

Are They Engaged? Strategies for Determining Student Engagement Online

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Abstract - As increasingly more opportunities become available for the delivery of online courses, concerns abound in academia regarding how best to involve and engage students as active learners. These issues prompted the authors to explore both instructor and student perceptions of engagement in terms of a survey and specific site statistics gathered from the learning management system (LMS) used in an online ethics course against students' final course grades. Details emerged on both the frequency and process of synchronous chats required in the course; communication by students and instructor; and how the students felt 'connected' to the course, instructor or fellow students. Final statistical results also demonstrated a positive outcome in regards to final grades with total site activity as well as with chat activity (synchronous discussion) in the course.

Index Terms – Online Learning, Student Engagement, Synchronous Communication, Learning Management System, STEM (Science, Technology, Engineering and Mathematics)

I. INTRODUCTION

The most recent explosion in the growth of online courses offered by higher education institutions has only strengthened interest in the continuing debate of how best to engage students in their virtual classroom environments [1]. As instructors increase the use of various aspects of technology now available within most learning management systems (LMS), the traditional correspondence course has slowly become obsolete. Tools such as electronic podcasting, assignments with instructor plagiarism-check features, discussion forums or blogs, and online synchronous chats are now often standard aspects in most online courses. These audio and video technologies can provide sufficient opportunity for student engagement as well as an increase in online learning demands [2].

The tools available within the learning management system aside, it has been suggested that interaction in online environments generates additional student centered learning and fosters greater participation from students [3, 4]. In addition, Warschauer (1997) considers interaction within online courses for student benefit [5]. Results from Haythornthwaite, Kazmer, Robbins and Shoemaker (2000) suggest that students that fail to connect within the online environment “feel isolated and more stressed than those who are more active” [6]. Based on previous work by members of this pilot study's research team, perceptions of the instructors, course effectiveness and course products were similar no matter the delivery system – traditional, distance or compressed [7].

Additionally, Davies & Graff (2005) determined that students who failed their online courses interacted less frequently than their counterparts [8].

Measures of student engagement offer valuable indicators of educational quality; yet have been mostly limited to use in on-campus settings. Robinson and Hullinger (2008) used key engagement dimensions that the National Survey of Student Engagement defined to measure student engagement in online courses from three universities and found that online students were modestly engaged in NSSE dimensions; and had a pattern of engagement that differed from on-campus students [9]. Significant amounts of research on engagement in online learning have been completed [10, 11] and various theoretical frameworks have been developed [12, 13, 14] in an effort to create a body of knowledge in the field. However, little research exists on distance learning engagement by STEM students, and virtually no research has been conducted on either engineering or technology student engagement in online ethics courses.

II. METHOD

Given these facts, researchers began a pilot exploration of student engagement during the fall semester, 2012, in one common ethical decision-making course taught in the School of Engineering and Technology at Indiana University-Purdue University Indianapolis (IUPUI). Various STEM majors from every department in the school register for the course as it is a requirement for several; so it was an excellent choice for researchers in regards to the large number and variety of students available to examine. Researchers were specifically interested in how the students' final course grades might be impacted by their overall site usage, chat and message activity; and students' and instructors' perspectives on communication, tools, chats and activity within the learning management system (LMS). This led researchers to seek answers to several questions:

1. Is there a significant relationship between any of the following LMS elements: overall site usage, chat activity or message activity and the students' final course grades?
2. What are the students' perspectives on course communication, tools, and synchronous chats within the LMS?
3. What are the instructors' perspectives on course communication, tools, and synchronous chats within the LMS?
4. Do both the students and the instructors feel that the students are 'engaged' within the course

given the current tools and elements available in the LMS?

The pilot study featured two online sections of the same sophomore-level engineering and technology ethical decision-making course in order to better understand the course and the study before a larger launch might be possible with the full number of sections (usually 8 or more) offered each semester. Two separate approaches were used to gather data. First, both the students and the two instructors were invited to participate in an electronic survey specifically for their group (students or instructors) to gain their perspectives on various aspects of the LMS. The response rate from each survey was 90% from students' survey, and 100% from the instructors' survey. The students in each of the two course sections were offered a small amount of extra credit points as an incentive to participate and the survey was available for approximately one week. The instructors were provided no incentive for their participation and their survey was also available for approximately one week of time. Each survey took the study participants approximately 5-10 minutes to complete depending on their short answer questions. Questions consisted of several sections including general information/demographics on the students, LMS usage, communication within the course & LMS, synchronous learning requirements, perceived engagement, and finally, opinion-based fill-in-the blank questions. Both surveys were designed with "skip" logic as well as those questions that were "required" to answer based on research goals with the project. The short-answer questions at the end of each survey provided consistency by reinforcing earlier participant perceptions, but this time in their own words. This helped to validate the new survey instrument the research team had developed specifically for the pilot and for the continued use with this study. The survey was also tested by one instructor and two students outside of the piloted sections prior to launch to verify questions were consistent to the study's objectives. None of their answers were kept within those reported, but were used for simple validation and developmental purposes. Further reliability of the survey instrument will be measured in future semesters as more groups of participants continue to take the surveys. The majority of survey answers (excluding student information and demographics) are reported in both the Results and Conclusion sections of this paper.

Second, researchers gathered the students' final course grades, site LMS usage totals, the chat activity totals, and messaging activity totals within the LMS for statistical analysis in order to better understand the LMS tools' relationships with the students' final grades in the course. Researchers hoped to discover if any of the LMS tools directly impacted final student grades in a significant manner as well as triangulate student perceptions of the LMS tools communicated in their survey.

III. RESULTS

Results will be categorized by the survey responses first, followed by the statistical analysis performed on the data taken directly from the learning management system (LMS).

A. Demographics

The piloted sections featured 32 students of which 73% answered they were male, while only 12 participants or 27% responded they were female.

Given that IUPUI is an urban campus, a good percentage of the students tend to be a bit older than traditional campuses. The age range of students in the piloted study is shown in Figure 1.

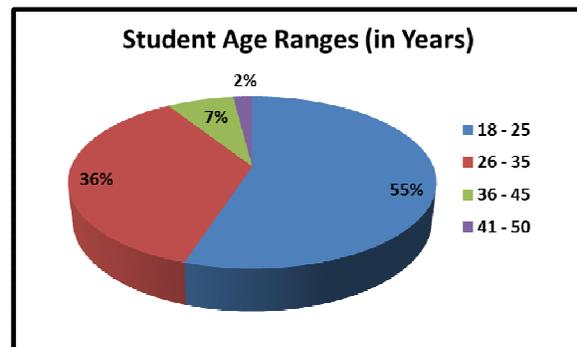


Figure 1. Student Age Ranges

Students in the pilot were also largely concentrated within the junior class the researchers discovered, but other class ranks were also represented as there is not a great preference in some programs *when* the ethical decision-making course is taken.

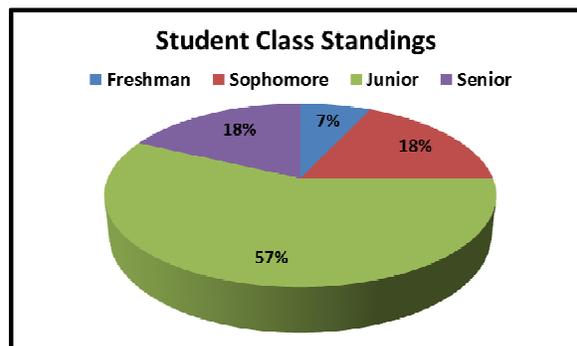


Figure 2. Student Class Standing

Researchers were also surprised to learn that 13 or 30% of the students in the course were majors from other schools at IUPUI such as nursing or general studies, meanwhile 31 students or 70% were actual School of Engineering and Technology students. Although it was anticipated that a percentage of the students would be from outside the School of Engineering and Technology, it was not expected for the number to be quite as high within the two piloted sections. The researchers look forward to expanding the study during the next two years to learn if this remains a consistent fact within the course sections examined.

B. Individual Engagement Initiatives

Individual students have the capability to engage themselves within the course material by connecting with the available tool, resources and the instructor as well as their peers if they so desire, whether it be a face-to-face (F2F) or online course. Within the online course and the

lack of time actually spent in the classroom, student engagement can be measured then by how often someone logs into the LMS for any variety of reasons such as to check for messages and announcements, to work on assignments, to download resources, etc. While both instructors indicated that they logged into the LMS daily on their survey results, student responses for the pilot were as follows:

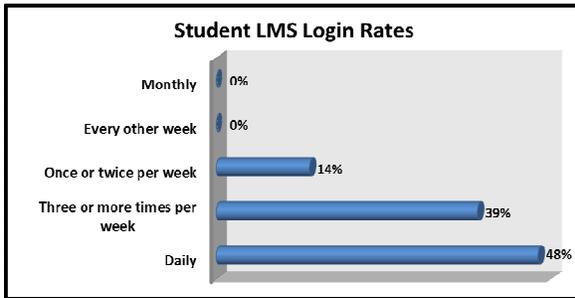


Figure 3. Student LMS Login Rates

The use of various tools or components within the learning management system was noted again at 100% for both instructors given the fact that they had not only setup the course, but also maintained it through the semester. Meanwhile, student utilization was documented in Figure 4 as follows:

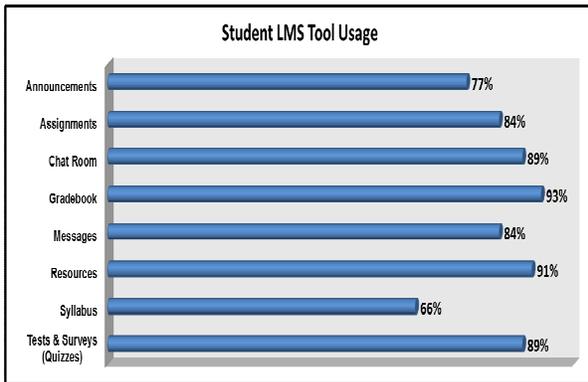


Figure 4. Student LMS Tool Usage

C. Instructor Engagement Initiatives

To encourage engagement within the online course, both instructors in the pilot study required bi-weekly synchronous chat sessions online with their course sections as an instructional designed engagement effort. One of the instructors surveyed led the chats themselves, while the other utilized a rotating student leader. 100% of the students in the first section commented that they were *happy* that the instructor led the chats, and 100% also did *not* prefer to have a rotating student leader for the chats instead of the instructor. Likewise, 95% agreed they were *happy* with using a rotating student leader in the second section, while only 5% commented they were *unhappy* with the rotating student leader. The largest inconsistency was with the 33% of the second section that did feel that they would have *preferred* to have the instructor lead the chats vs. the rotating student leader.

How well did students *like* these types of synchronous discussions in an online course? *Overwhelmingly* the results indicated that students in the pilot *liked* being able to connect with not only each other, but also the instructor in the live chats as Figure 5 below indicates:

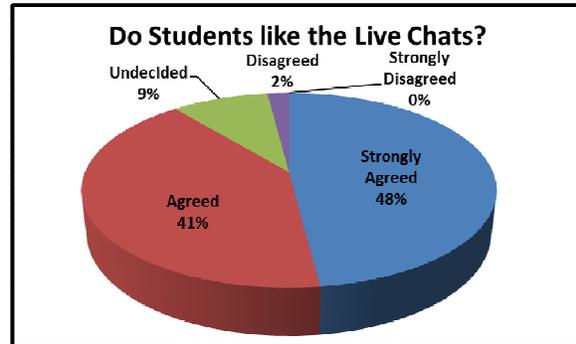


Figure 5. Live Chat Preferences

Each of the pilot instructors also commented that they *liked* holding the live discussions, but would *not change* their individual methods and switch to instructor led chats or student led chats or vice versa.

But did the synchronous chats help to engage the students further in the course (in addition to their own individual efforts as previously discussed?) Surprisingly, students again responded with *identical results* as the previous question as Figure 6 below demonstrates:

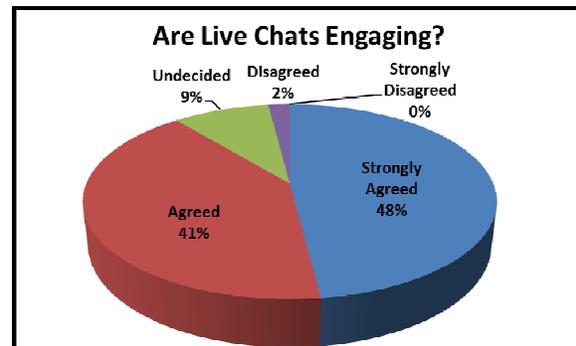


Figure 6. Live Chat Engagement

Both instructors also felt that the synchronous chats *did indeed* engage their students in the course as well.

Students were asked a final question related to instructor engagement initiatives of how 'connected' they felt to their peers and their instructor in this online course compared to that of a traditional face-to-face course given the added element of the synchronous chats. Figure 7 reflects the pilot section answers:

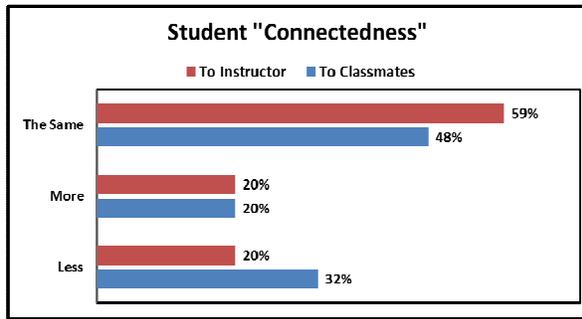


Figure 7. Student "Connectedness"

Instructors were also given a chance to react to their own supplemental engagement efforts in the course including the synchronous chats, which yielded *mixed* results. One instructor felt they were connected to their students *less* than the traditional face-to-face course, while the other instructor replied *the same*. By the same token, when asked how connected their students were to each other during the course one instructor replied *less* than a traditional classroom yet again, while the second instructor answered with *the same* once more. This leaves researchers to wonder if the difference might be due to how the synchronous chats were led (instructor led vs. rotating student leader) or perhaps a difference in communication methods between instructors in the course. Beyond the pilot study, researchers plan to dig deeper into this particular area in order to make further conclusions.

D. Communication

As many forms of communication often take place during both face-to-face and online courses, Figure 8 demonstrates the communication methods used in these two online pilot sections.

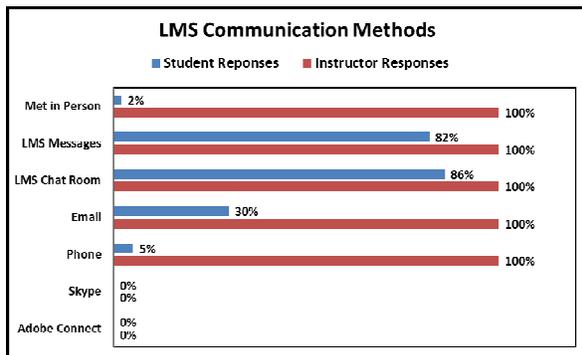


Figure 8. LMS Communication Methods

How frequently the students communicated with each other in the course turned out to be 2% at two or more times per week, 84% with weekly, 9% monthly and just 5% at never. Instructor frequency was similar as students commented that their instructors connected with them at the following results: 20% at two or more times per week, 73% weekly, 7% monthly and no students answered never or none on their survey. Likewise, the pilot instructors were asked how often they actually did communicate with their course sections on average. One instructor replied two or more times per week, while the other answered weekly.

When students were asked if this amount of communication frequency was enough to adequately engage them in the course, 93% of students expressed that they either *agreed* or *strongly agreed* that this amount was indeed enough to engage them in the course; meanwhile, just a mere 7% replied they were *undecided* and there were no students that answered with the choices of *disagree* or *strongly disagree* to the question.

E. Final Grades vs. Chat, Message & Total Activity

In addition to the survey, final students' course grades were collected from the learning management system along with their total site usage, total chat activity, and total message activity within the LMS.

What did researchers hope to discover?

1. If there was any relationship between students' final grades and the amount of site activity, chat activity, or message activity within the learning management system.
2. If increased site, chat or message activity impacted students' final grades in any manner.

To determine if there was truly a relationship between the learning management system's variables, Pearson Correlation was first performed on each set. Final course grades were examined with total site usage of the LMS to begin. This produced a significant correlation ($p=.000$) of .479. Next, final course grades were analyzed against chat room activity in the learning management system. This also produced a significant relationship ($p=.001$) result of .450. Finally, final course grades were evaluated alongside message activity in the learning management system. This time, however, the relationship was extremely low at .125 and not statistically significant ($p=.391$).

Regression analysis was then performed on all sets of data as previously matched in order to discern if increased site, chat or message activity impacted students' final grades in any manner. To perform this calculation, the pilot section's final course grades were translated into a 12 point scale, so an A+ = 12, an A = 11, an A- = 10, and so forth.

TABLE I.
ANOVA^{ab} RESULTS

	Model	Sum of Sq.	df	Mean Sq.	F	S
1	Regression	153.493	3	51.164	6.678	.001
	Residual	344.752	45	7.661		
	Total	498.245	48			

a. Dependent Variable: Course Grade

b. Predictors: (Constant), Message Activity, Chat Room Activity, Total Site Activity/Usage

TABLE II.
FINAL REGRESSION RESULTS^A

Model	Unstandardized Coefficients		Stand. Coeff. Beta	t	Sig.
		Std. Error			
(Constant)	5.950	1.09		5.438	.000
Total Site Activity	.005	.002	.362	2.602	.013
Chat Activity	.013	.006	.309	2.261	.029
Message Activity	-.004	.014	-.037	-.283	.779

a. Dependent Variable: Course Grade

The statistical results demonstrate that as the student's total site activity increased by 1, it also increased the final course grade by .005 based on the 12 point grading scale conversion. Similarly, an increase of 1 in chat room activity increased the final course grade by .013, the largest increase. Message activity, on the other hand, had a small negative impact associated with the final course grade, so this relationship was not statistically significant. The results for the beta coefficient suggest that the overall change in total site activity had the greatest impact on final course grade for students compared to the other two variables examined.

IV. CONCLUSION

The results of this pilot study suggest several implications on student engagement in regards to student usage, communication, synchronous chats and final grade impact within the sophomore-level, online ethical decision-making engineering and technology course.

It is important to note that while both instructors set up a 'connected' environment for students using various course tools within the LMS such as the chat room, announcements, messages, etc. and stayed connected to the LMS daily themselves, only 48% of the students accessed the environment daily, 39% at three or more times per week and 14% at once or twice per week according to survey results. Furthermore, while both instructors took advantage of the LMS's capability to forward the internal messages to an outside email so that they could stay connected to course issues and students, only 50% of students enabled this feature in order to stay informed of course events and information even after faculty reminders of the advantages of doing so. This demonstrates an amount of distance that a number of the students choose to maintain throughout the course despite efforts on the part of the instructors to bridge both the communication and engagement 'gaps'. Student comments within this area of the survey also reinforced conclusion as well: "because a weekly periodic check was sufficient so mobile access was unnecessary" and "I log on to my computer (and the LMS) frequently enough to stay informed." Researchers plan to examine this area in close perspective in a larger study that will be expanded in future semesters to determine if this is a continuing trend or if this data fluctuates with the additional online sections examined.

Within the area of communication itself, survey outcomes suggest that both students and instructors considered the amount of exchange within the pilot sufficient enough to engage students in the course. Less than 10% replied that they were *undecided* or *disagreed* with the feeling of engagement from the amount of communication between either student-to-student or instructor-to-student associations. Researchers are interested to learn if this changes as additional online sections are added to the study in future semesters.

One of the largest engagement factors within the course, synchronous chats, also had a favorable response within the surveys; as both parties indicated that they not only liked this type of discussion added to the course, but they also felt that this particular item helped to engage the students even further in the course. What's more, student comments in this area supported this as well: "helped us get more in touch with ethics, other students' opinions, and thoughts"; "it is the only way to engage in an online

class"; and "allowed us all to get involved with each other and get other points of view."

Even with all of the positive feedback on communication, when students were asked how 'connected' they felt to both their fellow students and their instructor, 32% still replied with *less* to their fellow students and 20% answered *less* to their instructor. But there were those students that felt the opposite within the online environment created, which was encouraging to researchers, as 20% of pilot students replied that they felt *more* connected while 48% felt the *same* connection to their fellow students as a face-to-face course. Similar answers were given with the connections to the instructors as 20% of students felt *more* connected to their instructors, while 59% felt the *same* for the instructor which indicates the greatest majority in the course had the *same*, if not *more* of a connection with both their fellow students and instructor.

In regard to the results it should be noted that there was a discrepancy between the leadership of the synchronous chats of the two piloted sections, as one section had the instructor lead the bi-weekly chats and the second section had a rotating student leader. The results demonstrated thought that students with the instructor led section were 100% happy with their chats and 100% did not prefer to change, while 95% were happy in the rotating student leader section and 33% did prefer to change and have the instructor lead the chats instead. In future semesters, the additional sections and instructors will have an impact on these results depending on how they elect to conduct their chats (instructor vs. rotating student leader.) Researchers hope to be able to determine true student preference when enough evidence can be collected to validate the results in future semesters.

Finally after running the statistical analysis with the pilot sections, specifically, Pearson Correlation, between students' final course grades and several of the learning management system variables such as total site activity, chat and message activity, researchers were better able to understand specific activities that impacted a student's final course grade. Overall, total site activity exhibited the greatest impact on final course grade at .005 to every 1 point of increased site activity. As mentioned previously, both the instructors and students enjoyed the synchronous chats and also believed that they engaged students more in the course as well. By the same token, the mathematical results demonstrated that the chat activity had an impact of .013 on a student's grade to every 1 point of increased chat activity validating those instructor and student opinions.

V. FUTURE CONSIDERATIONS

Due to the pilot results, in future semesters of the expanded study researchers plan to focus mainly on the total site and chat activity since the message activity had no significant impact with any of the findings. It should also be noted that researchers attempted to run the Chi-Square against certain questions within the two surveys, but almost all the results came back as not significant and this was mainly due to the fact that the pilot contained only two sections and two instructors. Researchers anticipate being able to expand the use of statistical analysis tools in upcoming semesters and with continued data collection depending on the number of online sections offered and instructors teaching.

Based on the results of this pilot study, researchers are confident that the majority of students examined felt engaged within the online ethical decision-making engineering and technology course due to their total site and chat activities. Next steps include the continuation of the study and data collection for the remainder of a two-year period with the expansion to all online sections each and every semester including summers. Researchers look forward to discovering if those results will be similar to these in the end.

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