# Is Gender a Factor within Student Engagement Online?

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*Abstract*—**With the significant growth in online learning in recent years, factors to improve this environment are finally being considered. This leads us to contemplate if gender plays a substantial role in how students are engaged within these courses. This pilot study examined student engagement by gender in one sophomore-level ethics course held in the School of Engineering and Technology at Indiana University-Purdue University Indianapolis (IUPUI). Results of this small, pilot study indicated that there were few variances between the sexes within the online environment. Researchers noted the small female sample size (n=12) and concluded that further research and data collection were necessary.**

***Index Terms*—*Gender, Student Engagement, Online Learning, Learning Management System***

## I. Introduction

Within higher education, online learning continues to grow at a rapid rate. Both engineering and technology schools have embraced this new instructional method, often referred to as distance education, as quickly as many others in business or education. Various tools such as chat rooms, email messages and discussion forums are often used within these online environments in order to enhance the student experience. Instructors have now begun the crucial process of understanding what design, delivery method and even courses they may offer online to enhance student engagement within their courses. One factor that is often mentioned within this area is that of gender – but unfortunately, research is limited [1].

Why the concern specifically for gender? It has been noted in previous research within the traditional classroom environment that gender may impact how well students engage within their courses, which in turn, impacts a student's overall educational experience. This pilot study examined gender differences in the use of various tools within the identified course's learning management system (LMS) as well as rate of log-ins to the course and LMS. The ultimate goal was to understand if any of these differences impacted students' final grades in the course.

As many have periodically debated the quality of online learning vs. the traditional classroom, higher education instructors need to examine any and all factors related to student learning including engagement within the virtual environment. Although student engagement consists of many aspects, this research specifically examined gender to determine if it needs to be a focus within the online environment in order to guarantee student success.

## II. Literature

For those interested in researching the online learning environment, data continues to grow in various facets providing a wealth of information. It is interesting to learn statistics related to distance education's growth such as the fact that in recent years the number of students taking at least one fully online course has almost doubled, growing from 23 percent to 45 percent [2]. Unfortunately, research is scarce concerning gender factors related to engagement in online courses. One of the few detailed examinations of gender, conducted by McSporran and Young, is more than ten years old and involves a web design course. Their research reveals that females registered within these types of technology courses are lower than their male counterparts, but the online learning environment is preferred by females in comparison to the traditional classroom. It was also found that females consistently scored higher than their male counterparts on the assignments, projects, and final exam; and that females were engaged more than their male counterparts within the online sessions and quizzes [3]. Contrary to McSporran and Young's research, more recent research from Beer, Clark and Jones found no significant differences between the sexes and suggested that the technology actually closed the gender gap [4].

Additional previous research has primarily been conducted within the following areas: 1) gender engagement and learning styles, 2) gender in the traditional classroom setting, and 3) general student engagement in online learning. In regards to research involving gender engagement and student learning styles, gender was found to be a factor. Thus instructors should consider the gender factor in relation to learning styles when designing online courses [1]. When examining gender in traditional classroom settings and general student engagement online, the data concentrates on the development of the online learning [5]. This mainly consists of how to deliver content to students and the level of interaction between student/instructor desired by students. It should be noted, however, that several sources mention the lack of information concerning gender's role within student engagement online [1, 3] and that there is an overall lack of understanding of how the student, technology and course interact within an online environment [1].

Within the online environment, females have been observed to seek out online courses in order to close the gender gap that may exist for them within the traditional

classroom setting [6]. It should also be noted that often online courses are designed for females and older, returning students who are more motivated and better communicators than their younger male counterparts who require the discipline of the traditional classroom environment [3]. Regardless of setting, either traditional or online, it has been shown that both sexes react with a specific set of gender-related traits [7].

Traditionally, most engineering and technology courses are presented within a traditional face-to-face classroom setting, and females are enrolled at a lower percentage3 in these courses than their male counterparts overall. Of course, this may be related to the lower number of females enrolled in engineering and technology courses. Online delivery of these courses could encourage female participation at higher rates given student identities within most online environments tends to be more veiled. Research indicates females most definitely feel a gender-related difference within the classroom but still lacks specific information in regards to their engagement vs. their male counterparts.

## III. METHOD

The population for this pilot study was students enrolled in one sophomore level ethical decision making course in the School of Engineering and Technology at Indiana University-Purdue University Indianapolis (IUPUI). The pilot featured two online sections of the course taught by two different instructors with various instructional strategies employed. Both of the sections were held entirely online within the learning management system (LMS) and shared the same course textbook, major assignments and bi-weekly synchronous chats held within the LMS environment.

A census of the sampling frame of all male and female students enrolled in these two sections of the ethical decision making course was used. The data was collected from the Learning Management System (Oncourse). Further, the data was collected entirely from the site stats tool in the LMS for the two online sections to better understand if any of these elements contributed both to the student grade and then the resulting engagement in the course. The data collected (including that from the site stats tool) provided per student:

- Gender
- Total site activity (this is a wide variety of activity within the course site including login, chat, message, access assignments tabs, access syllabus, and more)
- Total Site Visits (to the course site): = total logins to the course site no matter how they get there; through Oncourse, Onestart, etc.
- Chat room activity (required bi-weekly synchronous chats)
- Message activity (messages are similar to email within the LMS system and can be forwarded to outside email as an option)
- Course Letter grade earned (A, B, C, D, F)
- Course Grade percentage earned

The primary investigator (PI) collected and then coded the data for the research team to work with under IRB approval. Only the main PI had access to the original data with student identifiers. The information gathered is not identifiable and does not reflect which section the student was enrolled into or completed. A random number was assigned to each student as an identifier. The data was stored in Microsoft Excel 2010 and SPSS 21 for Windows to determine the number of men and women in the course, to compare the grades of men and women in the course, and to determine if a relationship or correlation exists between gender, final grades and online (via sources listed above) activity among the students.

## IV. RESULTS

### A. Demographics

For the two pilot sections, 76% of participants were male, while just 24% of the participants were female. Students' final grades were collected along with total site usage, total chat activity, and total message activity, and total site visits within the LMS. Averages of these variables by gender appear in Table 1.

TABLE 1.
MEAN BY GENDER FOR STUDY VARIABLES

| Gender | Mean Total Site Activity | Mean Total Site Visits | Mean Chat Activity | Mean Message Activity | Mean Course Grade % |
|---|---|---|---|---|---|
| **12 F** | 552.6 | 143.9 | 134.3 | 64.8 | 86.3% |
| **37 M** | 400.3 | 109.8 | 133.3 | 55.6 | 89.4% |

### B. Analysis

The following statistical analysis took place to determine significance of gender and LMS usage:

1. Is there any relationship between gender and the students' final grade?
2. Is there any relationship between gender and total site activity with the students' final grades?
3. Is there any relationship between gender and LMS functions (total site visits, total site activity, chat activity, message activity)?
4. Is there a difference between the patterns of how each gender utilized the LMS functions?

#### *1) Relationship between gender and the students final grade*

An independent-samples t test was calculated comparing the mean course grade of male students to the mean course grade of female students. No significant difference was found ($t(47) = .549$, $p > .05$). The mean course grade of male students (m=89.4, sd=13.5) was not significantly different from the mean grade of female students (m=86.3, sd=21.5).

#### *2) Relationship between gender, total site visits, and final grade*

To determine if gender and total site visits impact final course grade, a two factor ANOVA was conducted. To do so, total site activity was coded into four categories: High, Above Average, Below Average, and Low. The total site activity standard scores were used to place each student into one of these categories (see Table 2), with z-scores below -1 labeled as low, between -1 and 0 as Below Average, between 0 and 1 as Above Average, and above 1 as High.

TABLE 2.
TOTAL SITE ACTIVITY GROUPED BY STANDARD SCORES

| | Frequency | Percent |
|---|---|---|
| Low | 8 | 16.3 |
| Below Average | 16 | 32.7 |
| Above Average | 13 | 26.5 |
| High | 12 | 24.5 |

A 2 (gender) x 4 (total site activity level) between-subjects factorial ANOVA was calculated comparing the final course grades for students who were male or female and the level of their total site activity in the LMS. As before, the main effect for gender was not significant ($F(1.41) = 2.64$, $p > .05$). The main effect for total site activity was significant ($F(3,41) = 24.7$, $p < .001$). Tukey's HSD post hoc tests were used to determine the nature of the differences. Students with low site activity had significantly lower grades (m =63.1, sd=24.4) than did those with below average (m=92.3, sd =7.23), above average (m =92.5, sd =5.07) or high (m=96.7, sd =3.61) site activity. Finally, the interaction was significant ($F(3.41) = 5.60$, $p < .05$). As shown in Figure 1, female students with low site activity earned significantly lower grades (m=41.2, sd =2.90) than male students with low visit frequency (m=70.5, sd =24.0).

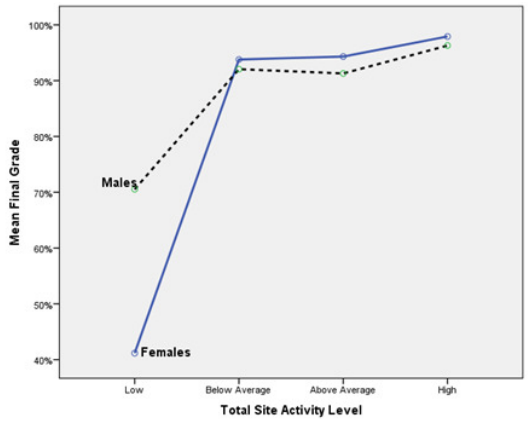


Figure 1. Interaction of Gender and Total Site Activity on Final Grades

### 3) *Relationship between gender and LMS functions*

Independent samples t tests were calculated comparing the male and female means for each of the LMS functions: total site activity, total site visits, chat room activity, and message activity. The results of the tests are provided in Table 3. No significant differences were found.

TABLE 3.
INDEPENDENT T TEST RESULTS FOR LMS FUNCTION BY GENDER

| | Gender | Mean | Std. Dev. | *t* | df | Sig. |
|---|---|---|---|---|---|---|
| Total Site Activity | M | 552.6 | 162.9 | 1.24 | 12.1 | .238 |
| | F | 400.3 | 415.2 | | | |
| Total Site Visits | M | 109.8 | 55.09 | 1.81 | 47 | .076 |
| | F | 143.9 | 61.64 | | | |
| Chat Room Activity | M | 133.32 | 78.302 | .040 | 47 | .968 |
| | F | 134.33 | 66.960 | | | |
| Message Activity | M | 55.65 | 31.49 | .941 | 47 | .352 |
| | F | 64.75 | 19.42 | | | |

The high standard deviation in total site activity led to further analysis identifying 3 clear outliers (2 female and 1 male). Figure 3 shows a visual representation of the outliers.

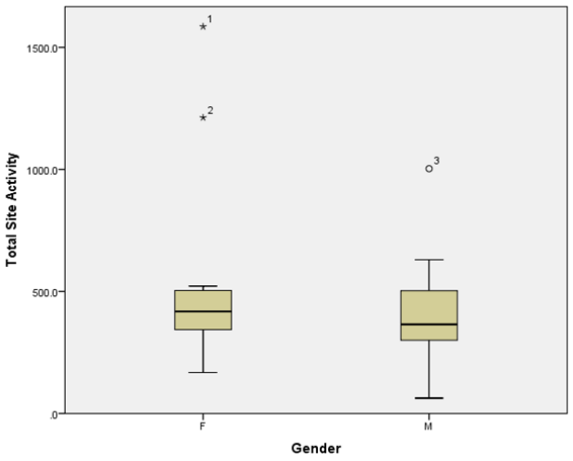


Figure 2. Total Site Activity Box Plots by Gender Shows 3 Outliers

Referring back to the SPSS data analysis, it is seen that the t test for total site activity did not meet the Levene's Test for Equality of Variances ($F(47) = 8.130$, $p < .05$) However, when these three outliers were removed, Levene's test was satisfied ($F(44)=.649$, $p>.05$). The outliers were removed and the independent t test was re-calculated comparing male and female means for total site activity. No significant difference was found ($t(44)=-.003$, $p>.05$). The mean total site activity of male students (m=383.6, sd=128.9) was not significantly different from the mean total site activity of female students (m=383.4, sd=110.2).

*4) Relationship between gender and pattern of usage across all LMS functions*

A chi-square test of independence was calculated comparing gender to the pattern of mean usage totals across all LMS functions (as shown in Table 4). No significant relationship was found ($X2(3) = 3.91$, $p > .05$). Gender and pattern of usage of LMS functions appear to be independent.

## V. CONCLUSION

The results of this pilot study revealed insufficient differences with respect to gender and overall student engagement online, and in addition the impact of gender and student engagement on final course grades. Analysis was conducted to determine if there was a relationship between gender and the students' final grade (independent samples t test); if there was any relationship between gender and total site activity with the students' final grade (factorial ANOVA); if there was a dependence between gender and LMS functions (independent samples t test); and if there was a difference between how each gender utilized the LMS functions (chi- square test of independence). The only significant result involved a student's total site activity level and their course grade. In an online course, low site activity is analogous to not attending class. Not surprisingly, students with low site activity earned lower grades than students who visited more often. What was surprising was that females with low total site activity earned lower grades than males with low total site activity. Perhaps women stopped 'attending' earlier in the course than males did. It may be useful to examine the timing of course activity by gender in addition to its total.

The conclusion of the lack of gender differences in course grades and LMS usage is consistent with Beer, Clark and Jones' [4] research, but contradicts McSporran and Young [3] which specified women earned higher grades in online courses. Based on inconsistent results from this pilot study, and the small female sample size (n=12), our conclusion is that there is not enough data within this study to properly reach any meaningful conclusions for this engineering and technology course. A larger collection of data, or data from a different course, may provide more diverse results than this small sample established.

Next steps to this line of research include the expansion to other online sections in the school. This will provide researchers a much larger pool of data to examine. Researchers are eager to discern if this additional data will either confirm the pilot results or contrast it. Regardless of the results, researchers realize this area of examination (gender) within online learning environments is essential due to the current lack of knowledge.

## REFERENCES


[1] Garland, D. & Martin, B. (2005). Do gender and learning style play a role in how online courses should be designed? *Journal of Interactive Online Learning, 4*(2), 67-81. Retrieved from http://www.ncolr.org/ jiol/issues/pdf/4.2.1.pdf

[2] Bolkan, J. (June 24, 2013). Report: Students taking online courses jumps 96 percent over 5 years. Retrieved from http://campustechnology.com/articles/2013/06/24/report-students-taking-online-courses-jumps-96- percent-over-5-years.aspx.

[3] McSporran, M., & Young, S. (2001). Does gender matter in online learning? *Research in Learning Technology, 9*(2), 3-15. Retrieved from http://www.researchinlearningtechnology.net/index.php/rlt/article/view/12024 doi:10.1080/0968776010090202

[4] Beer, C., & Clark, K., & Jones, D. (2010). Indicators of engagement. In C.H. Stee, M.J. Keppell, P. Geric & Housego (Eds.), *Curriculum, technology & transformation for an unknown future. Proceedings ascilite Sydney 2010*, 75-86. Retrieved from http://www.ascilite.org.au/conferences/sydney10/procs/Beer-full.pdf

[5] Monteith, K. (2002). Gendered learning and learning about gender online: A content analysis of online discussion. An ODELUCE, University of Stirling Report. Retrieved from http://www.odeluce.stir.ac.uk/docs/ Gendered%20Learning.pdf

[6] Goldberg, R. (2012, November 28). Women now outnumber men in college: How online education might help the gender gap. Retrieved from http://www.policymic.com/articles/19734/women-now-outnumber-men- in-college-how-online-education-might-help-the-gender-gap

[7] American Association of University Women Educational Foundation [AAUWEF]. (2001). The third shift: Women learning online. (Excerpts). Washington, DC: Kramarae, C. Retrieved from http://pages.uoregon.edu/cheris/PDF/ third%20shift.pdf.


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