Radical Awakenings: A new teaching paradigm using Social Media

Presenter: Clarissa Sorensen-Unruh

Abstract

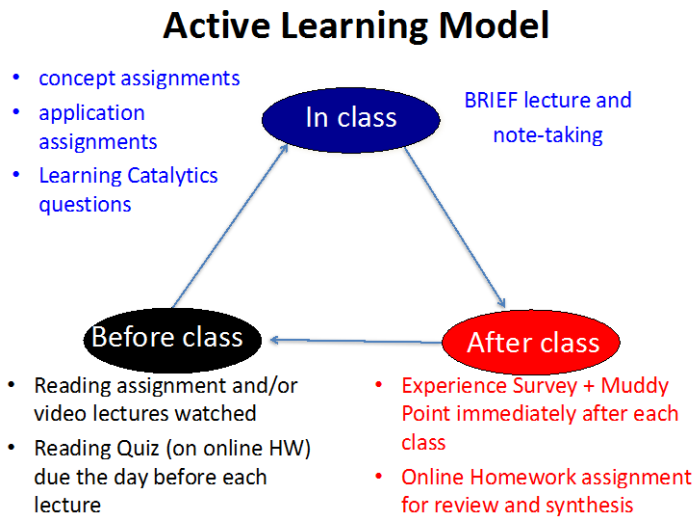
This paper focuses on one instructor's integration of social media into her classroom and her teaching life as both a communication tool, mainly between professor and student, and also a way to build community amongst the students. Multivariate statistical analyses were implemented to determine the relative success of the integration as compared to the baseline of an active learning model. Future directions include qualitative analyses and further quantitative analyses on questions raised by the initial findings.

Introduction

Unmotivated or under motivated students are common at all levels of education, but are more prevalent at the community college level (McFarlane, 2010). Student motivation impacts student grades (Maurer, 2013) and persistence in STEM careers. Research has shown that faculty members can impact student motivation through classroom activities and assignments (Maurer, 2013). Samson (2015) found that activities that promote critical thinking skills increase student engagement.

Bransford, Brown, and Cocking (1999) discuss the importance of active learning within the classroom, and found that students who actively engaged with course material learned more effectively. Extensive research demonstrates the value of active learning for STEM disciplines (Freeman et al., 2014). Many students leave STEM fields because of lack of engagement (Chang et al., 2012), and therefore, incorporating more active learning into STEM fields can increase student learning and retention in STEM disciplines.

These findings, coupled with my own reflective practice, lead me to employ an active learning pedagogy within my classroom starting in 2009. Beginning in 2012, I employed an active learning model that looked like the following (based on *The Learning Strategies Triangle* developed by Gary A. Smith at UNM):



The underlying theme within this model is that the pinnacle of learning should be inside the classroom, with student preparation before class and synthesis after class.

As CNM is the largest higher education institution in New Mexico with an enrollment of 29,000, of which 46.3% of students are Hispanic and 7.1% American Indian or Alaskan Natives (National Center for Educational Statistics, 2015), I believed active learning pedagogies could help my students tremendously. However, the relationships built within the classroom were not enough, particularly because I was often teaching hybrid students who only physically met together (face-to-face or F2F) once a week.

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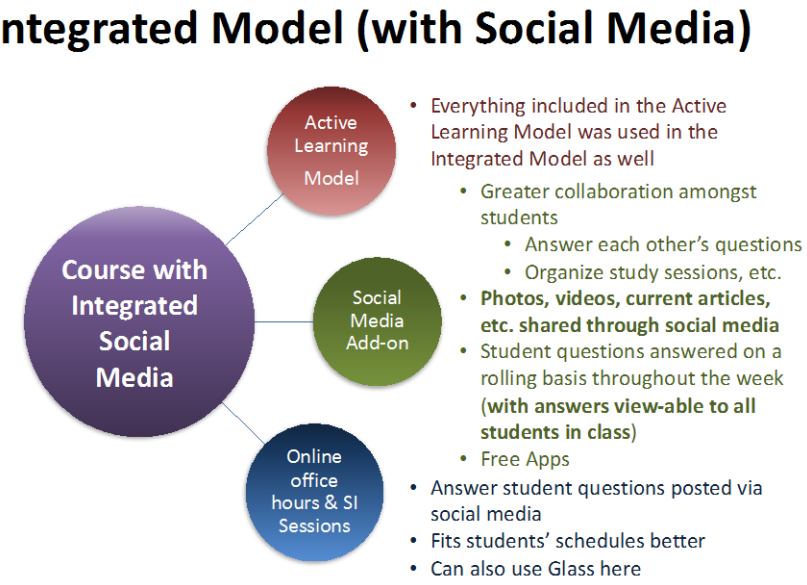
Osterman (2000) argued that both community and relationships among peers increase commitment and engagement in individual student learning, and are thus essential building blocks for any learning space. Selwyn (2010) developed this line of thinking further, arguing the use of social media can not only help build a better learning community for students both inside and outside the classroom but also democratize the digital and face-to-face learning environments further. Dunlap and Lowenthal (2009) contend that students' use of social media can benefit from modeling and can extend far beyond the classroom, enabling the building of digital citizens. These ideas - using social media within classroom environments and developing students as digital citizens - couldn't be more timely. As of April 2015, approximately 74% of all online adults used at least one social media site (Wormald), and 71% of teens (aged 13-17) used more than one social network site (Lenhart, 2015). While 79% of AAAS scientists believe it is a major problem for science communication that news reports don't distinguish between scientific findings that are well-founded vs. those that are not well-founded, only 47% of those same scientists use social media to talk about science or read about scientific developments (Rainie, Funk & Anderson, 2015). Four in ten Americans say they regularly get news updates from social media (American Press Institute, 2015) and that number is only expected to increase (Mitchell & Holcomb, 2015).

Therefore, I decided to incorporate a social media component into my classroom pedagogy to enhance the active learning model. The integrated model looked like the following:



At this point, one might ask what was gained in the Integrated Model? As was found in Selwyn (2008), I found that the community aspect of my class increased because I implemented the digital facets of the classroom community using a social media platform (mostly Facebook in closed groups) my students already understood, and I found that my students increased their academic self-efficacy skills as a result of the multimodal communal aspects of learning.

Methods

The educational research on the usage of social media within learning and professional environments remains in its beginning stages, and currently a dearth of empirical articles exists on the use of social media within these environments (Conole and Alevizou, 2010; Tess, 2013). To that end, after obtaining the appropriate IRB approvals, I also performed a series of statistical analyses centered around the use of social media to communicate chemistry within a classroom setting. The pedagogical

goals of the research project included building a digital learning community for students and aiding in their development as digital citizens. The project asked two main research questions to explore the use of social media to communicate chemistry:

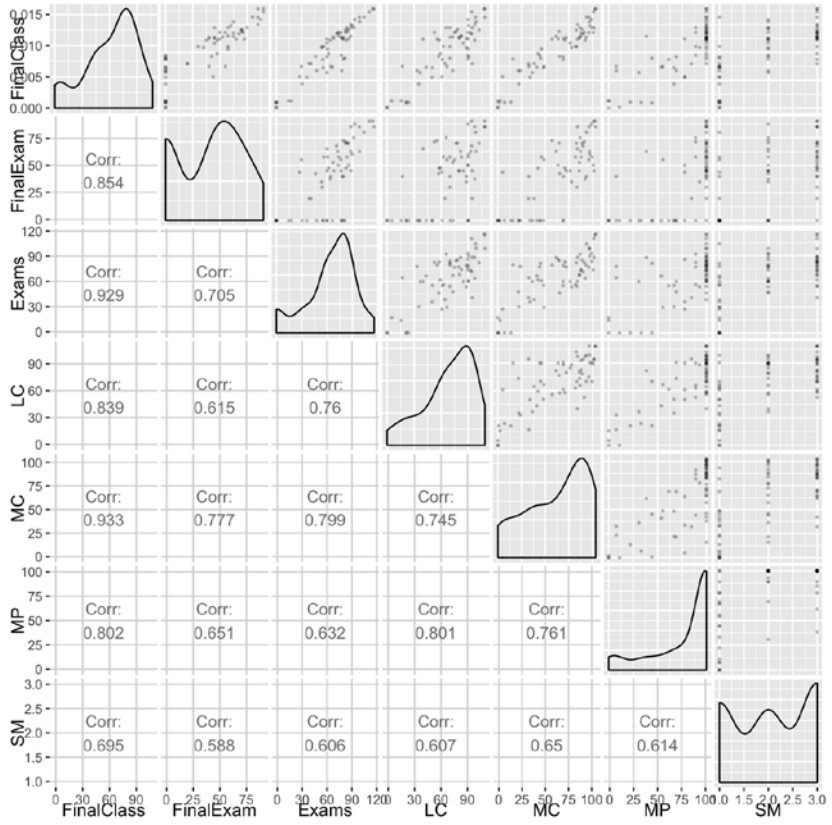
1. **How does the presence of class-based social media affect persistence and impact students' course grades in their beginning chemistry courses?**
2. **How does the presence of class-based social media in beginning chemistry courses affect persistence and impact students' course grades in next level coursework?**

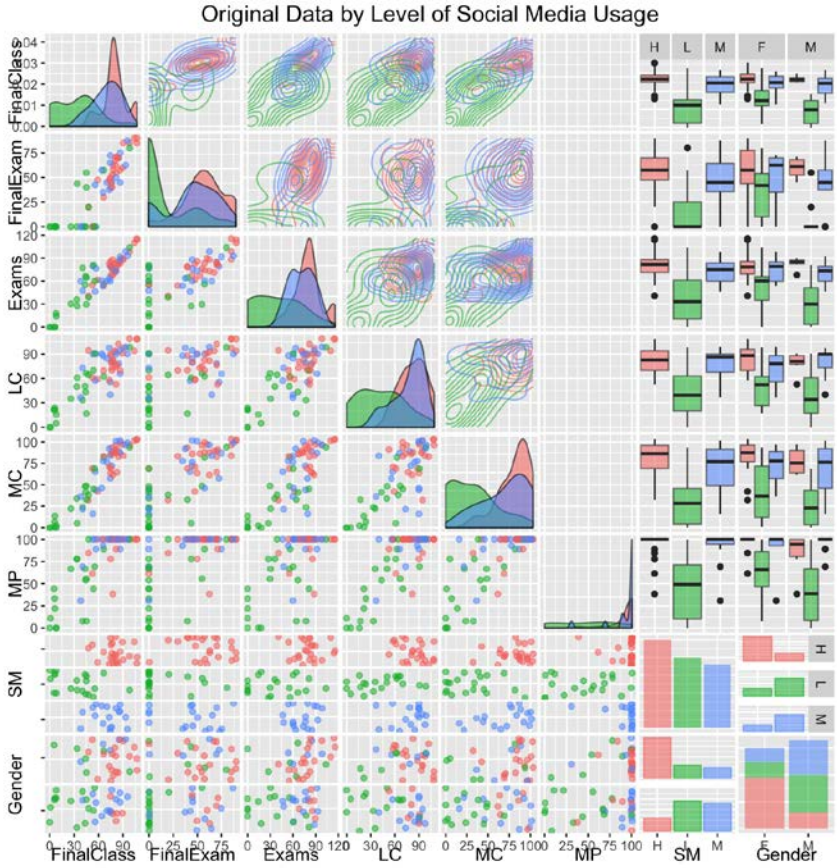
Results and Discussion

The questions were explored using both mainly quantitative methodologies, including multivariate regression analysis in the beginning chemistry course and then paired t-tests between the beginning chemistry courses and the next level course. The variables used for the statistical analysis can be found in the table below:

Variable	Definition	Description	Type	Values
FinalClass	Final Course Grade	Students grades for the course	Numerical: Continuous	0-100
FinalExam	Final Exam Grade	Grades on comprehensive, entirely multiple choice final	Numerical: Continuous	0-100
Exams	Average Exam Grade	Average of 4 midterm exams	Numerical: Continuous	0-100
LC	Learning Catalytics	Average from in-class exercises (80% given for participation)	Numerical: Continuous	0-100
MC	Mastering Chemistry	Average for online homework	Numerical: Continuous	0-100
MP	Muddy Points	Experience sampling survey combined with metacognitive reflections on student's progress through the class (Muddy Point)	Binary	0, 100
SM	Social Media Involvement	H (or 3) reflects high use of social media (>20 postings) M (or 2) reflects medium use of social media (10-20 postings) L (or 1) reflects minimal or non-use of social media (<10 postings)	Can be either: categorical or continuous	H, M, L 1, 2, 3
Gender	Gender/Sex	Binary gender (M = Male; F = female) was taken from survey results. No third category (trans or other) was checked & therefore not used.	Categorical	M, F

The multivariate scatter plots with correlation values (top) and colored according to social media usage (high = Pink; Medium = Blue; Low = Green bottom) are below:


FinalClass
FinalExam
Exams
LC
MC
MP
SM
Corr: 0.854
Corr: 0.929
Corr: 0.705
Corr: 0.839
Corr: 0.615
Corr: 0.76
Corr: 0.933
Corr: 0.777
Corr: 0.799
Corr: 0.745
Corr: 0.802
Corr: 0.651
Corr: 0.632
Corr: 0.801
Corr: 0.761
Corr: 0.695
Corr: 0.588
Corr: 0.606
Corr: 0.607
Corr: 0.65
Corr: 0.614

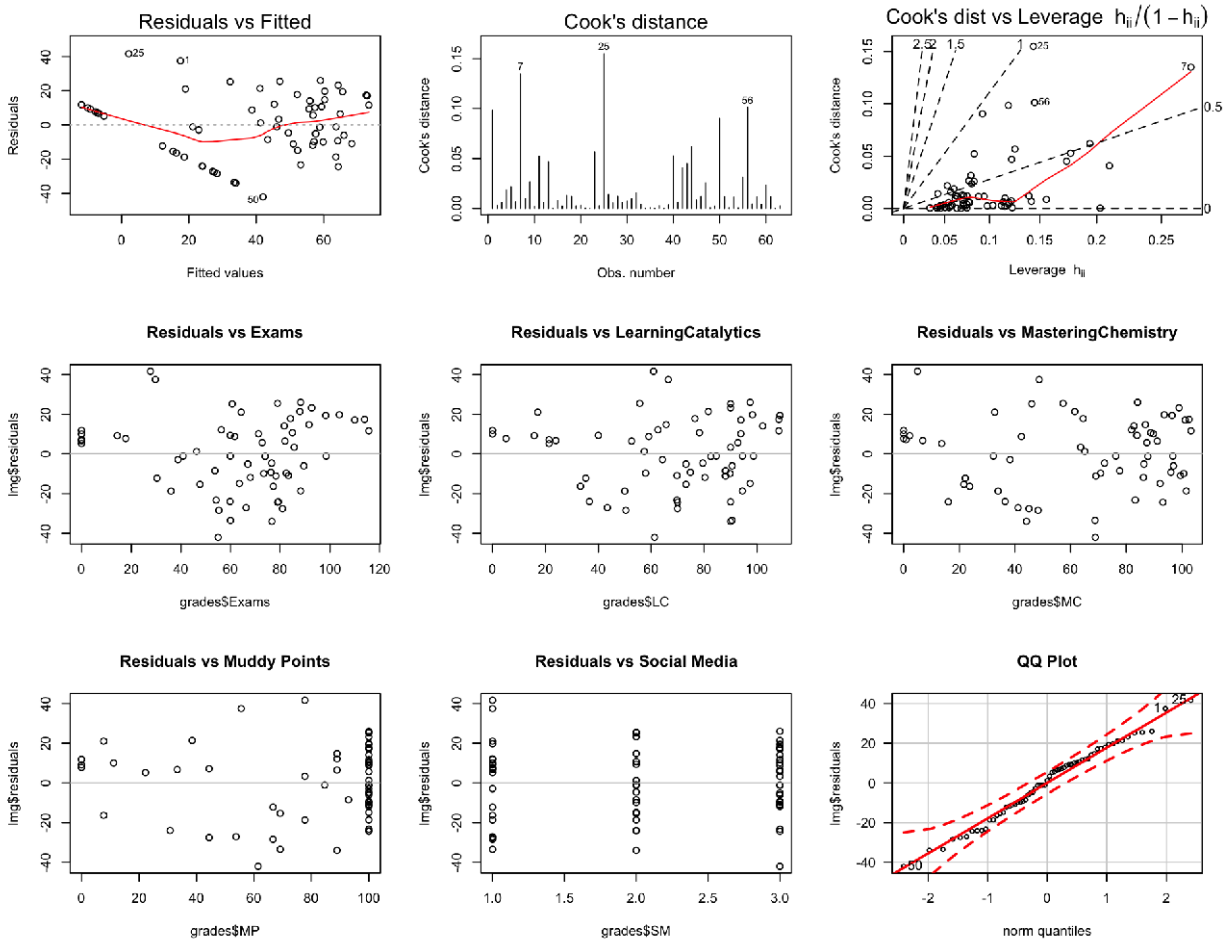

Original Data by Level of Social Media Usage
FinalClass
FinalExam
Exams
LC
MC
MP
SM
Gender
H
L
M
F
M

From these plots, we can see that the highest correlation values exist between Exams and MC when regressed against FinalExam. The FinalExam variable was chosen as the dependent variable in the multivariate regression as the final exams used in CNM's general chemistry classes have several features of interest. The final exams are independent grades (unlike FinalCourse grades, in which every other variable contributes some percentage) and originated as the first and second semester general chemistry exams from the ACS Exam Institute, and then, when time was no longer available for the longer exams, were modeled on the same exams. The analyzed semesters used the final exams based on the ACS finals, not the ACS finals themselves. As the ACS Exam Institute exams have been externally validated and are entirely multiple choice, so strict reliability measures are less obligatory, the final exam was deemed to be at least a reasonable measure of whether students learned the important chemistry concepts during the semester. Thus, the full regression model used was:

$$\boldsymbol{FinalExam = -15.33 + 0.27(Exams) - 0.14(LC) + 0.44(MC) + 0.16(MP) + 3.52(SM)}$$

with each variable contributing positively to the final exam grade except for the learning catalytics (LC) variable. Why the LC variable contributed negatively is certainly cause for future analysis, but from viewing the student grades for LC, I believe the fact that many students did not regularly complete the learning catalytics assignments is the biggest reason this variable had a negative impact on their final exam grades.

From the colored multivariate scatter plot, we can also see that there is a positive correlation between social media usage and active learning. This relationship has been confirmed repeatedly by observation throughout the time I have been offering social media as an extension within my active learning classes, ranging from Introductory Chemistry to Organic Chemistry.

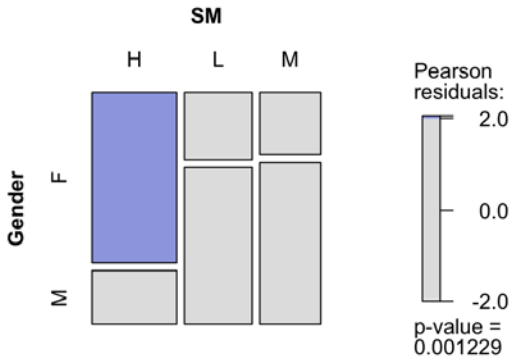


Checking the assumptions of this model from the plots above, we can see, in summary, the following:

- From the qq plot, we can see the normality of this model looks good. The histogram (not included) as well as the Shapiro-Wilk test (p-value = 0.7261) confirm normality.
- From the residuals vs. fitted plot, we can see the assumption of constant variance is confirmed. The Breusch-Pagan test (p-value = 0.6984) confirms constant variance as well.
- No significant x or y outliers and no real influential points (Cook's Distance vs. Leverage) are shown, so no data points were excluded.
- From the residuals vs. order (not shown), we can see the independence of model is confirmed as well.
- The full model was reduced, and the equivalence of the reduced model was analyzed (via ANOVA Type 3 test). The reduced model was significantly different than the full model, and thus not equivalent, so the full model was kept.

Essentially, the full model meets all of the assumptions and is the best model for this data.

A mosaic plot was made to compare gender differences in terms of social media usage. From the Pearson residuals, we can see that the only statistically significant relationship is between females (F) and high social media usage (H) (p-value: 0.001229). Therefore, we can say that there is definitely a positive correlation between women and their use of social media within this project and furthermore, we can say that women use classroom social media at higher rates, at least within this project. However, qualitatively we have no information as to why women use social media more often.



Bar graphs were used to compare the integrated model with previous classes using the active learning model exclusively (i.e. reference). On the far right, the next level class (General Chemistry II) was analyzed. While pairwise t-tests for the pass rate (green) and retention rate (purple) for the semesters in which the integrated model was used (Gen Chem I: Fall 2015 and Spring 2016) showed no significant differences (at alpha = 0.10) from the reference (Gen Chem I: Spring 2015), there is evidence via a pairwise t-test between Gen Chem I Fall 2015 and Gen Chem II: Spring 2016 (p-value = 0.12) that the next course pass rate and retention rate might improve dramatically and in a statistically significant way (especially as we increase our *n* value).

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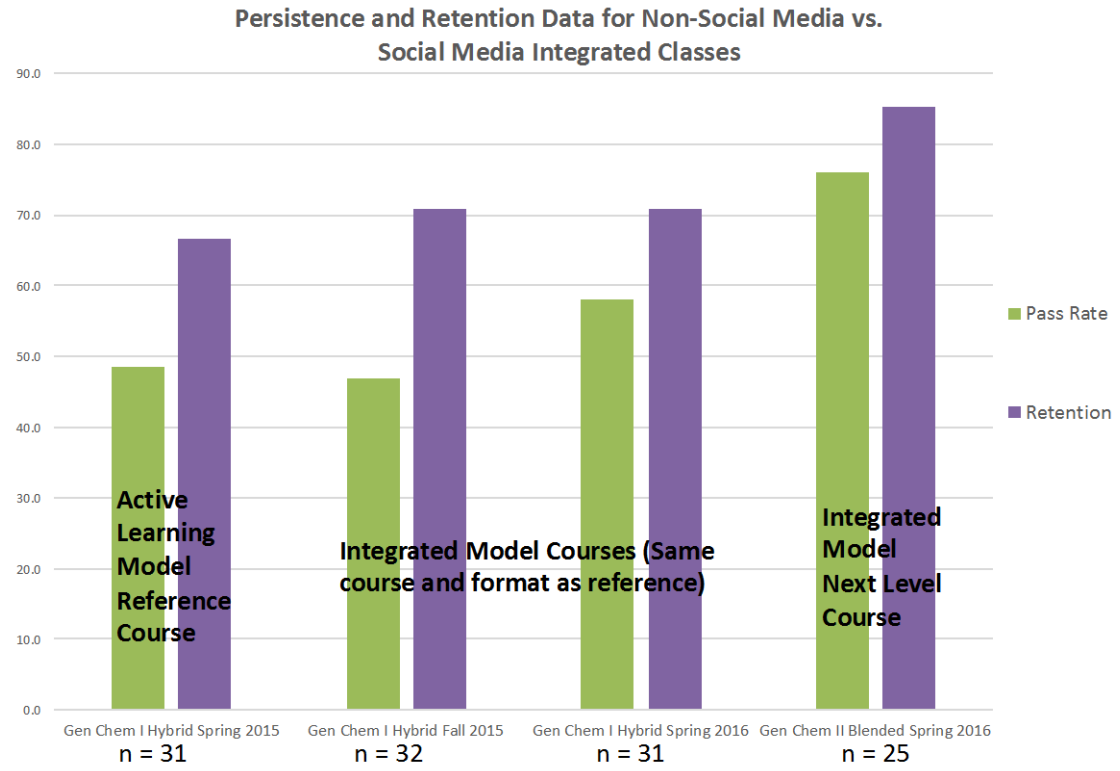

Conclusions

Within the context of this project, there was definitely a positive relationship between social media integration and final exam grades, in that the more students posted on social media, the higher their final exam grades were. However, the extent of this relationship remains to be seen as it is neither a particularly strong correlation nor a deep one - the relative quality of student postings has yet to be analyzed. Obviously, to simply know the number of social media posts is far different than knowing their content, and so analysis on quality of social media posts using qualitative methods is definitely warranted. Women tend to post to classroom social media at higher rates, but again, qualitatively we have no information as to why women use social media more often, and are thus left with more questions to explore than answers.

However, the next level course results show great promise: the general chemistry II blended spring 2016 class that had begun their studies in the general chemistry I hybrid fall 2015 had a 76% pass rate and 85% retention/persistence rate (including 4 audits). While these results do not significantly differ from the active learning model in the next level class (76% pass rate and 79% retention/persistence rate), the remarkable thing here is that the active learning model was successful when offered in the ***same class format*** (i.e. hybrid) and the integrated model was successful when offered in ***different class formats***, where the F2F (face-to-face) component was essentially eliminated in the next level coursework. The students in the integrated model next level class also independently set up their own GoogleDrive and GroupMe accounts to further their communication and community. Comparison of different types of classes (F2F, hybrid, blended) and levels (introductory chemistry, general chemistry I and II, or organic chemistry I and II) is still needed to determine if this is a trend or just a one-time occurrence.

The pedagogical use of social media to build community and enhance communication between students tends to "mirror much of what we know to be good models of learning, in that they are collaborative and encourage an active participatory role for users" (Maloney, 2007: B26). I found my

experience with social media integration to be positive, affirmative and a success. Yet much work remains to be done. Social media integration does not work the same for every class, especially when not required as a graded component. Framing by the instructor when "selling" the idea of social media integration to students seems to be a defining factor according to the literature (Cole, 2009; Minocha et al., 2009), and has not been adequately addressed within the context of this study.

I'd also like to collect more surveys detailing how students feel about the social media integration, particularly as a reflection of the semester and possibly several semesters. Interviews and/or focus groups could also be conducted to gather more about the individual student experience.

The one thing I did not expect when the classroom social media integration was implemented was what a professional development opportunity it provided for me personally. While there isn't time to detail the community building or many PD interactions it's afforded me, it was a great and unexpected benefit of this project and pedagogy.

I would like to thank the following persons/entities involved with this project: my students, who allowed me to teach them (and thus gather data on them); Emily Alden, my supplemental instructor during the time the social media extension was offered; and CNM Community College and its IRB*.

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