but were not generally used. Instead small informal study groups formed to prepare assignments after the online meetings but before the weekly Excel® spreadsheets were due in the course management system Desire-to-Learn (D2L) "drop-boxes."

The average retention rate of 91.9% shown in Table 1 falls between the in-class format (*A*) and the online format with optional in-class meetings (*B*). Significance is discussed in section III, *B*.

Also, it's noteworthy to mention that the overall final exam averages have not changed significantly for these formats, with a *p*-value of 0.232 for averages of 82% for format *A*; 81% for format *B*; and 84% for format *C*. This

finding is consistent with the conclusion stated in reference [10] (see III *A.* paragraph 2 that follows).

III. IMPROVING PRESENCE ONLINE

A. Background

Reference [11] found that "social presence could be promoted in a computer-mediated communication (CMC) setting by employing strategies that encourage interaction." The instructional designer of tomorrow needs to be prepared for properly using tools to help motivate and encourage learning using applications common to the new learner. These commonplace tools, with proper mediation should encourage more opportunities for interaction.

Reference [10] used survey questions and performed a t-test for independent samples that showed no difference in the perceived social presence of computer-mediated communication technologies between the online and face-to-face collaborators ($t(29) = 1.23$, $p = .23$). This study examined whether there was a difference in overall satisfaction with perceived knowledge gained between learners who chose to collaborate online and those who chose to collaborate face to face. The quantitative finding of no difference has implications for course design wherein collaborative activities comprise a major portion of the course work. If learners are able to choose their collaborative format, it is expected that they would select what is most comfortable for them to bring about satisfactory results.

So, a major objective for the online designer is to find the tools and use them effectively to improve social presence to the point that makes the online class no different than the on-campus class and improve retention to the same levels.

One activity for building a community is through the use of live chat. Live chats offer an opportunity to provide a less formal, more personal style of communication, which is often favored by students [12]. Plus, the reduction of time-dependent communication is something that individuals seek when communicating on certain topics or have specific questions. Reference [12] identified that instructors who participated in chat sessions where considered more salient or real compared to those instructors that do not participate in live chat sessions.

Another action step that can be taken to enhance community in an online learning environment is to provide personalized emails. Reference [12] found that personalized emails create an impression that the instructor is warm and involved. One author uses personal email to follow up with students who have not participated in course discussions or who have not submitted an assignment. The response from students to this simple follow-up (the message is typically brief and ends with the question, "Is everything okay?" is overwhelmingly positive with students often explaining their circumstances and concluding their response with a thank-you for showing a caring attitude.

The author uses these activities from reference [12] in the current online course using the Desire-to-Learn (D2L) course management system. One activity used in the author's course that can help to enhance an online community is to incorporate audio and video to enhance text-based content. The tool used in the online meetings is Elluminate © Online Rooms in D2L where online video and audio is used to communicate with students and to display the instructor's or student's spreadsheet in working on Engineering Economy assignments. Reference [12] stressed that employing audio and video into online learning can help to enhance communication and involve cues normally found in the face-to-face environment. Video and audio files have repeatedly proven themselves beneficial in terms of the reaching students in a way that standard text cannot [13].

B. Data Analysis

The data from Table 1 was analyzed using Design Expert 8 (DX-8) Design of Experiments (DOE) software by Stat-Ease Corporation as a single-factor general factorial experiment with 3 levels (or treatments that represent the 3 types of meeting formats from Table 1), with each level having 6 replicates (representing the 6 semesters covered by each course format). This software was chosen for its ease of use and program outputs which include the graph shown in Figure 1 using the data from Table 1. (This test is essentially an ANOVA *F*-test).

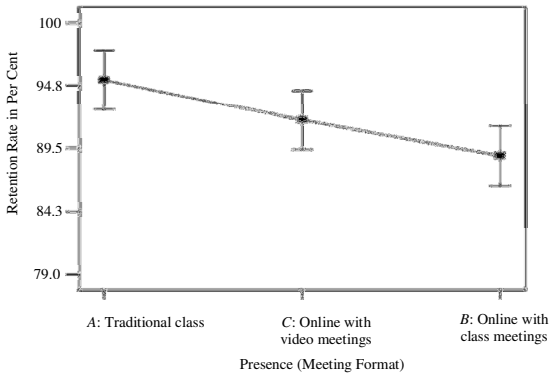

Figure 1. Presence (Class Meeting Format) versus Retention Rate %

At a 90% confidence level the traditional class has a higher retention rate than the online class with optional in-class meetings (*F*-value of 4.3 and *p*-value of 0.065). Note from Figure 1 that the "I-beam" bars representing the Least Significant Differences (LSD) do not overlap between these two meeting formats.

However, the center LSD bar representing the current online class with optional online video and audio meetings overlaps both the traditional class and the former online class format where the optional meetings were in-class. This ANOVA has an *F*-value of 1.89 and *p*-value of 0.0185 which indicates there is no significant difference in dropout rates when using this method unless one is willing to accept an 80% confidence level.

C. Conclusions

All the research sources are in agreement that social presence improves student satisfaction and retention. This study reinforces that basic finding by demonstrating that retention rate does in fact have a close relationship to the social presence by examining data from three course formats. It is clear that, for the problems-based course

studied, the average retention rate drops from 95% to 89% when comparing the high social presence of the traditional in-class format to the low social presence of an online class with optional in-class meetings.

The same online class with optional online class meetings shows promise in improving the social presence over optional in-class meetings; however, meeting attendance is still an issue that hinders the student interactions with each other as well as with the instructor. Such social presence is necessary for further retention improvement.

D. Recommendations

To help combat isolation and create a greater sense of community among learners, reference [6] suggested a "greater use of synchronous communication facilities." If students are required to attend class meetings online, then the social presence will increase and so will the retention rate. A *synchronous* format transforms the pure *asynchronous* online course with optional online meetings into an online course with scheduled online meetings that requires attendance by all students at a particular day and time.

Obviously many students benefit from the pure asynchronous format by allowing them more flexibility in course scheduling, so there is a tradeoff for flexibility versus retention. To attempt to meet both needs may require a two-section offering – a hybrid on-campus course with online lectures and in-class or online meetings which are synchronous with attendance mandatory, and the current offering of online asynchronous optional meetings. Due to the nature of the problems-based class, the traditional in-class version would not be recommended since the "class" would be a problems-based lab with lectures and study aides online as covered in Section II *A* earlier in this paper, and of course, scheduling flexibility is lessened.

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AUTHOR

D.W. Gore, P.E. is an Associate Professor at Middle Tennessee State University's Engineering Technology Department, Murfreesboro TN 37132 USA (david.gore@mtsu.edu).

He is a graduate of the Georgia Institute of Technology and Florida Institute of Technology; and has worked as a Senior Engineering Manager at Nissan North America for 19 years before joining MTSU in 2000.

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