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Improving Engagement by Creating a Peer Environment

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Introduction

This paper will describe my use of peer-led learning in providing library instruction and a series of workshops in the use of LaTeX, a document preparation system. Since 2008, I have been the applied science librarian at The University of Akron. The departments served by this position include several of the engineering disciplines, as well as engineering technology and computer science. Most instructional sessions with students consist of integrated library instruction for particular courses. The workshop series on LaTeX consists of seven modules and students from many of the science and engineering departments attend them. This paper is written with engineering student behaviors in mind; however, adjustments could be made to apply the findings to other populations.

Peer-led learning has seen a measure of success for students in many disciplines (Bolton, Pugliese, and Singleton-Jackson 2009; Chase and Okie 2000; Micari and Light 2009). Vygotsky's theory of the Zone of Proximal Development states that more advanced students can effectively instruct students at a lower level of understanding on a topic (Cracolice and Trautmann 2001, 97). In practice, peer-led learning often employs students to present the material; however, it is possible to achieve this effect in educator driven instruction. Social constructivism has roots in Vygotsky's theories and dictates that everyone is responsible for the dissemination of knowledge, including students. If an educator can establish more of a colleague type of rapport with students, this type of environment can be generated naturally. Since everyone is responsible for the dissemination of knowledge, students feel part ownership of the content which naturally increases engagement and collaboration. An assessment tool, such as an electronic survey, can be used to facilitate collaboration between the educator and students. The data collected from students will not only improve the instruction but also will show students they are contributing to the instruction as seen in the social constructivist classroom.

The information seeking behavior of engineering students fits Vygotsky's theory and social constructivism. Engineering students are comfortable asking peers when seeking assistance. There are situations when they will ask a supervisor or professor questions, but they are not always comfortable seeking answers at a higher level in the hierarchy. Seeking answers can be the first step in engagement and seeking answers from interpersonal sources leads to collaboration. Therefore, establishing a peer or colleague relationship can facilitate an open dialog that leads to collaboration and engagement. Social media can be used to extend one's social network; however, care must be exercised when educators use these tools to become part of the student's social support system.

Seeking Information for the Fastest Results

There is a long history of research literature establishing that engineers and engineering students find colleagues or peers to be an important information source (Allard, Levine, and Tenopir 2009; Du Preez 2007; George et al. 2006; Kraus 2007). The level of importance of this type of communication can vary depending on job specification, level of education, the phase of and their role in a specific project (Allard, Levine, and Tenopir 2009; Du Preez 2007).

A likely reason for the importance of colleague or peer communication is the need to access information quickly in order to apply it in some practical way. For example, this urgency could be fueled by a lack of

time to seek answers due to the full course load of an undergraduate student or an unexpected project delay near the project deadline in the corporate environment. Even though the information needs of engineering graduate students often differ from undergraduates and practicing engineers, a study by George *et al.* (2006) found that the most cited factors affecting graduate students use of libraries to find information were a preference for convenience and a need to access information quickly. For quick access to information, they ask the cohort that would most likely possess the information to solve the immediate problem and would be the most approachable. It could be those with first-hand experience, such as engineers on the same project or senior students who took the course previously. It could also result from successfully receiving information from this individual previously (Allard, Levine, and Tenopir 2009; Du Preez 2007; Agarwal 2011).

A study by Allard *et al.* (2009) found that some engineers were using the Internet for a first stop to find information; however, context cannot be ignored when assessing information seeking behavior (Agarwal 2011). Many of the engineers in the study were software developers, where a noted use of the Internet was looking for solutions to specific code problems. Accessing the Internet first to acquire information could be possible for most engineers; however, the Internet is rich with developer Web sites containing this information. The developer Web sites could be viewed as an extension of seeking information from colleagues or peers. Although the information seeker does not know the individual who posted the information per se, they could be considered a peer based on a common interest. This information seeking behavior is likely to be a time saving measure. Engineering graduate students appreciate that information on the Internet is convenient, fast, and current as well (George et al. 2006).

When an educator is teaching a subject, students will often view this person as an expert in the subject. As seen by the behavior of practicing engineers, this expert status could facilitate questions and engagement in the subject. Without analyzing other facets that differ between practicing engineers and engineering students, another common factor that prevents information seeking from a particular source is the source being unapproachable. When an interpersonal source is seen as a social equal, it often increases confidence in the information seeker which facilitates the process. If this transfer of information is successful, it increases the chance this source will be used again in the future.

Learning with Help from your Friends

Peer-led learning has been found effective for different disciplines and implemented in various ways. Peers can be students taking a class at the same time or students who took a class previously. One theory that could explain the effectiveness of peer learning is Vygotsky's theory of the Zone of Proximal Development. The theory postulates that learners operate in a zone of development. Before learning a concept, a student might be at the bottom of this zone. A more advanced peer, who could have learned this concept previously or be further along in understanding the concept, could instruct the other student. According to Cracolice (2001, 98), the peer leader has a natural tendency to try to bring the other students to their level of development. A concrete example of this concept was seen at the University of Windsor, which had an established information literacy program based in active learning and peer-led instruction (Bolton, Pugliese, and Singleton-Jackson 2009). A course was established to aid first-year students in their transition to college and one component of this class included peer mentors

assisting in the delivery of information literacy instruction. In another course for students who wanted to become peer mentors, a portion of the class included training by experienced mentors. The new mentors stated that the senior peer mentors were seen as a voice of authority and social equals, which drove the new mentors to imitate the senior mentors, illustrating Vygotsky's theory.

Social constructivism is a related theory that brings a social, group, or communication aspect to constructivism, where sense-making occurs in the mind of the learner. A social constructivist classroom provides a safe space for learning where everyone learns as a group. Oldfather outlined several classroom characteristics provided by social constructivism (Oldfather and West 1999, 74). Teaching and learning are based on social interaction. Since the focus is on sense-making, errors are a natural part of learning. The teacher is teaching and learning as well as the students, resulting in the lateral flow of ideas instead of hierarchical. Physical, emotional, and psychological needs are considered along with intellectual needs. In a study by Austin (2011, T3J-2), several social constructivist concepts were found when interviewing engineering students about how care and respect were shown among peers when working on group projects, such as accepting differences in opinion, concern for the well-being of others, kindly critique of others, and taking into account what others can contribute. Albeit a very small sample set, the results were not unexpected. There are common truths that pertain to the treatment of others, as well as the fact that providing a safe environment for learning will promote learning. It is extremely important to know that one's opinion matters and that they can contribute to the learning of the group.

A peer or colleague relationship can be established in many ways including using some social constructivist principles. It is not necessary that a peer is the same age; however, the connection might be more naturally facilitated (Micari and Light 2009). In fact, colleagues are not all the same age in the working world, but they can have a successful working relationship and identify with each other based on like interests, such as the success of a project. Some effective methods of establishing peer relationships are based on showing care and respect. In my library instruction and LaTeX workshops, for example, increasing availability by answering questions during non-work hours has shown students that their problems are important. In addition, an open door policy will allow a student to ask a question at any time. Establishing an open dialog about availability has curtailed disappointment when I am not available. Reliability and flexibility can be almost as important as expertise in maintaining the status of a valid source of information. Of course, these courses of action are not feasible in all situations particularly when there is a mass of students needing service; however, other courses of action that show care and respect can be just as effective. Technology can eliminate time and space issues of the past; however, technology itself does not guarantee collaboration (Woodard 2003, 184). Increasing contact points, such as availability via instant messaging and text as well as email, telephone, and in person can make it more convenient for students to contact a faculty member, but it does not mean that they will do so. In addition, social networking could help establish a peer or colleague relationship, but must be done so carefully.

Today's Expanding Network of Peers and Colleagues

Social media networks are often used in a personal manner; however, these networks have been used for academic and business purposes although not all of them are used equally for professional and personal networking. The design of the system, including systems of access, of social networks can facilitate how they are used. For example, LinkedIn requires information on how the connection or person is known, thereby emulating professional etiquette (Papacharissi 2009). It also provides a professional sense of place by supplying templates based on resumes or curriculum vitae, suggesting referrals from colleagues, and facilitating networking and professionally related questions (Papacharissi 2009; Skeels and Grudin 2009, 97). In general, the groups in LinkedIn are professional or company related (Skeels and Grudin 2009, 97). The design of Facebook is more open and facilitates social interaction. The template is not as structured and many of the applications promote informal social interaction, such as participating in games, sharing of likes/dislikes and sharing photos (Papacharissi 2009).

The ECAR National Study of Undergraduate Students and Information Technology (2011, 26) found that while 25% of students find Facebook valuable to their academic success, 53% found Facebook of limited value. It is likely that most academic encounters occur with other students, since 58% of the respondents said they would be comfortable using Facebook to communicate with other students about coursework. The majority of students (60%) would include a faculty member as a friend; however, 39% of the respondents still find this inappropriate. Since it was reported that 90% of surveyed undergraduate students use this source, the majority of Facebook use by undergraduate students would be social in nature most likely. The surveyed population was a stratified random sample that consisted of more than undergraduate engineering students alone, but it would not be outrageous to consider this subset of the population to be similar. Some libraries have seen a measure of success using Facebook; however, these libraries had pages for the library as an institution not individual librarian pages (Jacobson 2011; Sachs, Eckel, and Langan 2011). From ECAR, it was found that 30% of the students strongly agreed that they would like to keep their academic and personal life separate, so it would be possible that a friend request could be found intrusive from a faculty member (Jacobson 2011, 80; Sachs, Eckel, and Langan 2011, 38).

Professional orientated social networks, such as LinkedIn, can establish a professional connection by providing an electronic contact list with more information than just an email address and a name (Skeels and Grudin 2009, 98). In addition, professional oriented social networks might be less invasive than connecting through an open network like Facebook, particularly for students who like to keep their personal and professional or academic lives separate. Even though a smaller percentage might find faculty on social networking sites invasive, contacting a student who does might prevent the student using you as an information source in the future. Just as these Web based social networks extend the reach of a traditional “social network” of people that the student can contact and collaborate with, other traditional tools in the electronic environment, such as surveys, can facilitate collaboration in addition to providing assessment of programs.

Assessment as a Tool for Collaboration

Assessment is crucial to ensure that programs, courses, and other student services are functioning as intended, and to their full potential (Munde and Marks 2009; Suskie 2009). Assessment is part of nearly every accreditation process and institutional action plan. Assessment can consist of several methods or use several tools to verify performance. One method of assessment is collecting feedback from students using a survey (paper or electronic). Depending on the use of the student feedback obtained, this data might be viewed as asynchronous collaboration. From social constructivist perspective, everyone is learning, including the educator. Students are shown that they can supply knowledge in addition to being the recipient of it when their feedback is used in some way to improve the program or course. It shows the student that they have valuable input and perspective to contribute. Students will feel that they have part ownership in the program or instruction; thereby increasing engagement. In addition, it shows that the educator cares about the student's success and respects the contribution that they can make. Not only are care and respect important in the social constructivist classroom, they are also important among peer engineering students working on group projects. If this peer or colleague relationship is to be established, care and respect between educators and students are paramount. Integrating feedback can establish rapport and facilitate this relationship naturally. The remainder of this article will present a case study of effective use of implementing feedback in library and LaTeX instruction resulting in increased engagement and some evidence of peer or colleague like rapport.

Finding the Appropriate Assessment for the Target Audience and Acquiring the Information

Although I instruct mostly engineering students, many of the other disciplines that I have instructed prefer receiving the most concise and timely answers possible. In general, engineering students do not appreciate long winded answers with a lot of unnecessary background information nor do they have the patience to answer a long survey with multipart questions. Due to this fact, the surveys contain the bare minimum number of questions to gain implementable feedback. The questions are inspired by the "one-minute paper" (Quigley and McKenzie 2003) and are as follows: please describe something you learned from the session; please describe how this session could be improved or make any other comments; and how did you become interested in LaTeX.

Survey data are collected electronically using the Checkbox software by Prezza. Due to the simplicity of the survey, the complex features of the software are not employed except for the use of a hidden variable to determine if a particular question should appear. The anonymous results are exported to a Microsoft Excel spreadsheet. In addition, actions taken to address the student feedback are recorded in this spreadsheet in order to track the effectiveness of the changes.

Sometimes it is difficult to entice students to take the surveys. To increase response rate, the last five minutes of each LaTeX workshop are used for the attendees to complete the survey, which results in nearly 100% response rate. Another class receives ten points to complete the survey as a homework assignment, which yields a response of around 90%. Other methods have been tried, such as the chance of winning a $25 gift certificate, resulting in a 40% response rate at best. Rarely has anyone responded to the survey for the stand-alone tutorials. Intellectual curiosity was tried as a motivator, where the user must open the survey to see the answer of a bonus question in the tutorial, without success.

Survey visibility has been an issue particularly when the survey is not associated with a face-to-face class meeting.

Taking Action to Show Students their Opinions Matter

It is not possible in all instances, but integrating student feedback into the instruction, even if it is in a small way, creates a social constructionist environment that improves the instruction and makes the students feel more engaged. Incorporating feedback with the LaTeX workshops in particular has illustrated this assertion. The seven modules teach attendees to create a document from start to finish using LaTeX. The first workshop introduces the attendees to the software needed to create a document. The remaining workshops are hands-on with the software, where the attendees create a portion of the document during the workshop. Since this series of workshops build upon each other, the same students often attend multiple sessions in the series and there is an opportunity to show the students how their feedback will change the instruction and verify that it addresses the comment or eliminates their concerns. For example, a student suggested the following for the first workshop, "You might want to start with the differences in the TeX distribution first." In reaction to the comment, I created a document consisting of two tables that compared and contrasted distributions and front ends. The same attendees expressed that the document was helpful when they attended the next workshop. Prior to the feedback, the features were discussed individually while each software package was demonstrated. In addition to the student feedback to the document mentioned above, students in subsequent sessions have shown less confusion about choosing the software. In demonstrating less software packages and providing the document, students are better able to visualize how the software packages compare to each other, making the software decision a little easier.

Some feedback has been very time consuming. For example, a workshop attendee said, "Other operating systems should have at least been mentioned." This feedback required investigation of the software on Mac OS X and Linux systems. There was enough variation in the software packages and the behavior of cross-platform software to warrant demonstration using other operating systems. Now, all students are shown the software that they will be using and questions are answered more effectively regardless of operating system, thereby demonstrating the social constructivist theory of the educator learning along with the student.

There has been unexpected evidence of engagement. Since the students have seen their feedback implemented, some have contacted me and described something new they learned and suggested how it might be implemented into the instruction.

Challenges with Implementation

When using open ended survey questions, the feedback is not always straight forward. Open ended questions are useful because attendees often provide feedback that would not have been implemented otherwise. Most of the time, answers are specific enough to act upon; however, this is not always the case. For example, one user stated that the instruction could be improved by "making it more attractive so that I will not be bored for such a long time." Another user said that "the presentation needed some sort of spice or an attention grabber. It was educational and the level of content was sufficient, just

needed something catchy." The feedback samples above were from two completely different instructional sessions. Besides the students finding the instruction boring, there were no action items to improve upon. Other unusable responses include "more number of reading rooms will be useful," "having a user manual updated on the website," and "no." The response "no" probably means that no improvements are necessary instead of the student pleading the Fifth Amendment. The suggestion of more study (reading) rooms is very clear; however, it does not help improve the instructional session. The suggestion to update the user manual on the Web site is a complete mystery. Often, there are comments that the students found the instruction helpful. Of course, this comment is welcome; however, most students do not say why particular aspects are helpful making it impossible to compare their comments with contrasting opinions. Some examples of positive feedback without specificity include "tutorial is good and the newcomers can learn a lot from it," "everything is perfect," "great information," and "awesome lecture."

As stated previously, student feedback does not always agree. Instructional sessions contain students from various backgrounds. One discipline in particular usually contains no more than 25% of students that use English as their first language. The variety of students can cause some students to be bored during the presentation and others to be struggling to keep up. In addition, it can cause contrasting opinions on what content to include. For example, there has been contrary feedback on query examples. Some students liked several examples on search queries, where comments included "learned how to refine the search process using OR and AND" and "got a better idea how to use the databases efficiently using keywords." Others thought query examples were unnecessary, "I thought it was a little too focused on performing queries." In addition, there has been contrasting opinions on the number of examples to include, where some wanted more examples ("to improve maybe two or more examples could be shown") and others wanted less examples ("less examples using each of the sources. Too many had me confused on how to use all the available resources"). The student feedback contained several discrepancies, but several students commented that the instruction was useful and they learned a lot. The variety of results drew the conclusion that the instruction found the "middle" ground or a compromise of content based on the student population.

Some of these contrasting opinions can still be addressed to a degree. Those who wanted more examples and might be struggling to keep up due to language barriers could make use of online videos that were created based on student feedback from previous years. Students wanted the ability to pause and rewind the video when they did not understand a concept or wanted to try the examples at their own convenience. These videos were in place at the time the student feedback was acquired; however, the students did not make this connection. Future sessions will stress that there are videos that can help them outside class and are based on the feedback of previous students. Another student asked for presentation material to be available before class. This could aid those with language barriers as well.

Since several students find the query examples useful, removing the content that discusses queries is not an option; however, a small portion of the examples can be made available online to review as a home exercise. It would not decrease the number of queries, but provide slightly less emphasis.

Verifying the Changes were an Improvement

In addition to tracking the feedback itself, it was useful to track the actions performed to address the feedback and when the change was implemented. If an action was effective, the comment does not resurface; otherwise, the same or similar comment will occur during the next session. For example in the first LaTeX workshop, it was initially assumed that all the attendees of the workshop understood the concept of LaTeX or they would not be attending. This was a misconception. Feedback from the first session revealed that users wanted an example of a LaTeX document because they had no idea what a LaTeX document was. Essentially, this workshop discusses the software that can be used to produce a LaTeX document, shows a demonstration of how to use it, and discusses how to find documentation on writing a LaTeX document. The action taken in response to this comment was to provide an example of a LaTeX document as part of the introductory email sent to the user to notify them that they were signed up for the workshop. After the next session, an attendee commented that "the instructor assumes the users know more about LaTeX than they really do." This feedback showed that providing the example in the registration email was not enough. As a result, the introduction to LaTeX section was expanded including an excerpt of a LaTeX document in the handout. In addition, this example is shown live in class and the students can ask any questions about it before proceeding with the workshop. These actions have improved the instruction and help the attendees gain enough understanding about LaTeX to be comfortable obtaining the software.

The question about how students became interested in LaTeX showed that students were interested in more than just journal submission. From the survey feedback and face-to-face feedback in class, students indicated that they wanted to use LaTeX for school reports and papers and even their thesis. Many of the questions in class reflected this need as well. Essentially, publisher class files provide most of the necessary formatting and some of the questions in class include "how do I change paper size," "how do I change the margins," and "how do I change the formatting for the section headings." There have been program changes to respond to this need, including the addition of two workshops in the workshop series. When there are new packages that would make tasks easier or extend the functionality of LaTeX, they are discussed during the workshop even if they could conflict with publisher packages. The students are given the caveat that not all packages can be used with the publisher class files or each other for that matter.

Future Work

The greatest student engagement has been seen from integrating feedback with the LaTeX workshop series. Due to the nature of the workshop, the classes are very small. To increase the impact of these workshops, it has been suggested that I create an online component to reach more students. An online component would enable larger enrollment for a class; however, there are advantages in students attending in person. For example, the instructor is physically present to help students solve their problems. This is especially important for the first three or four workshops. A recording of these sessions alone will not provide this service. For the online component to be as effective as the in person instruction, there must be some level of this activity. There are asynchronous methods that could suffice. For example, I often receive emails asking LaTeX questions. In addition, a listserv has been created to serve as a question and answer forum; however, it has not been utilized as intended. I would

like to investigate synchronous or interactive methods to emulate this portion of the workshop, as well as establish additional collaboration and opportunity for team building.

Conclusion

Assessment is important to ensure that students are learning what you intend, but also that your lecture remains relevant over time. When developing a new series of workshops that was not affiliated with a course, a student survey revealed missing information and unexpected points of confusion. Using techniques of social constructivism to inform students how their feedback was applied to the instruction increased engagement and initiated further collaboration. The result was a notable improvement in the instruction. Through the use of the student survey as a collaboration tool, there was some evidence that a colleague type of environment was established, including students supplying content knowledge as well as receiving it, and student invitations to be LinkedIn colleagues.

By establishing a colleague type of environment, one can foster an atmosphere where students are comfortable asking questions and sharing what they learned. There are many ways to achieve this relationship. Showing care and respect is a powerful mechanism in this process. When students are aware that their input is valued, there is a level of comfort resulting in the outcome of increased student engagement in the topic of instruction. The greatest increase in engagement is found when students feel that they partially own the content as seen in a social constructivist classroom. One of the greatest advantages of this environment was the ability of the instructor to learn from the students to become a more effective educator.

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