

LET'S FACE IT: INTEGRATING FACEBOOK IN A PRECALCULUS HIGH SCHOOL COURSE

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ABSTRACT

This study examines 59 students' perceptions of using Facebook as an extension of the traditional classroom instruction, the value of Facebook as an educational tool, and the effects of blended learning in the class. A survey tool was used to assess students' perceptions pre and post implementation of Facebook page after nine weeks of integration. Findings reveal a positive disposition in students' perceptions of the educational value of Facebook, using Facebook to extend learning beyond the classroom, and blended learning with the greatest gain being students' perceptions of the educational value of Facebook. Students felt that it was fun, engaging and motivation to use Facebook. The results also reveal a positive disposition in students' perceptions of traditional classroom instruction. These finding suggest that even though students use Facebook as a social tool, most of these students (average age 16) prefer and place more value on traditional classroom instruction. Facebook by itself cannot be used to deliver instruction, however, when combined with traditional teaching or used as a supplement it was very effective in this study.

Keywords: Facebook, Learning Technologies, Web 2.0, Technology and high School Precalculus, Mathematics and Technology.

INTRODUCTION

Educators are constantly striving to meet the needs of their students. In modern education, meeting needs of students usually involves the use of 21st century tools. When making efforts to meet the needs of students, educators should consider the characteristics of today's school aged students. Today's school aged children are referred to as "Generation-Z" or "digital natives". The terminology Gen-Z and digital natives refers to the group of individuals whose oldest members were born in the latter part of the twentieth century (Urban Dictionary, 2010). Digital natives have grown up knowing and using the Internet. In addition, digital natives are a highly networked group often using social networking sites to maintain their connections.

Review of Literature

Successful and effective educators in today's society understand how digital natives learn. Teachers need to find ways to teach students mathematics concepts that are more familiar to them and reflect the way they learn when they are not in the classroom, (Niess and Walker, 2010). Niess and Walker also conclude that with the

capabilities of digital tools students should not be expected to learn only through traditional lecture style teaching. A recent study revealed that middle school math students prefer learning through the use of video podcast rather than textbooks (Kay and Edwards, 2010). The same study concluded that students find video podcasting valuable in facilitating their understanding of mathematics concepts. Test scores of the students involved in the research reflect their perceptions by showing a 64% average rate of improvement. The gains in the study reported by Kay and Edwards were reflected in both regular education and special education students.

Web 2.0 technologies offer many functions that appeal to educators who are looking to extend learning beyond the classroom. Web 2.0 technologies promote sharing, collaboration and authorship among groups of participants in a common virtual setting (Garner and Bull, 2012). In addition, Web 2.0 technologies revolve around communication and interaction while traditional websites only allow "passive viewing".

Facebook is an example of a popular Web 2.0 technology.

In a Facebook demographic article, Burbary (2011) documents that there are almost 14.5 million Facebook users between 13 and 17 years of age, of which, approximately 6.6 million are male and 7.7 million are female. Students are spending a lot of time on-line and a large portion of this time is using Web 2.0 technologies (Caudill, 2011). In addition, Caudill states that Web 2.0 technologies offer media rich environments that thrive on communication, collaboration and the sharing of information. The combination of characteristics and functions of Web 2.0 technologies offer great potential for teaching and learning. Thus, Web 2.0 technologies are a favorable medium for meeting students where they “hang out”, extending learning beyond the classroom and facilitating a learning environment that encourages students to accept and take responsibility for their own academic learning goals.

Web 2.0 technologies offer many functions, mainly in the form of data management, communication, and presentations that are potentially valuable tools for educational settings. These functions make it easy to share and access multimedia between users. These functions may have the potential to foster virtual educational environments in which students collaborate, contribute, stay informed, access class notes and videos, and ultimately extend their learning beyond the traditional classroom setting. While Web 2.0 technologies are widely used for social networking, it has yet to become standard practice to use them for educational purposes. Facebook is a Web 2.0 technology that has been identified as a plausible resource in the world of education. One study analyzed the perceptions of Generation-Y (Gen-Y) students on the usage of Facebook in an educational manner and the effect that gender and access to appropriate technologies including home computers and home access to broadband Internet have on their perceptions (Tan & Low, 2010). The research concluded the following:

- Gender does not play a role on students' perceptions on the value of Facebook.
- The capabilities of social networking sites have a positive impact on students' perceptions on the ease of use of social networking sites with respect to

teaching and learning.

- Students' accessibility of home computers does not have a significant impact on students' perceptions of the ease of use of social networking sites for educational purposes.
- Students' accessibility to broadband Internet access does not have a significant impact on students' perceptions of the ease of use of social networking sites for educational purposes.

Another study investigated the educational value and potential of Facebook in a mentor/mentee relationship and sought to understand high school students' motivation for using Facebook as well as their perceptions of the social networking tool as an educational resource and collaborative tool in a virtual educational setting (Pollara & Zhu, 2011). The research analyzed the level of participation and the ways both mentors and mentees utilized the virtual meeting space, Facebook. The results lead the researcher to conclude that relationships between mentors and mentees can be strengthened through Facebook interactions. The results also lead the researchers to conclude that high school students, who value Facebook as an educational tool, feel that it has a positive impact on their learning and are interested in having Facebook become a part of their academic resources.

It is clear from researches presented that Facebook is a worthwhile investment for classroom teachers. On the other hand, if a teacher does invest time in creating and maintaining a Facebook page, he/she needs to take steps necessary to ensure that all students can easily access the page and post information. Teachers should consider that the most significant and unique quality of a Facebook page for students is supposed to be the ease of access and the idea of meeting students at their virtual “hang out”. There should be minimal effort on the students' part when it comes to locating and accessing the page. In addition, the research suggests that Facebook can prevail even when students do not have equal access to technology and the Internet at home (Tan & Low, 2010; Pollara & Zhu, 2011).

In favor of incorporating Web 2.0 technologies into education, Zahidi, Sin, and Jamal (2011) report on a study

which reveals that Facebook features support students' learning by allowing learning to take place anytime and anywhere, allowing students to create their own knowledge and by allowing learning to take place in a supportive setting at a pace suitable and chosen by the student. In addition, they conclude that there are specific Facebook features that foster academic achievement, including "Tag" and "Notifications". Features like "Tag" and "Notifications" contribute to academic achievement because they are intended to engage users. Facebook features create a sense of academic value with respect to Facebook among students (Zahidi et al., 2011).

While current research suggests that Web 2.0 technologies are positive and useful for students, further research should examine the educational value of specific Web 2.0 technologies in specific discipline settings in order to strengthen existing research findings (Hazari, North, & Moreland, 2009). Many people have doubts about the educational value of Facebook. Karpinski and Duberstein (2009) conducted a research study that suggests a link between Facebook users and lower grades. Karpinski and Duberstein conclude that Facebook users have lower GPAs than non-Facebook users. The authors also mention that there are likely unknown variables that could be responsible for the difference in GPAs. Other doubts that teachers have about incorporating technology to fill gaps in education may be rooted in their belief that students do not have equitable access to computers and/or the Internet; however, a recent study found that students' perceptions of the educational benefits of Facebook was not affected by students' access to home computers and/or broadband Internet access (Tan & Low, 2010).

The purpose of this research is to understand students' perceptions of the value of Facebook in an effort to extend learning opportunities for mathematics beyond the traditional classroom walls and foster an environment that encourages students to take greater responsibility for their own learning. This research also examines students' perceptions of the educational value of various Web 2.0 technologies, specifically Facebook.

The following research questions guide this study:

- How do high school mathematics students use

Facebook to extend learning beyond the traditional classroom setting?

- What are high school students' attitudes and perceptions about using Facebook for mathematics courses?
- What are high school students' attitudes and perceptions about traditional classroom instruction for mathematics courses when compared with use of Facebook a Web 2.0 technology?
- What are high school students' attitudes and perceptions about blended learning involving traditional classroom instruction and Facebook for mathematics courses?
- What are high school students' attitudes and perceptions about the academic value of Facebook for mathematics courses?

Methodology

Participants

This study utilized a mixed approach. The quantitative data in this study involved 59 public high school precalculus students enrolled in three precalculus classes all of which were taught by the same teacher. The high school is located in the southeastern region of the United States. During the 2010-2011 school year, the cohort graduation rate for the high school was approximately 87% and 89% of the high school seniors participated in the SAT. Twenty-six male students and 33 female students participated in the survey and participation was voluntary. However, parental and administrative permissions were requested for students to participate in the study. The mean age of the student participants was 16 years of age. All students had access to Facebook at school.

Instruments

The research utilized a semantic differential researcher developed Likert scale instrument addressing the following categories: The educational value of Facebook, traditional classroom instruction, Facebook to extend learning beyond the classroom, and blended learning. The survey was comprised of 32 semantic differential paired extreme adjectives. There were eight semantic differential paired extreme adjectives in each category with responses

measured on a 5-point Likert scale addressing the following paired extreme adjectives: Unimportant/Important, Boring/Interesting, Irrelevant/Relevant, Unexciting/Exciting, Means nothing/Means a lot, Unappealing/Appealing, Worthless, Valuable, Not needed/ Needed. Descriptive statistical analysis was used to analyze the data.

The quantitative data were collected via the researcher designed student survey pre and post intervention. The pre-survey was conducted prior to the implementation of the Facebook page for the precalculus class and within the first five days of the 2011/12 academic school year. The same survey was then administered to the same group of students after nine weeks of having implemented the Facebook page for the precalculus course. The survey, created in Google Docs, was posted on the teacher's website and participating students responded to the survey questions during an allotted class time. At the end of the intervention qualitative data was also collected in class following a 15-minute class discussion about Facebook between the teacher and students. The class discussion was recorded. After the discussion, each student was given a survey form, which prompted them to describe how they used the class Facebook page, what they liked about the class Facebook page, what they disliked about the class Facebook page and suggestions for improving the class Facebook page. Participation was voluntary and names were not collected. All participants participated in the process. After the qualitative data were analyzed using triangulation methods to identify themes and categories based on the number of occurrences.

Procedure

The students involved in this study met in the precalculus class five times per week for 50 minutes of face-to-face instruction. A single Facebook page was created for the 3 precalculus classes. In the creation of the Facebook page, a teacher Facebook account was first established. The account was created strictly for educational purposes and it was not associated in any way with the teacher's personal life. The teacher's picture was the profile picture for the account. Next, a Facebook page for the precalculus class was created. The settings chosen offered little to no privacy in an effort to make the page easy to access. The setting

were such that anyone with Internet access was allowed to access the page and the content posted; however, only Facebook members were able to post on the wall of the page. Next, and once again in an effort to make the Facebook page easy to access, a link to the Facebook page was posted on the teacher's school website. Students, parents and/or persons who chose to "like" the page would then have quick access to the page through their own Facebook account. Regular/daily postings to the Facebook page included test and quiz dates and homework assignments. Students were encouraged to use the page to post questions when they were having trouble with their homework assignments. In addition, the following were posted on an as needed basis, usually occurring three times weekly in some combination: copies of class notes, videos teaching precalculus concepts and solution sets.

SMART Board, SMART Notebook, Google Docs, and YouTube were at the center of the creation of the class notes and videos. The teacher exported notes to a pdf file at the end of class and uploaded the notes to Google Docs. From there, the teacher changed the sharing setting to allowing anyone with the link to access the document and posted the link to the notes on the class Facebook page. For videos, the teacher used the record feature in SMART Notebook to record a lesson. The recording was saved and then uploaded to YouTube. From YouTube, the teacher chose to share the video on the class Facebook page. Using Facebook for the precalculus course was not required and students did not earn a grade for their participation on the Facebook page. Students who did not have a Facebook page were not negatively affected. The unconstrained sharing settings allowed all students to access information regardless of their Facebook account status.

Results

Table 1 shows the results of pre and post survey mean scores. As to the findings for the academic Value of Facebook, the pre-survey mean showed a negative disposition with a mean of 2.38 and a standard deviation (STDV) of 1.11. The post survey showed a position disposition towards the academic value of Facebook with a mean of

Students Perceptions	Number of Respondents	Pre Survey Means	Pre Survey Standard Deviations	Post Survey Means	Post Survey Standard Deviations	Change
Academic Value of Facebook	59	2.3877	1.11	3.1441	1.2	0.7564
Traditional classroom instruction	59	4.2564	0.88	4.1419	0.97	-0.1145
Facebook to extend learning beyond the classroom	59	3.0742	1.13	3.4682	1.06	0.394
Blended Learning involving classroom instruction and Facebook	59	3.5339	1.05	3.7521	1.08	0.2182

Table 1. Students' Perceptions of Web 2.0, Traditional Learning and Blended Learning

3.14 and a STDV of 1.2. Though a mean of 3.14 on a 5-point by itself is not significant, the results show that the intervention of Facebook in the class changed students' perceptions by .76. As it relates to students' perceptions of traditional instruction, the pre-survey mean was high, 4.25 with a STDV of .88. This result could be attributed to the fact that the traditional learning approach is what students are used to through their years of education. However, with the intervention of Facebook and blended learning approach the post-survey mean score dropped to 4.14 with a STDV of .97. There was a -.11 change in the post mean. Though this change is not significant, it showed a downward trend on how students perceive traditional teaching after experiencing Facebook and blended learning. As it relates to the use of Facebook to extend learning beyond the classroom, the pre-survey mean of 3.07 showed minimal positive disposition. The post-survey mean of 3.46 with a STDV of 1.06 and a change of .39 from the pre-survey mean score showed a more positive disposition towards the use of Facebook to extend learning beyond the classroom. As it relates the findings for the integration of blended learning involving classroom instruction and Facebook, the pre-survey mean of 3.53 with a STDV of 1.05 showed a position disposition. The post-survey mean of 3.75 with a STDV of 1.08 and a change of .22 from the pre-survey mean showed a more positive disposition towards blended learning involving classroom.

Figure 1 displays the change in the pre and post survey means. It is clear that the educational value of Facebook

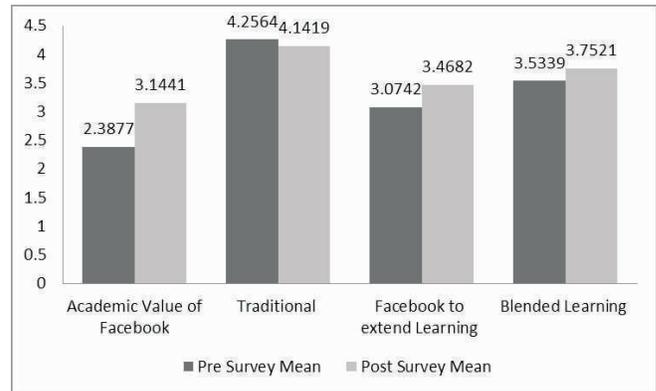


Figure 1. Students' Perceptions of Web 2.0, Traditional Learning and Blended Learning

had the most gains from the pre-survey to the post-survey. The presentation also reflects a negative change that occurred on students' perceptions of traditional instruction as a result of Facebook intervention.

Figure 2 presents changes that occurred in students' perceptions of the educational value of Facebook, traditional classroom instruction, using Facebook to extend learning beyond the classroom and blended learning from the pre-survey to the post-survey. Findings reveal a positive disposition in students' perceptions of the academic value of Facebook, using Facebook to extend learning beyond the classroom, and blended learning with the greatest gain being students' perceptions of the educational value of Facebook. Findings also reveal a negative change in students' perceptions of traditional classroom instruction.

The study also utilized qualitative research to analyze data. The data revealed more information about how students used Facebook and their recommendations for improvement. Table 2 shows accessing videos and notes, communication with colleagues and teachers, and checking homework as the three common ways students'

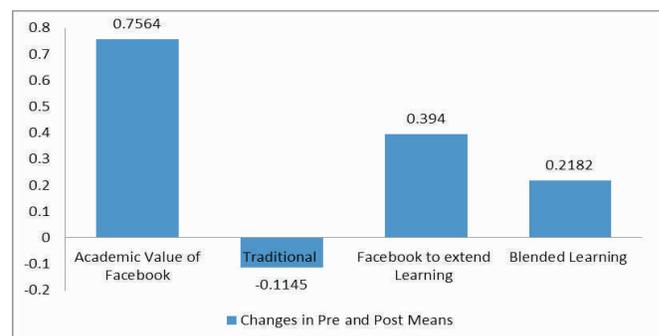


Figure 2. Observed Change in Students' Perceptions of Web 2.0, Traditional Learning and Blended Learning

Uses of Class Facebook	Number of Responses
To access support materials including videos and notes	55
Communication	50
To check the homework assignment	43

Table 2. Uses of Class Facebook

used the class Facebook.

Students provided few, but valuable responses on how to improve the use of Facebook as an educational tool as presented in Table 3. Students recommended that the Facebook is designed as a group and not as page and also for the instructor to align Facebook activities with Twitter. Though the number of responses were small relative to the research size, this may be attributed to the fact that few students are using Web 2.0s in general or experience Web 2.0 tool for the first time in an educational setting.

Discussion

Web 2.0 technologies such as Facebook clearly play an important social role in the lives of digital natives. Findings of this study suggest that students are interested and willing to use Facebook to extend learning beyond the classroom. Using Facebook as an extension of the classroom has the potential to provide additional support to students, engage students beyond the classroom and increase communication between students, peers and teachers.

For this research project, the teacher had access to many technology hardware and software tools, which orchestrated the delivery of engaging and meaningful instructional items via the class Facebook page resulting in an overall positive student perception of the educational value of Facebook. It is important to mention that having access and knowledge of technologies including but not limited to SMART Board, SMART Notebook, Google Docs, YouTube and an external microphone as well as familiarity of Facebook greatly contributed to the effectiveness of the class Facebook page. Teachers who intend to create and use a Facebook page should seek knowledge and access to these technologies as well as create a professional

Dislikes/Suggestion for improvement	Number of Responses
Make it a Group and not a Page	10
Synchronize with Twitter	5

Table 3. Suggestions to Improve Facebook Use

Facebook account that does not intermingle their professional and personal lives.

Findings of this study suggest that even though students use Facebook as a social tool, most students in this study (average age 16) prefer and place more value on traditional classroom instruction. One reason for this could be that traditional classroom instruction has been the primary delivery mode for them throughout their school career. Perhaps this will change as elementary and middle school students' learning experiences begin to reflect the incorporation of 21st century learning technologies. There was a greater gain in students' perceptions of the educational value of Facebook than in students' perceptions of using Facebook to extend learning beyond the classroom. This reveals information about how students are using Facebook as an educational tool. Students in this research prefer to have Facebook provide supportive opportunities rather than serve as initial learning and delivery mode for new mathematic concepts. Students' perceived value of supportive materials and opportunities is further supported through the analysis of the qualitative data, which reveals that students place most value on supportive instructional materials such as class notes and instructional videos, which was followed closely by communication and posted homework assignments.

Limitations and Recommendations for Future Research

This study only assessed students' perceptions of Facebook from the perspective of a high school precalculus course. Precalculus is considered an honors course. The average age of the participating students was 16 years of age. Further research is needed to explore the effectiveness of Facebook in other disciplines. Further research is also needed to examine the effectiveness of Facebook among younger school aged students and students who are enrolled in standard courses. In addition, many students expressed interest in participating in a Facebook group rather than a Facebook page. Being a member of a group would allow students to receive notifications any time there was a post on Facebook. More research is needed to determine the best design for a Facebook page with consideration including but not limited to ease of access and notifications offered by the design, and

synchronization with Twitter.

References

- [1]. Burbary (2011). *Facebook Demographics Revisited – 2011 Statistics*. Retrieved September 10, 2011, from <http://www.kenburbary.com/2011/03/facebook-demographics-revisited-2011-statistics-2/>
- [2]. Caudill, J. (2011). Media-rich Social Networks: Open Source Solutions to Media Creation. In M. Koehler & P. Mishra (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2011* (pp. 187-194). Chesapeake, VA: AACE. Retrieved September 10, 2011 from <http://www.editlib.org/p/36256>.
- [3]. Garner, R. & Bull, P. (2012). Learning with Web 2.0: Using Wiki Page to Teach Mathematics. In P. Resta (Ed.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2012* (pp. 2804-2809). Chesapeake, VA: AACE. Retrieved from <http://www.editlib.org/p/40013>
- [4]. Hazari, S., North, A., & Moreland, D. (2009). Investigating pedagogical value of Wiki technology. *Journal of Information Systems Education*, 20(2), 187-198.
- [5]. Karpinski, A., Duberstein, A. (2009). A description of Facebook use and academic performance among undergraduate and graduate students. Poster presentation at the 2009 American Educational Research Association Annual Meeting, San Diego, CA.
- [6]. Kay, R. & Edwards, J. (2010). Evaluating the Use of Instructional Video Podcasts for Middle School Mathematics Students. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, 2010. (pp. 3626-3629). Chesapeake, VA: AACE. Retrieved September 10, 2011 from <http://www.editlib.org/p/35163>.
- [7]. Niess, M.L. & Walker, J.M. (2010). Guest Editorial: Digital Videos as Tools for Learning Mathematics. *Contemporary Issues in Technology and Teacher Education*, 10(1), 100-105. AACE. Retrieved September 10, 2011 from <http://www.editlib.org/p/34122>.
- [8]. Pollara, P. & Zhu, J. (2011). Social Networking and Education: Using Facebook as an Edusocial Space. In M. Koehler & P. Mishra (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2011* (pp. 3330-3338). Chesapeake, VA: AACE. Retrieved October 8, 2011 from <http://www.editlib.org/p/36833>.
- [9]. Tan, E.X. & Low, Y.C. (2010). The Perception and Acceptance of Students towards using Social Networking Sites in Teaching and Learning. In Z. Abas et al. (Eds.), *Proceedings of Global Learn Asia Pacific 2010*. (pp. 247-252). AACE.
- [10]. Urban Dictionary. (2010). *Generation Z*. Retrieved September 7, 2011, from <http://www.urbandictionary.com/author.php?author=xSpartan117x>
- [11]. Zahidi, Z., Mat Sin, N. & Jamal, J.I. (2011). Facebook Features: Enhancing Student Engagement in Self-Regulated Learning. In S. Barton et al. (Eds.), *Proceedings of Global Learn Asia Pacific 2011* (pp. 268-277). AACE. Retrieved October 8, 2011 from <http://www.editlib.org/p/37184>.

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