AC 2012-5464: EXPLORING THE EFFECTS OF ONLINE BLOGGING ON STUDENT PARTICIPATION, QUALITY, AND THE ACHIEVEMENT OF COURSE OUTCOMES IN A FRESHMAN ENGINEERING COURSE

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Exploring the Effects of Online Blogging on Student Participation, Quality and the Achievement of Course Outcomes in a Freshman Engineering Course

Abstract:

Online communication is gaining a rising presence in higher education. The use of the Internet has stimulated educators to employ tools like Second Life, Facebook and even blogging in their teaching practices. This impulse to adopt new technologies also imposes a need to investigate the effects of using such tools on education itself.

In order to explore the use of online blogging specifically, five questions were queried. Over one half of a semester, students in four sections of an introductory engineering course participated in blogging as a percentage of their overall grade. Several data collection methods were used to determine the effects of varied conditions on participation rates, the quality of post content, student perception and outcomes. The purpose of this paper is to introduce this exploratory, yet practical application of blogging in higher education. Findings are revealed based on the prevailing research questions in an attempt to argue whether the use of blogging is an effective tool given student participation, perception and content quality.

1. Introduction

A 2011 study conducted by Cisco Systems[1] shows that nearly half the student population surveyed internationally considers the Internet as close in importance as water, food, shelter and air. It further shows a tendency of college students to prefer online social media in comparison to other in-person interactions. In response to this shift from the more traditional tendencies of students, educators have been somewhat coerced into implementing Internet-based technologies into their course curriculum.

Web logs (also known as blogs) are one of the emergent Web 2.0 technologies being used. This online, computer-mediated communication tool (CMC) allows users to publish information in the form of posts, comments and self-reflection. It is driven by user-generated content and is available in several formats. The type of information that may be exchanged in a blog ranges from text, pictures, hyperlinks, audio, video, images and other formats[2]. Although single user blogs seem more common in the past, recent implementations of web logs in academia report group blogging as well.

One of the main drivers of the popularity associated with blogging in academia is its potential to create or enhance a highly engaging learning environment[3] that promotes interactivity among

students and in some cases the instructors. Its general use varies based on course needs; some researchers report using blogs to (1) gather/share resources, (2) share opinions, ideas and experiences, (3) exchange hyperlinks, (4) enable peer review, (5) provide instructor feedback, (6) encourage reflective learning, (7) report course news and updates, (8) improve writing skills, and (9) serve as journals or logbooks[2,3,4,5,6]. Depending on its use, these methods can facilitate the dissemination and transparency of information[7] while encouraging collaboration and knowledge construction[8] outside the temporal and spatial bounds of the traditional classroom environment. While cooperative or collaborative learning is often employed in the classroom, it is likely more affected by the atmosphere, peer pressure, isolation, time and personal factors[9]. In an asynchronous or blended learning environment, blogging can prompt an opportunity to cover material at a greater depth (based on Bloom's Taxonomy), with one mode reinforcing the other.

1.1 Types of Academic Blogs

The main formatting alternatives for academic blogs are whether they are available for individual input or group interaction and whether their use is restricted to a certain topic or more open to a range of topics (See matrix in Figure 1).

	Open	Restricted
Individual	IO	IR
Group	GO	GR

Figure 1. Generic Academic Blog Formats

Halic et al.[8] recommends the use of more structured blogging tasks based on their study that revealed that more structured blogs result in more course-specific blogging. Kerawalla et al.[6] stresses the importance of being aware of the fine line between constraining the discussion to the extent which students become uninterested in the conversation. Their suggestion is to provide a prompt or "trigger" that allows students to explore topics within the scope of the course and explore blogging itself to increase the student's motivation to participate and create quality posts.

1.2 Past Research on the Use of Blogs in Academia

The results of past studies are somewhat mixed, reporting low response rates, mediocre content and implementation concerns yet an overall positive influence on perceived learning, sense of community and collaborative constructivism was found. Krause's overall dissuasive report[10] following a blogging implementation confirms the possibility of low quality in posted content and minimal participation on behalf of students. Blogging technology has evolved over the past few years so some consideration was used when interpreting his findings. However, Shamra[7] found significant disparity in the number of posts and the content of posts as well. His students complained about their need for security, a lack of time to complete posts, the importance of face-to-face support, and a lack of interactivity (peer comments) hence decreasing their motivation to participate.

A more neutral account raised questions about the consistency of message quality and the effectiveness of communication in asynchronous scenarios[9]. Researchers found that the use of blogs formed a better social interaction model than the classroom cooperative learning model. Top[4] further showed that blogging is appropriate for self-learning and developing interactive relationships with others. Halic et al.[8] adds to these claims by showing that fostering a sense of community among learners using blogs affects a students' perceived learning and facilitates group interaction and the social construction of knowledge.

Nevertheless, the desire to implement blogs does not come without warning. The consensus seems to be that blogs have the *potential* to create engaging learning environments, yet the design and implementation should be pedagogically cohesive[3,9]. Realistically, incorporating a new tool into a course curriculum can be an extremely difficult and cumbersome task[6]. Attention to the technical and cultural context of the environment is important to assure the alignment of appropriate pedagogical strategy[6]. In some cases course outcomes may need to be adjusted and student receptivity should be examined[5]. One researcher further notes that students' acceptance and use of blogs is a key determinant of the success of the blog[3]. Notably, Papastergiou et al.[2] challenges future research to consider the impact of blogging on student learning while Top[4] further identifies that gap in the literature as the relationship between blogging and course outcomes.

2. Research Questions

This study will serve as a pilot study into the use of blogging in freshman engineering education. It investigates several identified gaps in the literature by manipulating factors such as blogging format, student participation and prior blogging experience to answer five questions:

     A. Are students receptive to blogging in engineering education?

B. How do students perceive blogging in a freshman engineering course? Is previous experience a significant contributor to this perception?

C. Which factors affect the student's ability to participate in the blogs?

D. Does blog participation vary significantly with the format of the blog (i.e. RC= Required Chosen Topic, RNC=Required Non-Chosen Topic, VC= Voluntary, Chosen Topics)?

E. How does blogging contribute to the students' perception of accomplishing course outcomes?

3. Methodology

3.1 Course Description

During a fall semester, four sections of an introductory engineering course were utilized as the basis of this study.   The course is designed to introduce students to engineering and its many disciplines. It leans heavily on communication, teamwork and technical skill through design tasks, computational analyses and research-based projects while also attesting to the importance of crucial soft skills often unrecognized by young engineering students. Each section averaged 27 students, with one student assistant assigned to each. All courses were taught by a single instructor using the group blog format within the Blackboard interface for the first half of the course only (approximately 8 weeks).

3.2 Participants

Students were generally first-year students enrolled in one of several engineering programs offered at the University.   Although specific majors vary, most students were aerospace engineering majors. Ninety-two percent of the participants were male and ninety seven percent were 21 years old or younger.

3.3 Data Collection

Three data collection mediums were used in this study:

[A] Course records were graded and compiled by the instructor on each student's usage of the web log interface in Blackboard. Key information gathered were organized as the *quality of post*, determined by a 4-point scale (i.e. 2 points for thoroughness, 1 point for relevance and 1

point for peer comment(s)) and *student participation* which is the number of posts submitted per student minus any "mis-posts" or duplicates.

[B] Survey One was designed to capture the students' receptiveness to blogging, any prior blogging experience and individual demographics. It was developed using a standard 5 point Likert Scale (1- Totally Agree, 2- Somewhat Agree, 3- Neutral, 4- Somewhat Disagree and 5- Totally Disagree) and disseminated in-class after four weeks of blogging. This survey instrument was tested for reliability using the chi-square test for association and rendered a Cronbach's Alpha of 0.76 which is greater than the standard of approximately .7. This shows that the survey items are likely measuring the same construct. A closer look suggests that 2 items (Question 6 & 9) should have been removed from the survey to acquire a Cronbach's Alpha of .93 yet due to the nature of these questions, they were retained.

[C] Survey Two was designed to give the students an opportunity to measure the effectiveness of blogging with respect to course outcomes. It was disseminated online at the end of the blogging task. It additionally queried any factors that may have contributed to the student's ability to actively participate. This instrument utilizes the same Likert Scale and achieved a Cronbach's Alpha of .94 when tested for reliability.

3.4 Data Analysis

Initial data analysis involved recognizing patterns and relationships using descriptive statistics like the mean, standard deviation, mode and range. Cross tabulation of Survey One was required to examine the relationship between previous blog experience and the students' perception of the blogging task. An ANOVA test was run on the student records data to determine whether blog format truly affected overall participation.

3.5 Limitations

One major limitation of this study is the use of the Blackboard interface to blog. Because students were able to post anonymous posts and Blackboard's denotation of student contribution on blogs is quite misleading, it was impossible to match anonymous posts with the student that created them. Therefore, rate of participation is slightly skewed in course sections that receive a significant number of anonymous posts. As a result, each section has generally been treated independently in this study.

4. Results

4.1 Student Receptiveness to Blogging in Engineering Education

Students were moderately receptive to blogging in the freshman engineering courses based on both participation rates and oral/written feedback. There were many complaints about awareness

of due dates and the location of the blogs due to the mediocre usability of the blogging interface in the version of Blackboard utilized.

Yet, two students add:

> *"I really enjoy blogging for this class because it provides students with social interaction outside of the classroom towards a specific topic about engineering."*

> *"We've all been doing written homework since first grade and this is somewhat of a big change for us… It allows us to gain opinions and have conversation with others in our class."*

Given the assumption that students were receptive of blogging if they participated in the blogging task, participation data was gathered for each topic. A high variation in the rate of anonymous posts across different sections, yield significantly different results in blog use. Table 1 displays the summary data for all sections. The *rate of participation* is the number of participants, not including anonymous postings, divided by the total number of students enrolled in the course section. *Tot # of posts* represents a more cumulative account of anonymous and non-anonymous posts. *Avg. #/stud* is the average number of posts per student, while *avg. # /astud* eliminates those students that did not post anything. The last two variables, *avg. qop/astud* and *% anym posts* represents the average quality of posts for those students participating in the blog and the percent of anonymous posts per topic, respectively. Any asterisk (or missing value) further denotes that a specific component was unavailable or deleted from the analysis.

Table 1. Participation Data

	Required, Topic Chosen (RC)						Voluntary, Topic Chosen	Required, Topic Not Chosen		
	T1	T2	T3	T4	T5	T6	T7V	T8C		Avg. RC
Section 1 (S1)										
Rate of participation	0.76	0.68	0.72	0.84	0.88	0.64	0.28	*		0.75
tot # of posts	23	19	27	51	40	38	7	*		33.00
avg. # /stud	0.79	0.66	0.93	1.76	1.38	1.31	0.24	*		1.14
avg. # /astud	1.15	1.12	1.50	2.43	1.82	2.24	1.00	*		1.71
avg. qop/astud	3.16	3.29	3.19	3.52	3.82	3.75	*	*		3.46
% anym posts	4%	0%	0%	0%	0%	3%	0%	*		0.01
Section 2 (S2)										
Rate of participation	0.35	0.42	0.42	0.15	0.54	0.23	0.31	0.46		0.35
tot # of posts	14	18	14	15	18	14	13	35		15.50
avg. # /stud	0.42	0.62	0.46	0.38	0.62	0.46	0.38	1.04		0.49
avg. # /astud	1.22	1.45	1.09	2.50	1.14	2.00	1.25	2.25		1.57
avg. qop/astud	3.18	2.43	3.77	3.71	4.00	4.00	*	*		3.52
% anym posts	21%	11%	14%	33%	11%	14%	23%	23%		0.18
Section 3 (S3)										
Rate of participation	0.63	0.56	0.63	0.41	0.33	0.30	0.04	0.37		0.48
tot # of posts	32	30	30	42	16	25	3	24		29.17
avg. # /stud	0.78	0.63	0.85	1.04	0.33	0.59	0.04	0.70		0.70
avg. # /astud	1.24	1.13	1.35	2.55	1.00	2.00	1.00	1.90		1.54
avg. qop/astud	3.14	3.25	3.32	3.73	4.00	3.85	*	*		3.55
% anym posts	34%	43%	23%	33%	44%	36%	67%	21%		0.36
Section 4 (S4)										
Rate of participation	0.64	0.54	0.68	0.64	*	0.39	0.25	0.54		0.58
tot # of posts	25	19	32	67	*	22	13	30		33.00
avg. # /stud	0.79	0.61	0.89	1.86	*	0.79	0.32	0.96		0.99
avg. # /astud	1.22	1.13	1.32	2.89	*	2.00	1.29	1.80		1.71
avg. qop/astud	3.25	3.29	3.29	3.70	*	3.45	*	*		3.40
% anym posts	12%	11%	22%	22%	*	0%	31%	10%		0.13

Figures 2-4 collectively, more clearly shows the fallacies mentioned earlier. Section 1 appears to outperform all other sections if the interpretation is performed based on the non-anonymous participation rate per post. Yet, the anonymous post rate somewhat balances the overall interpretation of student participation in Sections 1, 3 & 4. Upon observance of the total number of posts and accounting for the missing data in Section 4 on topic 5, the data is very similar (averaging around 30 total posts per topic). The average participation data for all RC topics for these sections (see rightmost column in Table 1) also shows that the average number of posts for the students that posted at least

one post was between 1.5 and 2, with an average post quality of around 3.5 out of 4. Although the overall participation rate could be viewed as poor to moderate, the conclusion is that the students that chose to participate in blogging provided about 2 posts per week, while about 25% of students yield absent or inconsistent contributions.
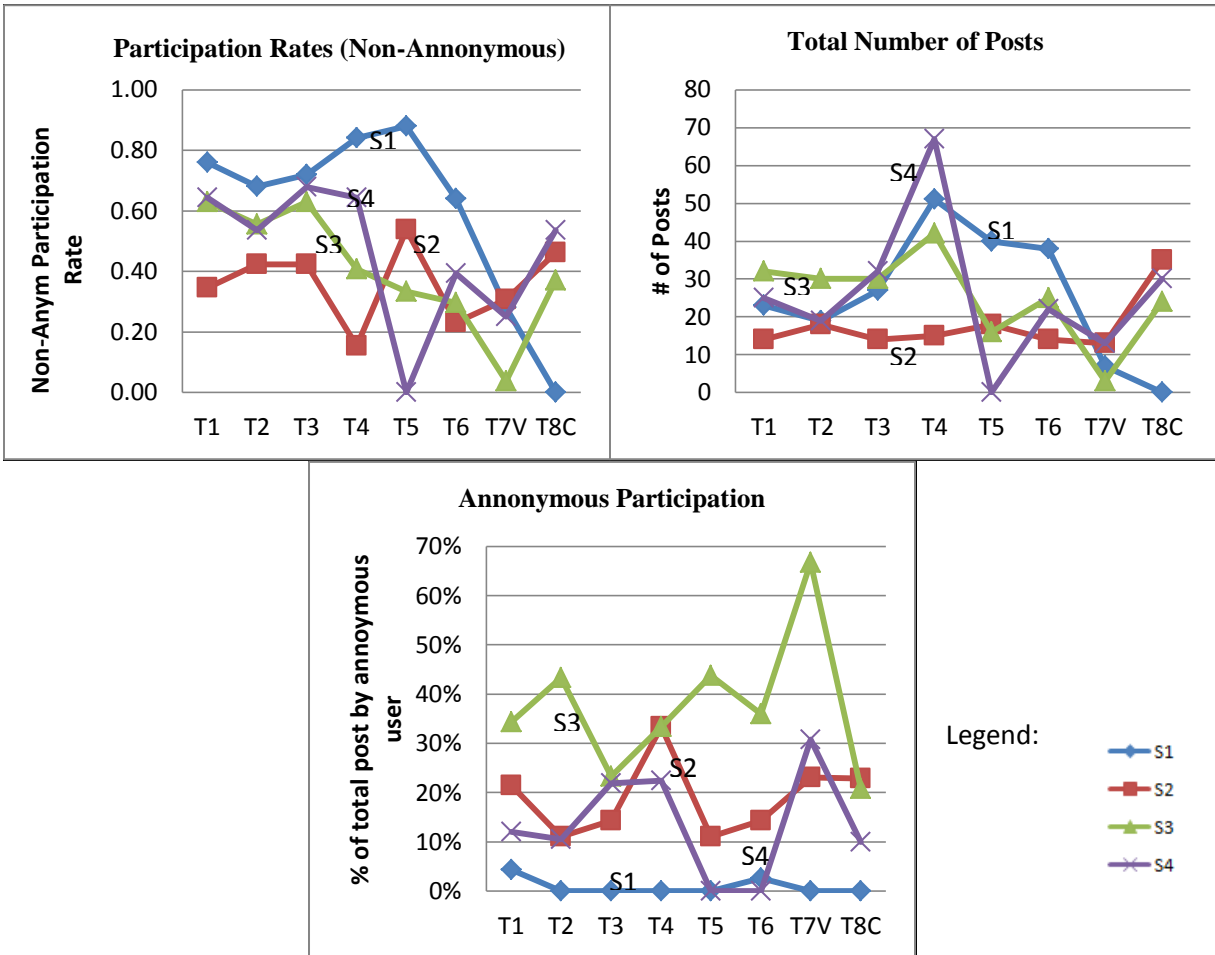

Figure 2-4. Summary Charts of Student Participation

4.2. Student Perceptions of Blogging

Survey One captured the students' explicit perception of blogging (Table 2). The feedback was supportive overall when the results were truncated to positive or negative options only and the neutral responses were disregarded.

Table 2. Survey One Questions

Survey One Questions	
Pre-Q	Prior to this course, I had participated in an online blog (Y/N).
	Using Likert Scale,
Q1	*I enjoy online blogging as a component of this class.*
Q2	*Blogging is an effective way to communicate with the rest of the class.*
Q3	*Blogging enhances my desire to communicate with my peers.*
Q4	*I share more information on the blog posts than I would have in an in-class discussion.*
Q5	*Blogging should be a component in my other courses.*
Q6	*I would prefer to talk to my peers face-to-face.*
Q7	*Blogging motivate me to participate in class.*
Q8	*Blogs make the class more interesting.*
Q9	*I would prefer to have more traditional lectures (=no blogs).*

One student wrote:

> *"It's a great way for those that never get their voice heard in class to open up and share their thoughts, ideas and overall input. Both blogging and in-class discussions are key, and both are equally valuable and necessary."*

Next, the Pearson Correlation Test and Chi-Square Test were used to test the hypothesis that previous blogging experience was not a significant factor in the responses to the survey.

H_o: *Previous blog experience does not affect a student's perception of blogging*
H_1: *Previous blog experience may affect a student's perception of blogging*

As Table 3 shows, there were no significant relationships between prior blogging experience and the students' perception of the blogging task for any of the questions based on a 95% confidence interval ($p > .05$).

Table 3. Summary Statistics for Survey One Tests

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Prior Experience	N	95	95	95	95	95	95	94	95	94
	Mean	2.83	2.66	3.15	2.77	3.22	1.93	3.23	3.14	2.96
	Pearson Correlation	-.013	-.043	-.129	-.087	-.032	-.115	.011	-.012	-.110
	$P_{Pearson}$	.903	.680	.213	.400	.762	.267	.919	.907	.293
	$P_{Chi-Square}$	.977	.559	.288	.741	.679	.659	.689	.224	.683

4.3 Factors Effecting Student Participation

One survey question asked students to identify variables that affected their participation. The factors included those posed by Divitini et al.[11] along with known student concerns to establish 5 factors- amount of time required, understanding its purpose, prior blogging experience, amount of effort required and clarity of expectations. It was a multiple selection item.

Figure 5 shows the distribution of factors with one crucial observation. Prior blog experience was not found to have affected any of the respondents, which is consistent with the previous conclusion that the experience variable was insignificant to the student's perception of blogging.

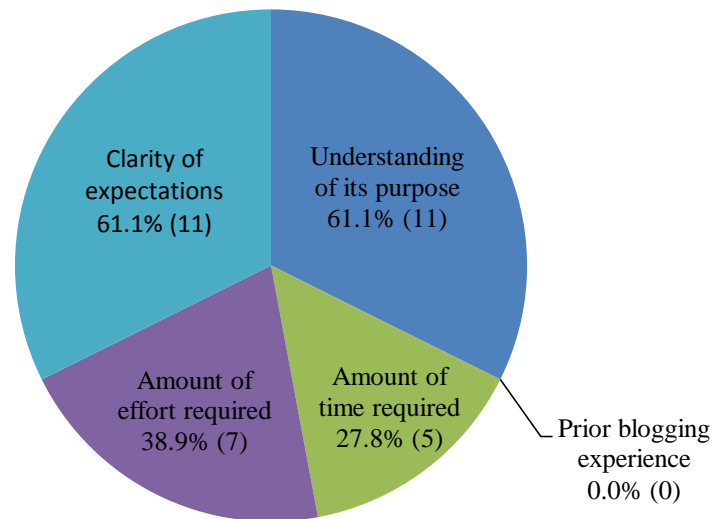**Distribution of Factors Affecting Participation**

Figure 5. Factors Affecting Participation

4.4 Variations in Blogging Format

Due to the significant difference in the posting habits of some sections mediated by the variation in the rate of anonymous posts present, Table 4 provides summary statistics for the number of posts in each section, by blog format.

Table 4. Descriptive Statistics by Blog Format

		N	Avg. # of posts	Std. Deviation	Std. Error
S1	RC	6	33.0000	12.08305	4.93288
	VC	1	7.0000		
	RNC	0			
S2	RC	6	15.5000	1.97484	.80623
	VC	1	13.0000		
	RNC	1	35.0000		
S3	RC	6	29.1667	8.54205	3.48728
	VC	1	3.0000		
	RNC	1	24.0000		
S4	RC	5	33.0000	19.60867	8.76926
	VC	1	13.0000		
	RNC	1	30.0000		

The average number of posts for required and restricted posts is around 30 per topic for all sections, with the exception of Section 2. Whereas the average number of posts is about the same for all required unrestricted posts (about 30) for all sections analyzed. However, the data is more dispersed for voluntary and restricted posts, showing a range from 3-13, with a mode of 13.

Next, an ANOVA test was employed by grouping like blogging formats, *Type 1 (RC), 2 (VC) or 3 (RNC)*, and the total # of posts as the measure of participation because it consistently measures the same constructs across all sections. The results in Table 5 reveal the need to accept the hypothesis that there is no true effect of format type on participation for sections 1, 3 and 4. In the case of Section 2, p is less than .05, therefore the null hypothesis can be rejected, and dependency is likely present.

A closer look at the data in Table 4 confirms that Section 2 participated a lot more than usual when the topic was open, although the responses were still required. One student wrote in his/her comments that "[the open blogs] encourage more participation because they give more freedom and liberty to the blogger and they offer a broader spectrum of things to blog about."

Table 5. ANOVA Test Results

		Sum of Squares	df	Mean Square	F	p
		ANOVA				
	Between Groups	579.429	1	579.429	3.969	.103
S1	Within Groups	730.000	5	146.000		
	Total	1309.429	6			
	Between Groups	350.375	2	175.188	44.920	**.001**
S2	Within Groups	19.500	5	3.900		
	Total	369.875	7			
	Between Groups	588.667	2	294.333	4.034	.091
S3	Within Groups	364.833	5	72.967		
	Total	953.500	7			
	Between Groups	333.429	2	166.714	.434	.675
S4	Within Groups	1538.000	4	384.500		
	Total	1871.429	6			

4.5 Blogging & Student Outcomes

Although Nackerud and Scaletta[5] warn of the issues related to measuring outcomes with relation to blogging after merely one semester, a survey was used to attempt to capture this relationship. Even though the resulting sample size is a mere N=19 (assumed to be low because students were asked to complete the survey online as opposed to in class), the responses were considered.

Table 6 summarizes the data by simplifying the findings to agree or disagree, disregarding the neutral respondents. For 8 out of 10 outcomes, the students felt blogging positively affected the course outcomes. The first exception was Outcome 3 which relates to professional and personal development. In this response, nearly half of the respondents opted for the neutral position. Based on Outcome 9, students felt that blogging was not instrumental in introducing them to engineering design. A final observation is the substantial difference in the responses for Outcome 10. With a 53% (Agree) to 5% (Disagree) response the conclusion is that blogging helped the students to develop knowledge of contemporary issues most consistently.

Table 6. Summary Outcome Analysis

	Agree	Disagree	
O1	42%	26%	To better understand the professional and ethical responsibility of an engineer.
O2	47%	32%	To develop an ability to communicate effectively.
O3	26%	37%	To develop a recognition for, and the ability to engage in life-long learning, professional activity and personal development.
O4	37%	21%	Gain an introduction to the engineering curricula, the faculty and the professional disciplines within engineering.
O5	42%	26%	To foster the development of good study and time management habits.
O6	53%	32%	To see the curriculum relevance and provided motivation to succeed in my engineering studies.
O7	42%	26%	To instill an interest for the engineering profession as a career objective.
O8	26%	26%	Reflect on practical and theoretical engineering exercises that cross disciplines to capture my imaginations regarding future academic and professional engineering activities.
O9	26%	32%	Gain an introduction to engineering design as a team activity and as a major element within the engineering profession.
O10	53%	5%	To develop a knowledge of contemporary issues.

5. Future Research

Following this pilot study, there are several things that should be considered in future iterations with the most important factor being the platform. Blogging was new to the Blackboard interface during the semester of this study therefore many operational issues were experienced from both the student and instructor perspective. More research should be conducted to assist in the determination of the most effective interface(s) for academic blogging. Other questions would query the most effective and efficient options for blogging format and an examination of how results differ when employing external blogging tools. Additional analysis could determine the effects of blogging on student retention in engineering programs, establishing a sense of community, and other more long-term outcomes beyond the course where the blogs are employed. A final opportunity rooted in student feedback towards the end of the study is the value of instructor presence within the blogosphere, where the instructor is actively engaged in the conversation. It would be of benefit to study if there is any significant effect on student participation, sense of community, perceived learning or collaborative constructivism caused by instructor presence.

6. Conclusion

Blogging in academia is not a new but rather an emerging technology. As students are becoming more and more dependent on digital mediums, higher education must continue to adapt to meet their needs. In this study, several research questions were explored. The results show that students were somewhat receptive to blogging, with those who chose to participate doing so as expected. There was no significant difference in the perception of blogging between the students who had prior experience and those that did not. Contrary to assumptions, there was no consistent relationship between blog types, required-restricted (RC), voluntary-restricted (VC) or required open (RNC) in three of the four sections examined. Nevertheless, the most significant outcome affected by blogging was developing knowledge of contemporary issues.

Quoting one student, "[Blogging] can be very useful in engineering courses and other college level courses, given the right direction. Blogging should not so much be an assignment as an opportunity to pose questions, discuss challenging concepts or topics, or merely expressing one's opinions." An ability to balance this notion should prove beneficial to future attempts to apply blogging to engineering courses.

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