MountainRise

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Project MountainRise: Rethinking Teaching and Learning by Design

Laura Cruz, Editor-in-Chief, MountainRise

One of my guilty pleasures is watching the television reality show *Project Runway*. Watching it one evening, I asked myself why the show appealed to me. As my friends and colleagues would surely attest, I am no fashion plate and my seamstress skills are practically non-existent (I can't even sew on a button). That being said, I discovered what interested me was not the products—the designs that walked down the final runway—but rather the process that led to their creation. Each successful designer has their own distinctive point of view that they are able to bring to a series of often oblique challenges. To watch them transform their work in response to these challenges while staying true to their own point of view was a balancing act of creativity that I continue to find fascinating. In each of the essays in this issue of *MountainRise*, the authors follow a similar process. They each take on teaching and learning challenges that inspire them to find ways to creatively redesign their practice while maintaining their own signature pedagogies. You might say that the pages of *MountainRise* serve as the runway for these pedagogical designs.

First on the catwalk is Kent Divoll, Sandra Browning, and Winona Vesey's take on redesigning conventional classroom assessment techniques. In a standard application, classroom assessment techniques provide snapshots of student learning, such as what they take away from a particular class session. The authors wanted to know more about long-term retention, or deep learning, and developed an innovative classroom assessment tool, the ticket to retention (TtR). The ticket to retention is based on a slate of specific, targeted questions that students answer in mixed pairs during class. This is a deceptively simple change in focus, but one that the control-based study presented in the article shows to be quite effective in improving the long-term retention of key concepts . Based on their results, the TtR may prove to be a timeless activity that instructors can keep in their closets for years.

In our second showcase, Carmen Huffman provides insight into re-conceptualizing undergraduate research projects by considering common objections to such projects. With careful design, she argues, undergraduate research does not have to benefit just the student or just the faculty member, but rather can contribute to the success of both. She presents a framework that incorporates best

practices into a framework for integrating undergraduate research across the curriculum and for designing research activities that dovetail with the semester (or quarter) time limitations. Her seamless design allows for multiple variations of the same form, ready-to-wear across multiple disciplines.

For our next design, Balser, Harden, Nestor, and Nowacek look at two seemingly incongruous pieces, SOTL and the Humanities, and find ways to bring them together harmoniously. The tension between the social science methodology and humanities perspectives is well known and, in fact, remains a serious issue within the SoTL community. Some have called for the creation of a “larger tent” for SoTL that incorporates theories and methods drawn from the humanities, while others have argued for a “smaller tent” that excludes these approaches. Based on reflections from their own classes, these designers suggest that there are benefits to bringing the techniques of “scientific” SoTL to the humanities and that this can bring benefits both to humanities instructors and the SoTL world. Using intentional strategies designed to bring the unfamiliar to both students and instructors, the designers discovered that they could create products that were smart and sophisticated, perfectly tailored for graduate educators.

The model of supplemental instruction is well known and well studied, but our final two designers, Drake and Foresman, present a daring new twist on an old classic. While keeping the structural integrity of SI, i.e. structured sessions outside of class, they replace student facilitators with faculty mentors. Using peer instructors has been a mainstay of SI, largely because of the perceived benefits to both the students and the peer mentors. Indeed, the authors show that participation in any kind of SI, whether peer or instructor led, brings learning benefits. These designers argue, however, that faculty-led SI edged out its competition. In a comparison study, they demonstrate that faculty-led SI leads to higher student satisfaction rates, increased student confidence, and greater student participation in supplemental instruction versus peer-led variations. Teasing out the reasons why this occurs, though, leads to some tantalizing speculation. On Project Runway, the judges frequently enjoin the contestants to create clothes to which potential customers can make emotional connections and the most successful designers tell a story about their clothes and who would wear them. Similarly, Drake and Foresman suggest that the emotional value of the bonds created through faculty-led supplemental instruction, though perhaps ineffable, may be part of the secret for their success.

Just as fashion designers must keep pace with trends, SoTL scholars are enjoined to consider what we do in an iterative cycle, constantly looking for ways to improve upon our designs and to keep our instructional design fresh and well-tailored for an audience with evolving tastes and needs. This issue of *MountainRise* celebrates this process by showcasing how practitioners can redesign, repurpose, and reflect in order to update old classics, create new forms, and keep teaching and learning relevant to our students. In this case, *MountainRise* is the equivalent of Project Runway's Bryant Park show (where finalists present their collections), but, unlike the show, there is no winner crowned at the end. Just as viewers like me find creative inspiration from the show, we hope that these examples will encourage our readers to look reflectively at their own practice and debut their own new designs just in time for the new Fall season.

The Ticket to Increasing Students' Concept Retention

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Abstract

Classroom assessment techniques have been used by college professors for over 20 years. The authors of this paper developed a new teaching technique, *the ticket to retention (TtR)*, which changes classroom assessment techniques from focusing on evaluating instruction to emphasizing students' long-term retention of concepts. The results of this mixed methods study include the students' perspective of the TtR and confirm that students who used the TtR scored higher on short answer questions than those who did not.

Introduction

Some researchers and educators (Angelo & Cross, 1993; Cross, 1998; Cross & Angelo, 1988; McGlynn, 2001; Richlin, 1998; Steadman & Svinicki, 1998; Weaver & Cotrell, 1985; Wlodkowski, 2008) suggest that classroom assessment techniques or closure activities should be used in the college classroom. Classroom assessment techniques, such as the Minute Paper (Angelo & Cross, 1993; Barkley, Cross, & Major, 2005; Cross & Angelo, 1988), and the half-sheet response (Weaver & Cotrell, 1985) are examples of assessment strategies that are used at the collegiate level. These strategies involve students writing about information covered during a class session to assess student understanding and determine if the professor was successful in conveying information to the students (Angelo & Cross, 1993; Cross & Angelo, 1988; Barkley et al., 2005; Weaver & Cotrell, 1985).

While these techniques focus on immediate assessment of student knowledge and evaluation of teaching, student long-term retention is a byproduct. How such strategies can be tailored so that students' long term retention of concepts is a direct result of such methods is absent from the literature concerning classroom assessment techniques. According to Sousa (2001), learning and retention are not the same and learning does not inevitably result in long-term retention. Sousa defines retention as "the process whereby long-term memory preserves a learning in such a way that it can locate, identify, and retrieve it accurately in the future" (p. 85). If after 24 hours a student cannot remember information presented, the information "was not permanently stored and, thus, can never be recalled" (Sousa, 2001, p. 50). Combining the benefits of the one minute paper, the half-sheet response, and the post-write strategy, the authors created a new method, which is referred to as *the ticket to retention* (TtR).

Wlodkowski (2008) states, "If we take an institutional perspective, the first aim of assessment is usually to audit adult learning. However, assessment should primarily be used to enhance learning and motivation" (p. 314). The TtR preserves the principles of assessing student learning and professor instruction with a focus on student concept retention (Authors, 2010).The TtR differs from other classroom assessment techniques in four noteworthy ways. First, many

classroom assessment techniques ask vague questions, such as what is the most important point your learned today as is the case in the Minute Papers (Angelo & Cross, 1993), or asks global questions that require students to "summarize a large amount of information on a given topic" into a sentence, which is the case with the One-Sentence Summary (Angelo & Cross, 1993, p.183). The TtR asks questions that focus on specific concepts from the class session without asking students to condense ideas into one sentence and targets specific ideas that might be missed in the process of chunking information. Second, the TtRi ncludes peer interaction and active learning, both of which are encouraged when teaching adults (Lawler, 1991). Third, the TtR alters the current view of a professor as dispenser of knowledge, the instruction paradigm (Barr &Tagg, 1995), toward the vision of a professor as facilitator of learning by focusing on improving student learning rather than merely having "teachers find out what students are learning in the classroom and how well students are learning it" (Angelo & Cross, 1993, p.4). Finally, the TtR allows students to interact with the topics multiple times using multiple modalities rather than having students only write the answers to questions.

During the TtR procedure, three to five target questions are distributed to students. The TtR questions can be simple recall such as "What is the first zone of Vygotsky's zone of proximal development" or more advanced such as "How can you apply Vygotsky's zone of proximal development in this situation?"The students first write their answers to the questions, then confer with a classmate regarding their responses and discuss that classmate's answers. This process is then repeated with another classmate. Lastly, the written responses are collected by the professor to determine gaps in learning and/or concepts that the students do not understand. Since the focus is on retention, students are allowed to use their class notes to answer the questions and modify their answers as needed when sharing with classmates. This process reinforces the major concepts in three ways recommended for learners:(a) using active learning, (b) asking students to think, write, explain, and listen, and (c) having students reexamine the material from the day(Cross, 1981; Flint, Zakos, & Frey, 2002; Grubb & Byrd, 1999; Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; McGlynn, 2001; Meyers & Jones, 1993; Sorcinelli, 1991; Vygotsky, 1978).In a prior study, students participating in the TtR demonstrated retention of

approximately 88% of the information reinforced using the TtR (Authors, 2010). However, this research on the TtR did not compare students who participated in the TtR with students who did not use the TtR. Therefore, the this study contributes to the field of research concerning classroom assessment techniques and adds to the current research on the TtR by using comparison groups to determine the effectiveness, both in terms of student grades and student opinions of the TtR. Effectiveness was measured by calculating the difference between the test scores of those who used the TtR and those who did not and students' perceptions of whether or not the strategy helped them retain the concepts. Students' comments about the TtR were included in this study because learning can be increased when students enjoy the classroom environment and enjoy the classroom atmosphere (McGyynn, 2001; Sullo, 2007).

Methodology

This mixed methods study was conducted during a 15-week undergraduate college-level teacher education course in the southwestern United States. Internal Review Board (IRB) approval was obtained for this study including the use of coded participant level data. The participants of the study were one college professor and his undergraduate students (n = 21). The instructor used the TtR strategy eleven out of the fifteen weekly meetings. During the semester, the students were divided into two groups, group A (n=10) and group B (n=11). Each week, the TtR group completed the TtR at the end of the class period, while the group that did not participate in the TtR was allowed to leave class 10 minutes early. Group A participated in the TtR in weeks 2-6.Group B participated in the TtR in weeks 8-13. Both groups A and B participated in the TtR in week seven due to an odd number of weeks in which the TtR was administered.

During week seven, a midpoint retention assessment (MRA) was administered to determine the information retained by group A and group B. The TtR for week 7 was conducted the same week as the MRA, but after the assessment was administered. When the students were given the MRA consisting of short answer questions, group A was tested on the material that was reinforced using the TtR, while students in group B were tested on the same material without having the intervention. The comprehensive retention assessment (CRA) was administered

during week 15 and included 49 multiple choice questions to test students' recall of the information from the entire semester. Questions 1-21 were from weeks 2-6, questions 22-28 were from week 7, and questions 29-49 were from weeks 8-13.Most of the short answer (MRA) and multiple choice questions (CRA) were at the remembering or understanding level of the new version of Bloom's taxonomy. For example, a question from the CRA at the remembering level was name two ways you can individualize praise, while a question from the MRA at the understanding level was explain how and why you would use voice variety as an attention strategy.

The syllabus for the course stated that students' grades were determined by papers and projects and not examinations. Students were aware that the effect of the TtR would be evaluated, but this process would not be a part of their semester grade. The MRA and CRA were given to the students without advance warning of the date. Before each assessment was distributed in class, students were reminded that the assessments were administered to help the students and the professor determine how much students have learned and would not count toward the students' semester grade. Since the students were not given advanced warning of the two assessments, students most likely did not study the material that was assessed on the MRA and CRA.

Data Collection and Analysis

Multiple data collection methods included: (a) the MRA, (b) the CRA, and (c) a student questionnaire about the TtR. The MRA, consisting of short answer questions, and the CRA, consisting of multiple choice questions, included only concepts discussed in class and reinforced using the TtR. The MRA was administered on the seventh week, while the CRA and student questionnaire were conducted during the final class.

The assessment data were analyzed across groups and assessment types. The results from group A and group B were compared on the MRA and the CRA. Group A and B's results on the MRA were compared to each group's results for the same concepts on the CRA. Overall results were generated for the MRA and the CRA, regardless of groups. In addition, the mean,

median, and range were generated for each data set. The nonparametric statistic Mann-Whitney U was used to compare group scores on the MRA and CRA. Given the small sample size and negatively skewed distribution, the Mann-Whitney *U* statistic was conducted to determine if the distribution of scores on the MRA and CRA significantly differed between groups. The questionnaire data was analyzed by question topic using open coding to create categories and patterns. After the categories and patterns were generated, a constant comparative approach resulted in discovering evidence for the categories and patterns across the questions.

Results

Group A and B MRA Results

Group A with TtR MRA results. The students who participated in the TtR during weeks two through six (*n*=10) had a mean score of86 on the MRA. Eight out of ten of the students in group A earned an 80 or above and three out of the ten students scored a ninety or above. The two students who did not earn above an 80 both scored a 75.9.

Group B without the TtR MRA results. The students who did not participate in the TtR during weeks two through six (*n*=11), group B, had a mean score of73 on the MRA. Four of the eleven students in group B scored an 80 or above, while only one earned a 90 or above. Three of the students scored less than a 70 (48, 59, and 67) with two of these three students failing the MRA (see Table 1).

Table 1

Midpoint Retention Assessment Results

	With TtR (Grp A)	Without TtR(Grp B)
	n = 10	n = 11
Mean	86	73
Range	75.9 to 98.3	48 to 94
Median	85.3	72.4

Group A and B on the MRA. Given the small sample size and negatively skewed distribution, a Mann-Whitney *U* statistic was conducted to determine if the distribution of scores

on the MRA significantly differed between groups. The results of the tests were as hypothesized, z = -2.83, p= .004. Students in Group A who received the TtR during weeks 2 – 6 scored significantly higher on the MRA (86) than students in group B (73), 13 points higher to be exact. The students who participated in the TtR (group A) had more students pass (10 to 9), twice as many students who earned an 80 or above (8 to 4), and three times as many students score a 90 or above (3 to 1). The lowest grade for group B was lower than group A (48 to 75.9) and the highest grade in group A was higher than that from group B (98.3 to 94).

Group A and B CRA Results

Group A and B CRA results for week 7.As mentioned above, due to the odd number of weeks in the course, students in both groups A and B participated in the TtR in week seven (the week of the MRA). There were seven questions on the CRA from week seven. The mean score on these questions was 89.8, while the range was 71.43 to 100. Sixteen of the twenty-one students (or approximately 76%) achieved an 80 or above and ten students (or approximately 48%) scored a 100 on these questions. The five students (or approximately 24%) who did not score above an 80 all earned a 71.43 on these. A Mann-Whitney *U* statistic was conducted to determine if the distribution of scores on the seven-week CRA significantly differed between groups. The results of the tests were not significant, as expected, since both groups received TtR, z = -.304, p = .809.

Group A and B CRA results. Given the small sample size and negatively skewed distribution, a Mann-Whitney *U* statistic was conducted to determine if the distribution of scores on the overall CRA significantly differed between groups. The results of the tests suggests the two groups were not significantly different, z = -.852, p = .426.None of the remaining nonparametric comparisons were significant and will not be reported. Descriptive comparisons will be displayed for the remaining comparisons. Students in group A had a mean score of 85.5 on the CRA whereas students in group B had a mean score of 88.9 on the CRA .The mean score for students in group A was 86.42 on the questions with the TtR (questions 1 – 21, covered in weeks 2-6 and questions 22-28, covered in week 7) while the mean score for students in Group B

was 83.55 on questions 1-21 without the TtR. Students in Groups B scored a 92.85 on CRA questions with the TtR (questions 29-49 from weeks 8, 9, 11-13)and an 83.55 mean score without the TtR. On the questions reviewed using the TtR, students in groups A and B had a mean score of 89.8, while students in groups A and B had a mean score of 85.03 on questions not reviewed using the TtR.

The combined groups A and B had a mean score of 83.22 on items 1-21 which assessed material from the first six weeks of class. Student who used the TtR the first six weeks, group A, had a mean scoreof82.86 on the aforementioned questions, while the students in group B had a mean score of 83.55 (see Table 2).

Table 2

Group Means on MRA and CRA

Group A	MRA with TtR	CRA with TtR
	86.03%	82.86%
	MRA without TtR	CRA without TtR
	N/A	86.67%
Group B	MRA with TtR	CRA with TtR
	N/A	92.85%
	MRA without TtR	CRA without TtR
	72.96%	83.54%

On questions 22-28, the information from the week that both group A and B completed the TtR, students had a mean score of 89.12. The mean grade for questions 29-49, regardless of use of the TtR, was 90.48. Group A, the group that did not use the TtR on these questions, had a mean score of 86.67, while group B, the group that did use the TtR on these questions, had a mean score of 93.94. The mean grade on questions 1-21 was approximately 7 points lower than the grades on questions 29-49 and 6 points lower than the grades on questions 21-28 (see Table 3).

Table 3

Class Means on CRA examination

Exam	Class Mean Questions 1-21	Questions 22-28	Questions 29-49
Mean of all Students CRA Grades	83.22%	89.12%	90.48%
Grades with TtR	82.86%		93.94%
Grade without TtR	83.55%		86.67%

Student Questionnaire Data

In addition to the students' retention assessments, the students were asked their views about the TtR. The students were asked two open-ended questions: (a) Did you like using the ticket to retention? Why or why not? And (b) Will you use the ticket to retention in your classroom when you are a teacher? Why or why not? The students were asked whether they would use the TtR in their future classroom because they are attending college with the goal of becoming teachers. As an education student, if they decide that they would use the strategy in their future classroom, then it shows how effective the student believe the strategy is. In addition, the students' justification for using the TtR in their classroom provided us with an explanation their thoughts about the effectiveness of the strategy. One of the twenty-one students did not submit the questionnaire.

Using the TtR in their future classroom. Thirteen of the twenty students (65%) suggested that they would use the TtR in their future classrooms. Of these thirteen students, eight indicated that they would use the TtR in their classroom to help their students learn more. Examples of these responses included: (a) "Absolutely, it works." (Student 11); (b) "Yes, to ensure my students understand."(Student 2); (c) "I will try anything that will improve grades." (Student 4); and (d) "Yes, I do plan to use it because I feel it is very important for students to be given an opportunity to connect and reflect" (Student 1). The remaining seven students (or 35%) indicated they may use the TtR in their future classroom. Of the seven students who suggested

they may use the TtR, three students mentioned that using the TtR before the student left the class was something that they would do differently. Samples of these students' responses include: (a) "Maybe because it is a good idea, but I will never use it before it is time to go." (Student 18); and (b) "Maybe at a different time of the day so it will be effective."(Student 19). Two additional students stated that they might use the TtR; however the strategy needed to be given more time.

Enjoyment of the TtR. When asked whether or not the students liked the TtR, Twelve of the twenty students (or 60%) indicated that they enjoyed using the TtR in class. Of these students, six stated only positives comments. Examples of these students' suggestions included: (a) "Yes, because I found that after doing the TtRI spent more time throughout that day reflecting/thinking about what I learned during that day." (Student 1); (b) "I liked the TtR because it helped me see if I got everything I was supposed to get out of the lesson." (Student 7); and (c) "Yes, I still remember the information" (Student 11). The other six of the students who suggested that they enjoyed the TtR, also mentioned issues with the TtR. One of these students (Student 19) suggested that he liked the TtR, but he did not like staying after class. The other five students suggested that the TtR was rushed. Some of the five responses included: (a) "I liked it except when you did it last minute because I rushed through it because I had to get to work" (Student 2); (b) "Yes, but not in the manner it was used. It was an afterthought and too rushed." (Student 13); and (c) "I liked the TtRand feel it is helpful, however, like I said, I felt others did not take it seriously and were in a rush" (Student 15).

Eight of the twenty students (40%) surveyed did not enjoy using the TtR. As was the case with the aforementioned students, many suggested that either they rushed the TtR or that the strategy felt rushed. Sample responses are as follows: (a) "No, it was always given too late in the class and it was not enough time to do it and not feel like it was rushed." (Student 8); (b) "No, but only because it was always rushed in the last minute of class and I was almost always late to my next class."(Student 9); and (c) "No because I felt pressured when writing" (Student 5).

Discussion

This study represents the first attempt to compare the results from a group who used the TtR to a group who did not. Previous research on the TtR (Authors, 2010) simply tested the retention of students when they used the TtR and did not have a comparison group. As was the case with previous research (Authors, 2010), students recalled approximately 88%of the information that was reviewed using the TtR.

Summary of Group A and B MRA and CRAResults

Students tested on the information that was reinforced using the TtR on the MRA, group A, had a mean that was 13 points higher than their peers who did not use the TtR, group B. In addition, all students who used the TtR before the MRA received a passing grade, twice as many students earned an 80 or above, and three times as many students earned a 90 or above. This data shows improved retention results from the TtR over a two to five week period (the time between the week the information was reinforced and the MRA).

When tested using multiple choice questions (CRA), the difference between information that was reviewed using the TtR and the information for which the TtR was not used resulted in a small increase, approximately 5 points (85.03 to 89.8). The Mann-Whitney *U* test could not be run for this data because the items are incomparable since they measure different content. However, the 13 point differential on the MRA between information that was reviewed using the TtR and the information for which the TtR was not used was statically significant, as confirmed by the Mann-Whitney *U* test. Thus, the TtR seems to have a greater impact on student retention when students do not have the answer from which to choose as was the case with the short answer questions on the MRA and was not the case on the multiple choice questions on the CRA (Biggs, 1999; Gay, 1980).

Despite the aforementioned positive results, the data also offer some conflicting results. When group A and B were retested on the concepts from the MRA with multiple choice questions on the CRA the results were unexpected. Our assumption was that group A's grades would be about the same or higher as the results on the MRA since the students used the TtR and that

group B's scores on the CRA would be about the same or lower than they were on the MRA. However on information discussed before week seven and retested using multiple choice questions in week 15 on the CBA, students, regardless of their involvement with the TtR, had a similar mean. In addition, group A's scores dropped slightly more than three points on the CRA from the MRA. Group B, who did not use the TtR during the first part of the semester, increased their score approximately 11 points from the MRA to the CRA on the same information. This could have resulted because short answer questions are often more difficult than multiple choice questions (Biggs, 1999; Carvalho, 2009; Nickerson, 1989). Gay (1980) suggests that short answer questions "require recall, as opposed to a combination of recall and recognition" for multiple choice questions (p. 45). Carvalho (2009) found students scored lower on short answer questions versus multiple choice questions. Carvalho theorized that, regardless of the students' intelligence, short answer questions are more difficult to answer than multiple choice questions.

The 11 point increase for group B, the slight decrease for group A, and the same mean on the concepts retested on the CRA for groups A and B might not indicate that the TtR is ineffective overtime. Instead, it could be a result of the type of questions used to assess students' long term retention (i.e., multiple choice questions on the CRA) (Biggs, 1999; Carvalho, 2009; Nickerson, 1989) and the fact that short answer questions are "less susceptible to test-taking strategies" (Biggs, 1999, p. 21).

Gay (1980) found similar results with multiple choice questions. She rationalized that the testing medium is the cause, stating "the effect would be stronger for more difficult items" (p. 50). Dansereau (1985) also found similar results; the learning strategies that were taught to students in his work had a lesser impact on cued tests such as multiple choice questions than un-cued tests such as essay questions and short answer. Similar to Gay's conclusion, Dansereau theorized that the intervention impacted recall (short-answer) more than recognition (multiple choice). We hypothesize that this was the same for our study. Furthermore, Gay suggested that students who were tested using a short answer format increased their recall when retested with multiple choice questions. She concluded that the increase resulted because students found it

easier to recognize answers on multiple choice tests than generate an answer for short answer questions.

Another possibility is that, although the TtR involves using multiple modalities, the act of using the TtR can be compared to rote learning because the students are repeatedly interacting with the information. The TtR may not engage students in higher leveling thinking activities, but in fact can be considered rote rehearsal, which does not allow for students to make connections between concepts nor does it lead to increased retention (Sousa, 2001). Although we expected different results, students might have forgotten some of the information over the course of the eight to 13 weeks between the time the information was reviewed using the TtR and the CRA. The students who participated in the TtR reviewed the material numerous times that class, but the information was not reviewed again before the CRA. The lack of consistent review of information can result in decreased recall (Sousa, 2001).

Student Questionnaire Data

The 20 students who participated in the questionnaire were all enrolled in a teacher education track and are planning to teach in a K-12 setting. Sixty-five percent of these students (13 out of 20) suggested that they would use the TtR in their future classroom. The aforementioned result and the fact that eight out of thirteen students indicated that they would use the TtR in their future classroom because they felt the TtR would help their students learn indicates that they recognized the value of the TtR. In addition, seven out of twenty students stated that they may use the TtR with a few changes. Therefore, all twenty of the students suggested that they would or may use the TtR in their future classrooms. The students' comments about the TtR are similar to previous research in that students suggested the strategy should be done earlier in class and that the TtR often extended beyond the class period (Authors, 2010).Not allowing students to leave class on time can result in tiring the students thereby, increasing students' discontent, and decreasing learning and classroom satisfaction (Boice, 2000).

Enjoyment of the TtR

The goal of the TtR was less about student enjoyment and more about concept retention. Yet, we were pleased that 60% of the students enjoyed using the TtR. One of the reasons for their enjoyment could be that interacting with peers supports "an atmosphere of trust and warmth" (McGlynn, 2001, p. 56). We prefer that students see the value of the TtR, but we recognize that if students dislike using the TtR, then they may not be as motivated to participate in the activity and this lack of motivation might result in a decreased impact from the TtR. Out of the twelve who stated that they enjoyed the TtR, half of them made only positive comments about the TtR, yet most students suggested changes for the TtR. According to Sullo (2007), "A joyless classroom never inspires student to do high quality academic work on a regular basis" (p.9). When students and their instructors enjoy the class "learning is deeper and stronger, and students maintain the keen desire to learn" (p.9). The recommendations from the students who enjoyed the TtR and the eight who did not enjoy using the TtR were similar to earlier research in that the students felt rush and often stayed late to complete the TtR (Authors, 2010). Although these concepts are easy to remedy in theory, we were not surprised that the students had comments similar to earlier research. Often times the realities of teaching resulted in the TtR being administered late in class. Additionally, on the weeks a student did not participate in the TtR, they were allowed to leave a few minutes early, while those who did the TtR stayed until the TtR was complete. The dismissal of half the class was perceived as the end of class, even if the class period was not over, and thus students rushed to finish the TtR so that they could leave.

Conclusion

The use of lecture and the philosophy of the professor as a provider of knowledge dominate the college classroom (Barr & Tagg, 1995; Bligh, 1998; Lammers & Murphy, 2002; Wang & Farmer, 2008). The TtR is a teaching strategy that shifts the focus of the college professor away from the instruction paradigm (Barr & Tagg, 1995) while focusing on student retention of concepts. This study is unique because it marks the first time that the TtR was investigated by having comparison groups. The TtR is an intervention strategy used to reinforce learning rather than

using lecture and a summative assessment with no reinforcement of learning, as is the case in the instructor paradigm. The data reported indicate that the TtR is an effective method to assist students with the retention of concepts when tested using short answer questions. However, the results are mixed. As was the case with previous research (Authors, 2010), students in this study recalled approximately 88% of the information that was reinforced with the TtR. Overall, students using the TtR to reinforce information scored higher on the MRA (statically significant)and higher on the CRA (although not statistically significant),The difference between those who used the TtR and those who did not were most pronounced on the short answer questions on the MRA.

Despite the high percentage of student recall when the TtR was implemented, comparing using and not using the TtR yielded results that suggest future investigation of the TtR is needed. The goal of the TtR is for students to have long term retention. Yet, students who used the TtR on the information reinforced during the beginning of the semester and retested on the CRA (questions 1-21) actually scored slightly lower than those who did not use the TtR, despite scoring 13 points higher on the MRA. Testing the students in a different format on the MRA (short answer) and CRA (multiple choice) may have been the cause of this discrepancy (Biggs, 1999; Carvalho, 2009; Dansereau, 1985; Gay, 1980; Nickerson, 1989). However, the results indicate that overall students using the TtR to reinforce information scored approximately eight points higher than instances when the TtR was not implemented. In addition, many of the students suggested that the TtR could have been improved if it was not rushed and if the students were given enough time on the TtR before the end of class. Given the students comments and the fact that the TtR had such impressive results on MRA, the TtR has potential to improve student retention of concepts. However, more research is needed to determine if the TtR is effective on different types of questions and overtime.

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Designing Undergraduate Research Projects That Benefit Both Students and Faculty

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Abstract

In any discipline, providing research experiences for undergraduate students is known to enhance their learning experiences. However, faculty research advisors sometimes fail to get much scholarly achievement in return for their efforts in working with such students, mainly because the students' lack of experience limits their ability to contribute to the research advisor's scholarly work. Additionally, students sometimes miss out on enhanced learning opportunities because of the obstacles involved in providing an ideal learning environment. This essay provides strategies to improve the potential for faculty gain when working with undergraduate students while simultaneously enhancing the learning experience for the student.

Motivation

A research experience is one of the most meaningful learning opportunities for an undergraduate student. The myriad benefits that result from such an experience have been elegantly summarized by the Undergraduate Research Advisory Committee at Winthrop University (2006) in a proposal to increase support of undergraduate research. Their proposal is supported by documented findings: undergraduate research experiences enhance critical and analytical thinking skills (Ishiyama, 2002; Lopatto, 2004; Merkel, 2001; Seymour, Hunter, Laursen & DeAntoni, 2004); improve students' abilities to acquire, process, and communicate information (Bauer& Bennett, 2003; Kardash, 2000); promote learning (National Conferences on Undergraduate Research/Council on Undergraduate Research, 2005), student success (Nagda, Gregerman, Jonides, von Hippel & Lerner, 1998), and self-confidence (Seymour et al., 2004); and help students solidify career plans (Lopatto, 2004; Seymour et al., 2004). While the benefit to students is substantial, the benefit to faculty research advisors may be less so. Undeniably, research advisors thrive on watching young researchers learn, grow, and become more independent critical thinkers. Yet, in terms of advancing meaningful scholarship relevant to an advisor's research interests, there is often little payoff to working with undergraduate students in a research setting.

For a research experience to be symbiotic, both the student and the research advisor must receive some benefit. For the student, the benefits are those listed above, but most importantly the development of critical thinking skills. For the faculty advisor, aside from the gratification associated with teaching in this capacity, an added benefit should be increased productivity of scholarly work, which in turn becomes a motivating factor for a faculty member to truly invest in cultivating a student researcher's analytical skills.

In this essay, I will outline a project design that provides the best opportunity for student contributions to an advisor's scholarly goals while simultaneously offering the best opportunity for student learning. This design is followed by a variety of disciplines, particularly the natural and physical sciences; however, it is not broadly utilized across all fields. Nonetheless, its incorporation in *any* undergraduate research setting could dramatically influence both student learning and the scholarly advancement of the research advisor in a positive way.

There are significant obstacles for the implementation of the proposed project design and impediments for the meaningful advancement of an advisor's work. These will be addressed along with some proposed strategies for their resolution. The goal is that the application of these techniques for research with undergraduates in *any* field will enable faculty to increase potential for scholarly productivity while providing a mutually beneficial experience.

Project Design

For students to positively contribute to the scholarly activities of a research advisor, they must possess certain analytical skills. However, very few undergraduate students have the skills necessary to critically analyze at the appropriate level when first beginning a project. Instead, they must follow a growth trajectory that takes them from mere technicians toward becoming independent researchers. These stages of development parallel the categories of the cognitive domain of Bloom's taxonomy (Anderson & Krathwohl, 2001) as depicted in Figure 1. As a student moves through the developmental stages from technician to observer to analyst to research designer, they will require the skills described by the cognitive domain: remember, apply, understand, and evaluate/create.

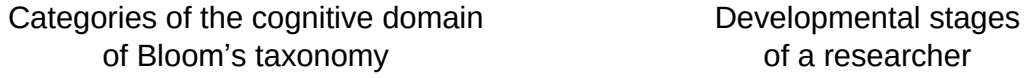

Figure 1. A schematic comparison of the categories in the cognitive domain of Bloom's taxonomy and the developmental stages of a researcher. The figure of Bloom's taxonomy was adapted from Anderson and Krathwohl (2001).

At the start of a project, undergraduate researchers are, at best, technicians because they can follow directions and *remember* steps or sequences, but their abilities beyond this are limited. However, the more exposure to research techniques they have, the better able they are to *apply* what they've done before to new situations. They become better observers of their own experimental processes, even if they can't necessarily put all the pieces together. While it is unlikely that a student will progress all the way to become a designer of a complete research project in just a few semesters of work, the goal of the advisor should be to bring the student to at least the beginning stages of an analyst, where a student truly *understands* the project and can start making his/her own conclusions.

Research advisors are the true designers of research projects, and it is unreasonable to think that an undergraduate student could independently create his or her own project. However, with guidance from an advisor, he or she could work toward that goal via the cognitive apprenticeship model. This model, developed by Collins, Brown, and Newman (1989), is a natural fit for a student research setting since this environment allows students to actually practice what they've been taught (Lave, Smith, & Butler, 1988).The methodology proposed in the model involves a progression from modeling, coaching, and providing scaffolding for learning to student articulation, reflection, and exploration (Collins, et al., 1989). Applied to an undergraduate research setting, the advisor is ever-present, guiding the student during the early stages of a project, but the presence fades over time, and the student becomes more independent. The overarching goal is to bring the student through the developmental stages of a researcher described above.

The strategies for working with undergraduate researchers described in this essay dovetail nicely with the cognitive apprenticeship model and are therefore at the heart of successfully imparting critical thinking skills to student researchers. However, the research project must be designed with this philosophy in mind. This is best achieved by developing a project that is both closely related to a faculty member's scholarly pursuits and original in nature.

Helping students choose projects that overlap with the faculty advisor's interests is one of the best ways for a student to potentially contribute to an advisor's scholastic goals. The student's experience is also enhanced because the advisor will have a vested interest in the research outcomes, which leads

to a closer student-advisor relationship, a critical component of any undergraduate research experience (Laursen, Hunter, Seymour, Thiry & Melton, 2010; Thiry & Laursen, 2011; Thiry, Laursen & Hunter, 2011).

As research advisors, it is often our instinct to let students choose their own research topic, and there are some advantages to this approach. This method is an excellent exercise in the use of the scientific method. After all, refining a research question is an important skill that should be nurtured. However, when students choose their own project, they may not be taking full advantage of a research advisor's expertise if the project is different than the scholarly work of the advisor. Additionally, this choice potentially negates the opportunity for students to contribute to the advisor's scholarly work.

Allowing students total freedom in choosing a project can lead to other challenges with the project as well. Most students are not familiar with the whole of their discipline and will not fully grasp the potential complications of a project of their choice. They are also unfamiliar with what resources will be available to them, and any shortage of required resources would limit their success. Finally, they will most certainly need the guidance of the research advisor for any project they pursue, and advisors will have difficulty providing support if they are not already well versed in the topic of choice.

The choice of an original project (versus an exercise with well-established results) instantly exposes students to a more realistic view of research where they will encounter uncertainty, failure, and real challenges without immediate answers. Also, original projects are likely to be more difficult and can therefore provide more advanced training to student researchers. Lastly, students will have a greater sense of ownership of their project if they feel they are working on something meaningful rather than a mundane exercise such as simply searching the literature.

While the ideal research setting has just been described, many obstacles exist for creating such an experience for students and research advisors. The obstacles related to these aspects of implementation and some potential solutions are described below. Many proposed strategies for handling these obstacles fit well with the cognitive apprenticeship model (Collins, et al., 1989), and their connections to this model are also described.

Obstacles

Students May Not Be Passionate About an Advisor's Work

The main concern associated with limiting students' choices when it comes to project design is that the student may not be interested in the available topics. Ideally, students could choose their own projects, and they would be passionate about them, thereby creating a vested interest in the outcomes. However, there is a high probability that the students' choices would be outside of an advisor's area of expertise. This not only minimizes the opportunities for an advisor's scholastic productivity, but also increases the level of difficulty for the student since he or she is not taking advantage of the advisor's expertise as a resource for success.

Original Projects Cannot Be Completed in a Short Period of Time

Most research projects are unending. While publication may result, signifying completion of a certain aspect of the work, in the big picture, there is always more to be done. It is difficult to imagine chopping a researcher's life's work into small pieces that could be completed by a student over the course of one or two semesters. Yet, students should experience a "beginning-middle-end" for their project rather than jumping into the middle of a project or having unfinished work at the end of their term.

Students Aren't Prepared for Difficult Projects

The primary reason research advisors have for putting students on simple, independent projects unrelated to their own work or projects that are unoriginal is that their own personal, original projects are too difficult for students to comprehend. This analysis makes perfect sense because researchers typically have a minimum of several years of graduate-level training, and many have decades of research experience. How can undergraduate students work on advanced projects when their exposure to the field includes only a few semesters of undergraduate coursework?

Faculty Don't Have Enough Time to Work with Students One-on-One

To provide students with the best opportunity for learning, particularly in an apprentice-style model, the research advisor must invest a large amount of time engaging with the student. However, time is a precious commodity in an academic setting and frequently not available for one-on-one interactions. Often, other priorities (usually those with deadlines and especially those that directly impact the advisor's own professional development) take precedence, and research students are unable to make significant progress without the advisor's guidance.

Strategies for Overcoming Obstacles

Create a Prerequisite Course

To prepare undergraduates for the rigors of research, a prerequisite course could be developed to introduce students to the various aspects of research related to his or her discipline. The course could include literature searching techniques, miniature projects or term papers, or a review of critical concepts required for success. Anything that a research advisor routinely tells each undergraduate researcher could be covered in such a course so that precious time is not wasted relaying such information on an individual basis. This strategy not only reduces the amount of individual attention required by students, even during the first semester of research, but also helps to prepare them for the challenges of advanced projects by teaching problem solving, control and learning strategies. These skills comprise the content component of the ideal learning environment described by the cognitive apprenticeship model (Collins, et al., 1989).

Encourage Students To Start Research Early in Their Careers

Students should be encouraged to start research early in their careers and work with an individual advisor for multiple semesters. This approach has obvious benefits to the student in that he or she has more time to work through the developmental stages of becoming a researcher. However, it also gives the faculty advisor more opportunities to bring the student through the method described in the cognitive

apprenticeship model (Collins, et al., 1989). The student has greater potential to reach the exploration step if he or she works long enough on the project. For instance, the initial semester may be devoted to the investment of training the individual on the basics of research through modeling and coaching. Then, in following semesters, students may become more independent and could go on to produce more and more fruitful contributions to a project over time, thereby improving the scholarly productivity of the project.

Provide a Limited Choice of Projects

The concern of a student not being passionate about an advisor's work is a valid one. After all, if the student is uninterested, he or she certainly won't be devoted, and there will be little productivity for the advisor or learning for the student. The best compromise is to provide some *limited* choices to students. Most researchers work on more than one project at a time, and there is likely more than one researcher in an academic program, so the combination of multiple researchers working on multiple projects means there are many options available to students that lie within the expertise of an advisor. The diversity of a student's interests can be surprising and at least one project is likely to spark his or her curiosity. Students can still choose the project that is most appealing to him or her, and the interest level of the student in any available project is likely sufficient enough to cultivate the desired ownership of the chosen project.

Additionally, when students work on a project that overlaps with the advisor's, they are placed in a "situated learning" environment that embodies a "culture of expert practice," as described in the cognitive apprenticeship model (Collins, et al., 1989). These are two components of the sociological aspect that give the student a sense of what real-world research experiences are like.

Create Narrow Projects with Small Achievable Goals

Despite the breadth of most research projects, small manageable goals can usually be defined. Narrowing the scope of a research question or simply researching the background and history of an idea are two ways to turn a large project into a smaller one which will make the project doable in a semester or two and perhaps make the experience less difficult for the student.

Another option is to break the project into small pieces. For instance, initial work for new students could involve fundamental literature research. The investment of training students in proper searching techniques can generate useful readings. Usually this background work will not provide new information for the research advisor in the beginning, but sometimes students will find articles that the researcher hasn't seen simply because the students' unique, inexperienced perspective allows them a wider view of the field. Literature searches can serve to enhance the student's critical thinking skills if there is an associated assignment such as providing a list of relevant publications, writing one page summaries or a list of questions related to an article, or simply creating a vocabulary list with definitions. (The results of such assignments can also be passed on to new students, thereby reducing the burden of training.) These are all manageable tasks for a beginning researcher with limited expertise, and such activities provide students with a sense of project ownership and training in literacy. Meanwhile, the advisor has increased the potential for finding new information relevant to his or her field.

Choose an Appropriate Project Difficulty Level

While it is true that students will undoubtedly struggle with difficult problems, they will be able to cope with the challenges they face if the faculty advisor ensures that the difficulty level is appropriate for the student's level of preparedness. While the project as a whole may be quite challenging for undergraduates, a senior-level student will be able to cope with the challenges better than a sophomore. So upper-level students should be given more difficult problems than beginning students. At first it may appear that inexperienced students lack the ability to significantly contribute to a project. However, these students in particular may become the best contributors over time because they are able to pursue a multi-semester research experience and can be trained from the most basic level. The increase in complexity of a project over time follows the method described by the cognitive apprenticeship model (Collins, et al. 1989). Consequently, at the end of their research experience, they will have improved critical thinking abilities and positive contributions may become the norm.

Provide Opportunities for Teamwork

One semester, or even two, is not a very long time for an individual to complete a research project. However, a strategy for accomplishing more work in a shorter amount of time has always been teamwork. For the faculty advisor, the colloquial expression "many hands make light work" adequately describes the opportunity for enhanced productivity when many students work on the same project. For students, much evidence exists to support the benefits of collaborative learning accomplished through group work (McKinney & Graham-Buxton, 1993; Topping, 2005; Windschitl, 1999). Also, part of the socialization aspect of the ideal learning environment described by Collins, et al. (1989) is the exploitation of cooperation. Cooperative learning is both a motivational tool for students and a mechanism for the development of problem-solving skills. In most fields, whether the student pursues research as a career or not, successfully working as a team will be critical to his or her success.

Having students work together will increase their own productivity since tasks can be divided among team members. However, an even greater gain will be their ability to learn from one another and the consequent rapid development of their critical thinking skills. The faster they learn a research strategy, the more quickly they can contribute to the advancement of the project. Finally, having students with varied levels of experience on the same project can reduce the research advisor's one-on-one training time since more experienced students can work hand-in-hand with new students.

Provide One-on-One Interactions with Students

Although one-on-one interactions with students require a large investment of an advisor's time (in fact, that's an obstacle listed above!), these meetings should be considered an investment, especially if the student is working on a multi-semester project. The investment results in students becoming more independent workers that require less faculty involvement as time passes, and the payoff, in terms of both student growth and scholarly achievement, is well worth the expense of faculty time.

This strategy mimics the method described by the cognitive apprenticeship model (Collins, et al., 1989) where students are given extensive modeling and coaching at the beginning of the project. This approach not only provides important student-faculty interactions that can have a tremendous positive impact on student development (Astin, 1993), but also vastly improves the student's understanding of the

project. The better a student's understanding of a project, the better able he or she is to positively contribute new ideas.

Often, students will encounter stumbling blocks (e.g. an experiment didn't work, an article didn't answer the question, something doesn't make sense, the next step is not obvious). During these times, it is especially important to work with the student one-on-one to avoid student frustration and help students exercise their critical thinking skills.

This approach proves to be quite challenging since research advisors often seek quiet seclusion to analyze results or work out their own stumbling blocks. At times, it may be necessary to dismiss the student, work out the issue, and then explain the thought process for working out the solution at a later time. Ultimately, whether to choose this approach or not will depend on the complexity of the issue. However, students will gain valuable insight into the critical thinking process if they can observe the researcher's methodologies for solving complex problems, regardless of whether the explanation comes in real time or is delayed. If the problem is truly so complex that the advisor needs to struggle with it (perhaps independently), then all the better! This means the student has brought forth an issue in the advisor's project that needed to be addressed, and the student has made a positive contribution to the project.

Host Group Meetings

Group meetings are a way for students to articulate and reflect on their progress, which fits with the later stages of the cognitive apprenticeship model (Collins, et al., 1989).All students will benefit by communicating with their peers about the challenges they are facing, and they can learn from each other. As they discuss their problems and potential solutions, they are simultaneously enhancing their problem-solving skills. Meanwhile, the advisor gets to meet with all the students at once, which may alleviate some of the time required for one-on-one meetings. If students are working as a team, they will also be reminded of how their aspect of a project fits into the big picture.

Require Weekly Progress Reports

In addition to reporting to a group, individual students could be asked to produce weekly progress reports detailing what they have done over the week and what they plan to do the following week. This exercise shifts some of the burden of planning and consultation to the shoulders of the students and helps them to constantly consider their end goals. It also keeps the students focused on the tasks at hand, provides opportunities for reflection and articulation, and helps to keep the project moving in the forward direction.

Require Summary Reports

Periodic assignments should be created in which students provide a summary of not only what they have done but also how they have done it. These documents not only serve to help students reflect on the big picture of their project and develop their communication skills, but can also act as a standard operating procedure to be passed on to future generations of students, saving the advisor from having to explain repetitious details.

Conclusion

Undergraduate research provides many benefits to student learning, but a symbiotic relationship between research advisor and student does not always exist. The type of project that provides the most potential for both the student and the advisor to benefit is one that is original and is aligned with the advisor's research interests. Designing a project in such a manner can be a challenge for several reasons: (1) students may not be passionate about the work, (2) such projects require a significant time commitment on behalf of both the student and the advisor, and (3) the project may be too difficult for the student to comprehend. Many of these obstacles can be overcome by assuming a cognitive apprenticeship style of teaching (Collins, et al., 1989) and applying some of the strategies presented in this essay such as matching the level of project difficulty with the student's experience; having students work for multiple semesters, especially in group settings; providing adequate opportunities for student-faculty interactions; and having students summarize their own progress and sharing it with others. These methods will not only improve the student's research experience, but also increases the opportunity for advancement of an advisor's scholarly interests. In this manner, the experience can ultimately become mutually beneficial.

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Beyond Teachers Telling Stories: SoTL in Literary Studies

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Abstract

The authors propose a model of introducing graduate students in the humanities to the Scholarship of Teaching and Learning (SoTL). The authors—three of whom were graduate students in a course structured on this model—provide brief case studies of how they successfully conducted SoTL inquiries without abandoning the ways of knowing and doing they value as scholars in the humanities.

"SoTL brings the science. Otherwise it's just teachers telling stories." –David

Introduction

A persistent challenge in the Scholarship of Teaching and Learning is helping instructors unfamiliar with SoTL shift their focus from teacher experience to student learning. Although part of the difficulty might be an egocentric impulse (teachers reflect on their own experiences but don't think to examine the experiences of students), the greater challenge may be determined by scholars' disciplinary backgrounds. Scholars from the sciences, Clegg (2008) argues, may find themselves frustrated by the "messy, human stuff which is learning and teaching." Scholars in the humanities, Chick (2009) notes, may be "alienated" by the "pressure to use pseudo-experimental models of research." Both of these claims posit, in essence, a genre problem: the ways of knowing, seeing, and doing embodied in and promoted by common disciplinary genres (such as the laboratory report, critical article, conference paper, or poster session) make it difficult for interested instructors to successfully engage in the Scholarship of Teaching and Learning.

We agree with Chick's claim that the unfamiliar genres and methods typical of SoTL publications can prove a stumbling block for scholars in the humanities. And yet, as the epigram uttered by one of our co-authors during a brainstorming session suggests, the "scientific" approach implicit in much SoTL work provides an important corrective to the teacher narratives that are the default mode of many instructors reflecting on teaching and learning. "The science" that SoTL brings, we argue, is not fundamentally about experimental (or even quasi-experimental) methods. Instead, "the science" lies in methods of inquiry and reporting that provide accounts of student learning that are replicable, aggregable, and data-driven (Haswell, 2005) —methods that are, perhaps surprisingly for some humanities scholars, entirely consistent with methods of data collection and analysis commonly valued in the humanities. Teachers can still "tell stories" in SoTL work, as long as those narratives attend to the experiences of student learners.

Furthermore, consciously wrestling with the challenges of unfamiliar "scientific" genres can provide an important intellectual resource for scholars entering into the Scholarship of Teaching and Learning. We advocate a model that strategically deploys familiar and unfamiliar genres to help inquirers shift their focus to student learning.

Scaffolding a SoTL Inquiry Project for Graduate Students in Literature: Rebecca's "Vision of the Possible"

"Rhetorical Theory and Practice" is a seminar required of new teaching assistants—all of whom are pursuing an M.A. or Ph.D. in literary studies—in the First-Year English program at Marquette University. Its goals are to introduce students to the debates over the writing process and theory in Rhetoric and Composition and to help new teachers see the implications of those theories in their own classrooms. Given those goals, the course also provides an opportunity to introduce graduate students to the Scholarship of Teaching and Learning. In our experience, teacher-scholars in the humanities are often eager to examine student learning but struggle with research design. For this reason, the model we describe immerses humanities scholars in genres associated with the sciences and social sciences in order, paradoxically, to help them more effectively use the methods of data collection and analysis they find familiar and compelling in the humanities.

The assigned readings are unlike the literary and historical essays literature students ordinarily encounter. Although some readings adopt a familiar, belletristic approach (Freire, 2000; Howard, 2000; Williams, 1981), many others are modeled on the genre of scientific report with subsections on methods, results, and discussion (Flower and Hayes, 1981; Somers, 1980). The focus on student learning and empirical methods is explicit; most often these readings present the type of replicable and data-driven research associated with the sciences and social sciences. It is not uncommon—or unexpected—for students to resist these readings: they often look and sound like lab reports, and are decidedly not what these graduate students were planning to spend time reading when they came to pursue advanced studies in literature.

The assignments, too, are unfamiliar. The graduate students are required to compose an "Inquiry Summary;" this assignment (included in Appendix A) is very intentionally not called a "seminar paper" in

order to highlight the ways in which this project differs from the seminar papers literary scholars are accustomed to composing. The assignment criteria (included in Appendix B) encourage authors to clearly distinguish, and perhaps even label, sections that identify the motivating "problem" (Bass, 1999) and discuss prior research in the area, pose the research question, describe methods of data collection and analysis, summarize the results (often, but not always, using charts, diagrams, or figures), and discuss the implications of these findings. Research methods and the ethics of conducting research with one's own students, in one's own classroom, are discussed in depth, both in class and in individual conferences.

At the end of the semester, the graduate students at Marquette participate in a poster session with TAs from another local university. To the extent that these literature students are familiar with the genre of poster session (and most of them aren't), they associate it with the sciences. The cumulative result is the strategic deployment of unfamiliar genres in order to help graduate students in the humanities engage in a type of "not talk" (Reiff & Bawarshi, 2011)—distinguishing the form and aims of a SoTL inquiry into student learning from the teacher narratives that they might otherwise be inclined to compose and the literary analyses that they frequently write for other courses. It's not enough to simply assign unfamiliar genres; meta-reflection on the affordances and constraints of these new genres—what types of assumptions they make, what types of conversations they foster—is crucial. It is this "not talk," we propose, that helps graduate students new to SoTL shift their focus to questions of student learning.

Furthermore, exposure to a wide range of data collection and analysis methods enables these graduate students to think creatively about their own methods. As two of the cases described below illustrate, these humanities scholars were able to employ ways of knowing (close textual analysis—in this case of transcripts of student talk) that were familiar and comfortable to them as humanities scholars; the third case illustrates the ways in which two humanities scholars were able to collaboratively employ methods often associated with the social sciences, but in ways these humanities scholars could comfortably and profitably undertake. In the remainder of this reflective essay, we include three accounts of the research process, not to provide the details of their studies or findings, but to illustrate and reflect on the arc of discovery that each of these three humanities scholars went through as they first undertook a scholarly SoTL project.

Keeping the "Science" Simple: David's Investigation of Writing Conferences

To be honest, I was quite skeptical of several of the readings assigned in the course, especially the most scientific and data-driven ones. This skepticism originated in a belief that many of the conclusions drawn from the studies were obvious, the kinds of conclusions teachers would draw from basic observations and discuss with other teachers. I cynically saw the "science" as little more than providing an avenue for scholars to publish. Determined to not do the same type of thing, I decided to pick a practical project that would directly relate to my teaching and keep the "science" as simple as possible. I chose to analyze conferences I had with students in my First-Year English class.

What prompted my interest in conferences was reading a selection from Laurel Johnson Black's *Between Talk and Teaching*. As I conferenced with my students, I noticed how fatigue seemed to make my interaction with students different for later students than early students, a consideration Black does not discuss. I therefore asked myself the guiding "what is" (Hutchings, 2000) question, "Do my conferences change from early in the day, when I'm fresh, to later in the day, when I am fatigued, and if so, in what way(s)?" To gather data, I recorded one round of conferences in one class, twenty students, over the course of two days using Quicktime Pro and my PowerBook's internal microphone. I then examined early and late conferences from each day to assess any changes.

Overall, I found that fatigue has a negative effect on my conferencing. As I progressed through ten conferences in a row, my responses at the end of each day were more drawn out, full of pauses, and repetitive. Also, I tended to rely more on vague pronouns that hinted, rather than explicitly stated, ideas. Finally, I tended to be much more directive in later conferences, dominating the conversations, rather than letting students work out issues themselves to find their "aha" moments.

Ironically, my project verified through "science" a rather obvious point: after a day's worth of conferences, any teacher is bound to be less effective. Like the studies in our readings, my project met the aforementioned criteria of being replicable, aggregable, and data-driven. However, unlike some of the studies we read in our class, such as Connors and Lunsford's "Frequency of Formal Errors in Current College Writing," any teacher with a voice recorder can easily collect and analyze a class worth's of data, change methodology, and collect and analyze the data again, comparing the results. Though perhaps not

rigorous enough to hold up in a scientific court, I feel my project still gave me the tools I needed to confirm my suspicions and encourage me to try new pedagogy. This doable aspect of analyzing teaching and learning is perhaps the single most significant lesson I learned through studying SoTL.

Another, but more subtle, lesson I learned through studying SoTL is to be more aware of how my pedagogy and my own limitations intersect. In some subtle way I do tend to view myself differently as a teacher. Though I don't explicitly ask scientific questions that translate into research, I do create mental distance to meta-analyze my interactions with students, whether in conferences or in class. This hyper awareness can sometimes be frustrating—for instance, when I am tired and am conscious that my responses reflect this fact—but I now also think about my students' perspectives in these moments and try to compensate somehow. Sometimes I simply take a deep breath, slow down, and refocus so that my feedback can be as consistent as possible. By fostering an awareness of such mental analyses, SoTL has placed the sheen of "science" over my teaching.

Scientific Genres, Humanistic Methods: Emily's Investigation of "Risky Reading"

During my first semester of teaching college English, I realized many challenges stood in the way of the ideal class I had envisioned in my teaching philosophy. My students that first semester were bright, polite, conscientious people. Yet our class discussions felt tentative and forced. It was not only that few students spoke in response to assigned readings. I was also struck that students who spoke during class discussions remained completely detached from all of the questions writers raised, treating assigned texts as sealed packages that should be expeditiously re-sealed and dispatched after their reading.

The problem that most perplexed me in my teaching, then, was that I wanted my students to do risky reading. I wanted my students to experiment with seeing and reading outside of their own subjectivities. Since, based upon their feedback in class discussion, my students did not seem to be reading in this way, I became interested in analyzing the ways in which students initially thought through the texts they read. It was the research design stage of the SoTL inquiry process that first pushed me to change my usual approach to investigating scholarly questions. When working to transform my problem into a series of steps for gathering data, rather than reading my way to an interpretive "answer," I did feel

that I was stepping outside my usual investigative style. As an English graduate student, I usually rely on my skills of close reading and writing as my resources for drawing meaningful connections and contrasts.

For this project, I needed to change my approach and *listen* closely in order to better understand my research problem. I gathered about twenty student volunteers from another instructor's class to participate in my study and asked students to read two short selections from the *New World Reader*, Second Edition, a required text in the university's First-Year English program. One at a time, I left each student alone with the text and a hand-held audio recorder in my office. I instructed students to narrate their thoughts about the texts into the recorder as they read silently. In other words, I wanted them to voice all of their myriad possible reactions to the text, sympathy, confusion, disagreement, annoyance, etc., as these reactions surfaced. Afterward, as I had hoped, listening to these students' recordings helped me to better understand the students' reading processes. I now understand, for instance, that students often ask questions as they read and find connections between the personal narratives of writers from other parts of the world and their personal memories, though they often choose not to reveal these questions and connections in class discussion.

My seminar project persuaded me that data collection is *not* counter to my identity as an English scholar. Stepping into methodologies—like interviewing a living author or thinker—more common in the social sciences than literary studies does not mean that I am abandoning my attention to nuance or subtlety; and I do not pretend to be a statistician. But I believe that carefully designed, data-driven SoTL inquiry projects can and do help humanities scholars make clearer sense of what is happening in their classrooms and in the minds of their students.

My SoTL research certainly helped me to become a more thoughtful teacher. Through the inquiry project, I sought to better understand the reasons for students' lack of participation in large group discussion of class readings. After recording individual students speaking their reading responses aloud, I learned that students were more actively engaging with the texts than I had thought. So I remain curious about the numerous elements of classroom dynamics that cause the dialogue of a class to unfold as it does. My SoTL experience heightened my awareness of the complexity of factors that interact to determine whose voices are heard and the depth of the ideas that are shared during class discussion. I am more attuned to the "surroundings" of classroom communication: differences of gender and race,

differences of language and communication style, as well as being situated in a graded system in which I necessarily hold more authority than my students. And I recognize now that these elements constantly interact with students' willingness to share insights in class. Since my SoTL work has made my experience of the classroom more complicated, it has also made me more skeptical of my first perceptions of my teaching. I readily question the effectiveness of specific aspects of my teaching, and I am more open to revision and improvisation in my teaching than I was before I undertook my SoTL research. Recognizing my pedagogy as another field for analysis as complex as my literary studies, I now think more precisely and deeply about the weaknesses in my teaching; and, from this new perspective, I have a fresh interest in discussing my teaching questions with my colleagues.

Experimenting with "New" Methods: Sarah's Investigation of Small Group Work

Shifting the focus from teacher to student can be difficult when considering "what works" (Hutchings, 2000) in the classroom and what does not. While teachers can observe and form their own opinions about the success of their lessons, student responses and involvement are critical to examining students' classroom experiences. A common classroom experience involves group activities—whether groups complete worksheets, conduct small group discussions, or review their writing—and my inquiry centered on how much time students need for group activities and subsequent classroom discussions about the group activities, as well as whether group activities helped students learn and retain information. Ultimately, I wanted to know how to create time-effective group activities by considering whether or not students need equal amounts of class time allocated for both group activities and post-groupwork discussion, or if the subsequent discussions were repetitive and unnecessary for student retention.

My concerns were echoed by my classmate Karen Zyck Galbraith and we ultimately worked in collaboration to examine students' experiences with group activities. Individually, we created three different group activities, as well as surveys for our students to complete at the end of each activity. In collaboration, we were able to discuss and formulate our methods, compare our results, and consider a greater number of students' responses in order to develop a data-driven conclusion about time-effective

group activities. While we individually conducted our class activities and surveys over the course of four weeks, we collectively considered the implications of our data. Ultimately, we hoped to learn about the perceptions and experiences of our students working in group activities and how much time they felt was required to effectively complete the activity. In addition, we considered whether or not they found it necessary to spend more or less time in post-group work class discussion.

The task of creating and implementing methods of data collection was challenging because the research needed to be data-driven and focused on student learning. By employing surveys, we were able to collect, analyze, and interpret the data in order to make conclusions about students' experiences and their need for both group activities and class discussion. With each activity I varied the time spent on the group activity and the time spent on group discussion, spending more time on the group activity, equal time on both, and finally more time on class discussion. The data collected demonstrates that students clearly appreciate the class dialogue that can come from post-group discussion and look for additional opinions and clarity from both fellow students and their instructor.

Consequently, we concluded that students find post-group work discussions beneficial and even essential to their engagement and retention of the group activity. Our data therefore suggests that post-group work discussions should be, at a minimum, the same length of time as the group work activity. While employing a social science approach can be challenging, we were able to incorporate our students' responses and move beyond our own observations in order to effectively assess our classrooms.

Moving forward, I have found it imperative to consider my students' responses as I structure my class and, in particular, group activities. Continuing to ask my students for their feedback—which is often anonymous—allows me to view the class from their perspective and provides them with a greater stake in the class as they offer suggestions for future assignments and activities. While I have yet to pursue another SoTL project, I found the experience valuable because it provided me with different tools to analyze my own classroom and how to consider students' responses and incorporate them into my lessons and activities. In addition, my SoTL presentation and this collaborative effort have provided me with further opportunities to discuss my research experiences in relation to my composition classroom. This was particularly beneficial to me as I composed my job documents and discussed these experiences during phone and campus interviews. Since the institutions I have interviewed with are considered

teaching institutions, they have been particularly interested in my teaching experiences and any research I have completed in relation to my teaching. I have consequently found this SoTL experience to be advantageous to establishing my career as a teacher and scholar.

Conclusions

These humanities scholars began their SoTL inquiries with a healthy skepticism: were classroom studies of student learning really within the appropriate range of their work as literary scholars? All three scholars, however, were able to gather and analyze information on student learning in ways that were either easily reconciled to their literary studies (David and Emily both engaged in close "reading" of spoken text via transcripts) or that stretched them to expand their notions of the work of literary scholars (Sarah not only used surveys but also co-authored an inquiry with a fellow classmate, when collaborative writing is not the norm in literary studies). And although we did not conduct a formal SoTL inquiry into the effectiveness of this graduate seminar, we can draw on the self-reported attitudes and experiences of the graduate student co-authors of this essay for one gauge of the long-term effectiveness of the course. Although none of these scholars has yet undertaken any additional SoTL inquiries since they completed this course two or more years ago, the experiences and self-conceptions they document in this essay suggest that the capacities they developed—articulating a problem and a research question, conducting careful analysis of student learning, sharing their findings with others—will help them throughout their academic careers, as instructors and perhaps eventually as administrators responsible for making decisions about curriculum design and implementation. SoTL practitioners responsible for graduate education in the humanities at other institutions must, of course, design curricula in ways that are sensitive to the needs of students and the affordances and constraints of local institutional conditions, but the experience of this course suggests that a strategic deployment of familiar and unfamiliar genres may help graduate students in the humanities embrace the scholarship of teaching and learning and is a strategy worthy of systematic inquiry.

Appendix A: SoTL Inquiry Summary and Poster Presentation Assignment

A recurring theme this semester will be the importance of going public with your teaching. Good teachers will (even on their own) reflect on their teaching and their students' learning, ask questions about teaching and learning, experiment with their teaching, gather information about student learning, and make changes to their teaching in the hopes of improving student learning. But too often teaching is something that happens behind a closed door. Our traditional scholarship is constantly subjected to peer review and critique; our teaching, rarely. If teaching is to be a central part of the work of a college or university, then I believe it must be made available for public conversation as well as personal reflection. Teaching, in short, needs to be thought of and approached in a scholarly way.

Consequently, the central project of the semester is a first engagement with the scholarship of teaching and learning (also known as SoTL). Your task is, in essence, to pose a question about student learning in your classroom and seek to answer that question over the course of the semester. You will go public with your findings in a poster presentation to be held with the new teaching assistants at UWM and in a summary posted on your on-line teaching portfolio. (You might also choose to submit a proposal to the International Society for the Scholarship of Teaching and Learning, which will hold its annual meeting in Milwaukee in fall of 2011.) That summary of your classroom-based inquiry might take the form of a traditional paper-based report of findings (see the Final Reports of Greene and of Feito for examples) or it might take the form of an online project snapshot (see multiple snapshots available via d2l). Either way, you will include a link to your inquiry summary on your online teaching portfolio.

Throughout the semester, I will provide readings about the scholarship of teaching and learning and examples of the work of other SoTL scholars. I hope that you will find some of this semester's readings helpful in articulating your own questions about and expectations for student learning. But this project is not primarily an analysis or critique of the work of other scholars; it is your scholarly inquiry into the teaching and learning happening in your own classroom.

You may work on this inquiry individually or collaboratively. Either way, I will ask that everyone adhere to the following schedule:

W September 29th	Submit a one-page idea sheet for your inquiry. You've read about SoTL and examples of other scholars' inquiries. Write down three "problems" in your own teaching that you'd be interested in exploring. For each problem, articulate a tentative research question, and any ideas about what kind of evidence you'd collect and how you'd analyze that evidence.
Early October	Meet with me to discuss possible project ideas
M October 11th	Submit a one-page memo (ungraded, single-spaced) describing the problem you intend to explore, articulating the question you'll be asking about this problem, and your methods of exploration (what kinds of evidence can you gather to answer that question? how will you analyze that evidence?). If you are working collaboratively, you should also outline your plans for collaboration.
M November 29th	Peer workshop of SoTL inquiry summaries
F December 3rd	Peer workshop of your polished poster presentation
TBA	Poster Presentation at UWM / MU's joint conference
M December 13th	Final (for now) version of your online teaching portfolio—including SoTL inquiry summary, teaching philosophy statement, and teaching artifact—due by noon.

As this schedule indicates, you will be making an oral presentation of your project at a conference co-sponsored with the writing program at UW-Milwaukee. We will devote some class time to discussing the genre of "poster presentation," but the basic idea is that you (the presenter) stand by your poster (which summarizes your inquiry project's fundamental claims) in a room full of people (who informally mill among various presenters) and give a brief (2-3 minute) explanation of your work to anyone who stops by. You should also have a handout for people to take with them. Still not clear on what exactly is involved? Don't worry: we'll discuss it in more detail in class.

Ultimately, my evaluations will be based on your inquiry summary. As I read the inquiry summary, I will be looking for evidence of a clearly articulated problem; a clearly defined question; a clear (though perhaps tentative) answer to that question; reflection on specific classroom experiences; thorough understanding of and synthesis with relevant scholarship; appropriate organization and development; clear and grammatically correct prose. As you are writing, think of your colleagues at Marquette and UWM as your audience.

Appendix B: Feedback guide for the Inquiry Project

English 6840 SoTL Inquiry

GRADING CRITERIA	Proficient A AB	Competent B BC C	Developing CD D F
1. Problem (70 points) • Inquiry Project Summary makes clear the origin of this problem • IP Summary makes clear the significance of this problem • IP Summary contextualizes this SoTL inquiry amidst previous inquiries into this problem			
2. Evidence (80 points) • Evidence is appropriate to shed light on the problem • Evidence was carefully, appropriately gathered (methodologically and ethically)			
3. Analysis (85 points) • Evidence is rigorously analyzed • Results of analysis are clearly presented			
4. Significance (50 points) • Significance of results for future teaching are clearly presented • Significance of results for future inquiry are clearly presented			
5. Organization (40 points) • If Inquiry Summary is a snapshot, visual layout and use of links is effective • If Inquiry Summary is a traditional document, linear organization is effective			
6. Prose (25 points) • Grammatically correct • Clear and graceful • Appropriately formal in tone			
SUBTOTAL			
Comments:			
Was a well-developed draft of the Inquiry Summary brought to peer review? (If not, deduct 40 points.)			
FINAL TOTAL:			

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The Impact of Faculty and Peer-led Supplemental Instruction: Comparing Two Disparate Courses

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Abstract

Supplemental Instruction (SI) has been a powerful tool for improving retention rates at colleges and universities around the country. It is backed by decades of research and a successful traditional model that institutions can comfortably rely upon. This study reports that faculty-led SI, a significant departure from the traditionally defined and implemented peer-led SI model, has a number of measureable advantages over the traditional peer-led model. While it was observed that student grades on exams and in the courses increased more for those who regularly attended faculty-led SI, students also reported that they preferred it to the peer-led sessions.

The Impact of Faculty and Peer-led Supplemental Instruction: Comparing Two Disparate Courses

After participating in a faculty-led Supplemental Instruction (SI) project in the Fall of 2009, the authors collaborated on a research study that compared the effectiveness of faculty-led SI with the traditional and widely practiced peer-led SI model. The study involved two teams of three peer SI leaders and one faculty member. Each of these future SI leaders attended a workshop together, used the same assignments and worksheets, attended classes, met as teams on a regular basis, and reviewed the course materials collaboratively.

In the course of the study, the authors observed that faculty-led SI has some advantages over the peer-led model. For instance, students earned better grades and developed more academic self-confidence. Students also appreciated the additional interaction with their professors, and preferred it to interacting with peer SI leaders.

In addition, the two professors, while teaching very different courses, had such strikingly similar educational ideologies and teaching personalities that it was expected from the start that their results would be roughly equal. This was thought to be especially the case when it came to their in-class teaching styles, which downplayed lecturing and emphasized active learning and student collaboration. However, each professor received somewhat different results that at first seemed unexplainable. Eventually, though, it was thought that the differences in the courses – one a building block course noted for its difficult content, the other a course with relatively low DFW rates (students who received a D, F, or withdrew from the course) that was taught in independent modules – may have caused the diverse results. Though the comparatively disparate, but still positive, data was not the anticipated end result of the research study, it may offer some promising areas for future research.

Here we report on an Institutional Review Board approved study that compares the effectiveness of faculty-led with peer-led Supplemental Instruction sessions in interdisciplinary, general education, social science, and analytical reasoning courses at a public, doctoral-granting HBCU in the southeast. Students enrolled in both of these courses would be primarily freshmen coming from a class where 48%

of the students were in the top 40% of their high school class and averaged 908 in their SAT combined scores; 89% were African Americans and 52% were female students (Factbook).

The Importance of Supplemental Instruction

Developed in 1973 at the University of Missouri-Kansas City, Supplemental Instruction was designed to address high attrition rates among core curriculum courses in the health science professional schools. It was not until 1983 that "Breaking the Attrition Cycle: The Effects of Supplemental Instruction on Undergraduate Performance and Attrition" was published in the *Journal of Higher Education*, documenting the impact of Supplemental Instruction on undergraduate retention (Blanc et al). Since that time, there has been an abundance of research conducted in this area. However, the traditional model of Supplemental Instruction has always been, and is defined by the International Center for Supplemental Instruction as, "an academic assistance program that utilizes peer-assisted study sessions" (2010). As such, there has been a dearth of research conducted on faculty-led Supplemental Instruction.

The only known publication on faculty-led Supplemental Instruction is "Rescue the Perishing: A New Approach to Supplemental Instruction," by C. B. Peters (1990). Therein, Peters argues contrary to the traditional structure of peer-assisted SI that the mechanism of success for students attending Supplemental Instruction is "using materials from your course to provide your students organized practice in the academic skills most necessary for them to succeed." This can be accommodated at least equally well by faculty members, according to Peters, who further hypothesizes that the modeling of the skills necessary to succeed within a discipline can be reinforced perhaps even better by a faculty member within that discipline than a peer. Since Peters made these statements, however, there have been no studies that have focused on faculty-led SI until now.

However, Uri Treisman's 1991 study of minority students in Math classes at the University of California at Berkeley provides an interesting comparison to the aforementioned study. Observing that most African American students rarely studied for their Math classes in groups, these researchers constructed "anti-remedial" study sessions that emphasized "group learning and a community life focused on a shared interest in mathematics." Like this study, cooperative groups working outside of class on challenging problem sets was at the heart of the program. In Treisman's case, minority students

completely eliminated the performance gap that previously existed between them and other high-performing groups of students in the study.

Student-faculty interaction and student engagement have been connected with increased achievement in student learning outcomes. First observed by Chickering and Gamson (1987) as "the most important factor in student motivation and involvement," student-faculty interaction may be especially important for students who feel less prepared for the college experience. Astin (1993) also concludes that student-faculty interaction is positively correlated with virtually "every academic attainment outcome," including intellectual and personal growth (383). In addition, George Kuh et al (2005) finds that increases in student-faculty interaction, as well as other key areas like academic challenge, active and collaborative learning, and a supportive campus environment, enhances student engagement. These are all areas that intersect with faculty-led SI, and given this, faculty-led SI, especially for many larger entry-level courses, may be one of the most comprehensive engagement strategies available for individual faculty members and their students.

The Analytical Reasoning and Contemporary World Courses

The Analytical Reasoning (AR) course was designed to provide students with the basic tools for constructing and evaluating their reasoning. It is a three credit hour course required of all students as part of their general education plan of study. As such, AR handles 900+ students per semester. The overarching objective of the course, in terms of student curriculum, is to provide students with a common language for describing and evaluating arguments as they enter into their major fields of study.

The starting point for all AR courses builds on concepts and distinctions from a traditional logic course. These concepts provide the basic building blocks for evaluating claims that conclude arguments. Where traditional logic courses focus on deductive reasoning, AR spends considerably more time on inductive arguments in scientific and statistical reasoning. To successfully complete the central learning objectives for this course, students are expected to recognize the components of an argument, the types of reasoning, and be able to evaluate the quality of the argument based on the strength of the inferential claim and the truth of the premises.

A central feature of the AR course's design is its building block nature. Skills and concepts from the beginning of the course are continually built upon and applied throughout the semester. By default, every exam is cumulative, since every skill acquired later in the course depends on competency with material learned from earlier in the course. Performance on AR Exam 1, for example, is a statistically significant predictor of performance on later exams.

The Contemporary World (CW) course, taught in a number of distinct and somewhat independent modules, fulfills the institution's regional accrediting requirement for three credit hours in the social sciences. It was designed to be an interdisciplinary course that examines "the social, economic, political, and cultural roots of today's world" (Bulletin). Its learning objectives include the development of critical thinking skills, effective use of information technology, and developing an understanding of the interrelationship of cultures locally, regionally, nationally, and internationally. As a general education foundation course, all incoming first-year students are required to take it within their first 36 credit hours at the institution. The content areas that students study, like global environment, trade, conflict, inequality, and human rights, are looked at utilizing the umbrella theme of globalization. However, each content area might be learned independently without being at a great disadvantage.

The Fall 2009 Pilot Project

Utilizing institutional data derived from the Wabash National Study of Liberal Arts Education, an evaluation conducted by the institution's Academy of Teaching and Learning concluded that first-year student retention rates were closely linked to total credit hours earned in the first year. While this is probably true at most institutions of higher education, 27% of students who did not complete 24 credits in their freshman year did not return for their sophomore year (Simkins& Hornsby, 2009a; Simkins & Hornsby, 2009b).

Based upon this data and the desire to utilize courses with the highest number of student contact hours, three foundational general education courses were targeted for SI for the Fall 2009 semester—two of which were the AR and CW courses. Here, faculty were assigned two one-hour SI sessions each week for the duration of the semester in return for a reduction in their office hours. To help get students to attend, faculty could award up to 10% of a student's grade in the form of extra credit. Because each of

these courses utilized a common syllabus, text, and student learning objectives, it was also decided that students could attend any professor's SI sessions and still receive extra credit.

Even though not nearly enough was done in the way of meaningful assessment, the Fall2009 pilot experience revealed a number of trends. First, there was a great deal of diversity in the attendance totals within each course team, highlighting the potential influence a course professor had when it came to students to attend (or avoid attending) weekly SI sessions. Second, there was a great deal of diversity in student attendance between the two courses. The AR course, considered more difficult, drew many more students to SI sessions than did the CW course, with AR accounting for 68.5% of the 1834 total student visits to SI sessions for the semester (Table 1). Here, possible explanations include the difficulty factor of AR, which might have caused more students to attend, or that AR faculty just did a better job of recruiting (or both).

Table 1:

DFW Rates

Course	Fall 2009 SI Attendance	Fall 2008 DFW Rate	Fall 2009 DFW Rate
Contemporary World (CW)	577	16.7%	16.3%
Analytical Reasoning (AR)	1257	37.8%	27.0%

Table 1 compares the overall attendance and DFW rate change from Fall 2008 to Fall 2009 across sections for CW and AR. While DFW rates for AR decreased by 10% in 2009, the DFW rates for CW did not drop by a similar amount. However, a closer look at individual CW sections suggests a positive correlation between SI and exam grades for those sections where students were regular SI participants. In addition, the DFW rates for these sections were about 10% lower than the overall rate for the course. Unfortunately, the lack of additional data does not allow for a more definitively supported conclusion.

While data from the Fall project was lacking in some specifics, it did suggest that many students benefitted by regular attendance in faculty-led SI sessions. Here, one professor found that students who went to at least four SI sessions during the semester had higher exam grades than did those who went from zero to three sessions. Indeed, students who attended four or more sessions in any of the three fall

courses had significantly lower DFW rates (3% as compared to 22% combined). In addition, only two of the 249 students who attended at least four SI sessions/courses had grade decreases from their mid-semester to their final grade, while 184 students gained by one full letter grade or more.

In semester-ending exit surveys and a mid-semester focus group, students reported that they benefited in many ways from their faculty-led SI experience. Trained student researchers administered exit surveys in the last week of SI. The results of the exit surveys (Table 2) indicated that most students found their SI sessions to be helpful. While it would be difficult to get any group of students to agree on many things, all 124 students surveyed "agreed" or "strongly agreed" that they "would recommend SI to a friend" (mean=3.73).

Table 2:

Fall 2009 Pilot Study Exit Survey Results

Survey Statement	Mean	% of Agree or Strongly Agree
I am learning more in this course as a result of participating in SI.	3.4435	93.5%
SI sessions are worth my time.	3.5645	96.8%
My grade in this course has improved as a result of participating in SI.	3.6048	97.6%
SI sessions changed the way I study for this course.	3.1452	78.2%
I would have participated in SI sessions even without earning extra credit.	2.8226	68.5%
I would recommend SI to a friend.	3.7317	100.0%

n=124 Scale: 1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree

In the end, the Fall pilot project seemed to create as many questions as it answered. For instance, how did faculty-led SI compare to the more traditional peer-led model? What motivated students to attend SI? Was there a relationship between SI and students' sense of academic self-confidence? As a result of these and other factors, a smaller more controlled research study was planned for the Spring 2010 semester.

Methodology

\The intention of this study was to address three broad questions:

1) Does faculty-led SI impact student learning differently than peer-led SI?

2) Does the type of course play a role in the effectiveness of faculty-led SI when compared to peer-led SI?

3) What type of SI do students prefer, faculty-led or peer-led?

While self-selection is a variable that would need to be controlled to fully answer the first two questions, it was important for this project that students be allowed to assert their own preferences regarding what worked best for them. After all, even if faculty-led SI turned out to be demonstrably better than peer-led SI in terms of academic performance, such a contribution to the literature would have little use if students were unmotivated or afraid to attend.

Given the scope and potential confounding variables involved in student learning and preference, the authors utilized a mixed methods approach to data collection. Attendance records, grades, focus groups, exit surveys, and knowledge surveys were all utilized to measure student preferences, performance, and confidence. Because SI sessions were generally held around the same time of day on the same days of the week, significant differences in attendance might be attributed to student preferences for the SI leader. In addition, exit surveys and focus group data were collected by trained student researchers in an effort to highlight any student preference variables that did not show up elsewhere. Finally, knowledge surveys became an integral part of each question on each examination. These knowledge surveys were used to measure student confidence in their answers.

Extra credit was offered by both instructors to those students who attended SI. In data reported here, extra credit has been removed from student grades, since it would unfairly skew student performance data toward students attending SI. Extra credit was used to motivate students to attend SI, but it did not encourage students to attend one type of SI over another. Furthermore, students were asked to give extensive feed-back on the role extra-credit played in their SI attendance, which is reported here.

To maintain commonality in content and practice among SI sessions, weekly learning materials were the same for all SI sessions. In addition, session learning materials were designed to require little or no "teaching." Instead, SI leaders would utilize common exercises designed to help students work collaboratively and independently of the SI leaders while processing important content and applying their learning. As such, students in faculty-led SI covered the same material as those in peer-led SI sessions, both utilizing common worksheets and critical thinking exercises in small collaborative groups.

Course assessments, like quizzes and exams, contained problems that were the functional equivalent of those on the worksheets provided in SI, so that competency on SI worksheets would be demonstrable on quizzes and exams. In an effort to control for the possibility of grading bias, all assessments were graded anonymously based on student identification numbers. Exams utilized multiple choice questions that were developed by a team of instructors independent from the research project. In addition, any coursework that did not use multiple choice questions, like some quizzes and assignments, were graded by graduate teaching assistants utilizing detailed rubrics.

Results of the Study: Contemporary World

Based upon a cumulative final exam closely tied to key course concepts, mean final exam grades in the CW course were positively correlated with student attendance at SI sessions. As in Fall 2009, it was observed that students needed to attend four SI sessions before their exam results began to increase significantly. In addition, improvements in grades correlated positively to the number of SI sessions that students attended.

Table 3 displays the relationship between how CW students who went to four or more faculty-led SI sessions performed on their course unit exams compared to students who went to four or more peer-led SI sessions (and the class as a whole). Here, students who would eventually attend four or more faculty-led SI sessions started out with a lower combined average score on Exams 1 and 2 (prior to the bulk of the SI sessions). In fact, the worse a student performed on Exam 1 and 2, with the exception of the group of seven students who attended twelve or more times, the more SI sessions they would eventually attend and the higher they would score on the final exam. As such, they progressed further

and faster than students in either of the other two categories. Here, while students did self-select which type of session to attend, their reasons seemed to have more to do with their desire or need to learn and improve than anything else.

Table 3:

Contemporary World Exam Grades

	Exam 1 and 2 Average (pre-SI)	Exam 3 (SI sessions available)	Exam 4 (SI sessions available)	Exam 5 (SI sessions available)
Average: Entire Class; n=196	69.9	68.8	80.3	77.4
Average: Faculty-led SI; 4+ sessions n=30	68.8	78.2	90.2	90.1
Average: Peer-led SI; 4+ sessions n=28	73.3	73.4	86.8	87.7

To better evaluate whether students' exam scores were influenced by attending faculty-led versus peer-led sessions or if the total number of sessions attended better explained the differences in the data, a regression analysis was performed to isolate these two factors. To accomplish this, the scores from Exams 3, 4, and 5 were combined as the dependent variable while using the number of faculty-led SI sessions/total SI sessions and the total number of SI sessions as the independent variables. Here, both the total number of SI sessions attended ($p<4.7E-05$) and the number of students attending faculty-led sessions ($p<.0001$) while preparing for each exam were positively correlated with improved exam scores. Thus, CW students going to peer-led SI sessions helped increase their exam grades; however, going to faculty-led sessions helped them to improve even more.

This would seem a surprising conclusion given that there was not any additional teaching on the part of the instructor. However, it was observed that students attending faculty-led SI sessions may have outworked and been more careful than those who attended the peer-led sessions. Here, students using

the Immediate Feedback Assessment Technique forms (IFAT),[1] that allow for tracking incorrect answers, averaged nine incorrect answers in the peer-led sessions while students in the faculty-led sections averaged three wrong answers per twenty-five question exercise (n=120). In addition, while students in both groups were completing the same assignments, those in the faculty-led sessions spent an average of over 11 minutes more time working than did students who attended the peer-led sessions (n=345). Because students could use their textbooks and notes as resources, those who chose to take more time and care in determining their answers would likely have had more correct answers. It might also be possible that students who expected to work harder and longer, or were more earnest to learn, self-selected the faculty-led sessions; a conclusion which anecdotal evidence from the focus group interviews (discussed below) support.

Results of the Study: Analytical Reasoning

While the results from the Contemporary World class showed obvious improvements in student performance, the data from the Analytical Reasoning course was more opaque when it came to determining how students may have changed as a result of their SI experience. For example, there were no consistent differences in exam scores between students who regularly attended SI and those that did not. There was, however, a significant positive correlation between the final grade for the course and student attendance in SI ($p < .05$). In addition, students who attended eight or more SI sessions had an overall quiz average of 72.9% compared to those students who attended fewer than 8 times who averaged 67.4%; the difference was statistically significant ($p<.05$).

AR students who attended eight or more SI sessions did receive more Bs and Cs and fewer Ds and Fs in the course than students who attended SI less often. These data suggest that regular attendance throughout the semester as being a key factor to affecting positive change, as opposed to sporadic and irregular attendance. Final grade distributions also suggested that students in the lower ranges of the grading scale appear to have benefitted as a result of the positive impact that faculty-led Supplemental Instruction had on student quizzes and class attendance.

[1] IFAT forms provide students with immediate feedback on their answer to a multiple choice question; they also record the incorrect answers that students made along the way. www.epsteineducation.com

Table 4 shows correlations between quiz averages, class attendance, total SI sessions attended (Total), total faculty-led SI sessions (F-Led), and total peer-led SI sessions (P-Led) for AR. There were significant positive correlations with quiz averages and class attendance for students who attended faculty-led SI or a combination of faculty-led and peer-led SI.[2] These positive correlations are notably absent from those who attended peer-led SI sessions only, indicating that contact with the instructor made a significant impact on students in these two areas.

Table 4:

Analytical Reasoning Correlations

		Total	F-Led	P-Led	Quiz Average	Class Attendance
Total	Pearson Correlation	1	.586**	.585**	.298**	.316**
	Sig. (2-tailed)		.000	.000	.001	.000
	N	122	122	122	122	122
F-Led	Pearson Correlation	.586**	1	-.314**	.208*	.259**
	Sig. (2-tailed)	.000		.000	.022	.004
	N	122	122	122	122	122
P-Led	Pearson Correlation	.585**	-.314**	1	.141	.111
	Sig. (2-tailed)	.000	.000		.121	.222
	N	122	122	122	122	122

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

For AR, the ultimate impact of SI is somewhat puzzling. Regarding exams only, students who attend SI prior to the first exam performed significantly better on average than those who did not ($p < .05$). Yet, there were no significant correlations between SI attendance prior to Exam 2 and performance on Exam 2. However, students who attended SI sessions between Exam 2 and Exam 3 did see a positive

[2] Quiz average made up 20% of a student's final grade, so improved quizzes were important to improving final grades.

impact on Exam 3 ($p < .05$). Unfortunately, this trend did not last, as there were no correlations between SI attendance and the final exam scores.

Like CW, self-selection in SI sessions for AR may have played a role in the data reported here. However, the lack of a clear impact of SI attendance on student exam performance coupled with the significant impact of SI attendance on quiz performance remains puzzling. It may have been that students who chose to attend SI were thereby forcing themselves to study earlier for their exams than they would have otherwise, and students who did not attend SI did eventually get around to preparing for exams, perhaps after they had performed poorly on a quiz. Knowledge survey data reported later in this paper suggests that students who were not confident on the first two exams tended to attend faculty-led SI later in the semester. This type of self-selection could explain the lack of a clear impact of SI on exam scores, but it is difficult to know within the context of this project.

Student Perceptions

Perhaps the most basic evidence of student satisfaction is voluntary attendance. Here, the data for both courses is remarkably similar. Though there were slightly more sessions offered in the Contemporary World course resulting in greater overall attendance (737 to 689), the average number of students per faculty and peer-led session was slightly higher for AR. In addition, the CW and AR faculty-led sessions averaged roughly the same number of students/session (13.5 to 14.2), as did the CW and AR peer-led session average (7.8 to 9.7). To further evaluate the potential impact of this faculty-led SI model, data from the university's peer-led SI program for the Fall 2010, when faculty-led SI sessions were not offered, were compared. There, thirteen course sections (n=486) averaged 3.4 students/session of Supplemental Instruction—well below the averages for *both* types of SI sessions in this study.

SI exit survey data for both courses was collected by trained student researchers at the end of the semester. Here, students in both courses responded that they perceived greater value in the faculty-led SI sessions. In fact, for each question posed, the faculty-led category exceeded the student-led. It is also notable that student responses, regardless of the course, were very consistent for each type of session. Thus, the means for the responses relating to faculty-led sessions were similar, as were those for the peer-led sessions (Table 5).

Table 5:

Exit Surveys

Survey Statement	Faculty-Led (CW)	Faculty-Led (AR)	Student-Led (CW)	Student-Led (AR)
The SI instructor keeps me focused on learning the material.	3.60	3.67	3.18	3.24
I am learning more in this course as a result of participating in SI sessions.	3.58	3.62	3.26	3.21
SI sessions are organized and structured.	3.58	3.72	3.21	3.24
SI sessions are worth my time.	3.67	3.68	3.34	3.37

Strongly Disagree=1; Disagree=2; Agree=3; Strongly Agree=4

Student respondents to both the AR and CW exit surveys reported positively that Supplemental Instruction helped their grades, study and self-assessment skills, and academic self-confidence about equally for both courses (Table 6). Notably, each of these areas averaged over 3.1 on 4-point Likert scale with an overall mean of 3.43 for CW and 3.37 for AR. In addition, these same students preferred "instructor-led SI sessions to student-led SI sessions" with means of 3.37 and 3.46 for CW and AR, respectively.

Table 6:

Exit Surveys (con't)

Survey Statement	CW n=51	AR n=51
My grade in this course has improved as a result of participating in SI sessions.	3.69	3.53
SI sessions changed the way I study for this course.	3.31	3.18
Attending SI sessions helped me develop better overall study habits/skills.	3.31	3.16
Attending SI sessions helped me better recognize the course content I need to study.	3.45	3.52
Attending SI sessions helped me become more aware of my academic strengths and weaknesses.	3.39	3.41
Attending SI sessions increased my confidence on course exams.	3.53	3.43
Attending SI sessions increased my overall academic self-confidence.	3.39	3.24
Overall, I prefer instructor-led SI sessions to student-led SI sessions.	3.37	3.46

Strongly Disagree=1; Disagree=2; Agree=3; Strongly Agree=4

Focus group data collected by trained student researchers expanded upon many of the themes identified in the exit surveys. Here, students remarked how they appreciated the small-class atmosphere that gave them the opportunity to interact with their professor in a meaningful way. As such, the term "one-on-one time" was used often in the interviews. For example, typical student comments to the question "How did SI sessions differ from the normal class?" were "more one-on-one time," "receiving one-on-one time," and "Now my teacher knows my name." In addition, one focus group note taker observed that students found it important that they were able "to form a better one-on-one relationship" with their professor.

Confidence and Motivation

Table 6 includes the survey statements "Attending SI sessions increased my confidence on course exams" and "Attending SI sessions increased my overall academic self-confidence." Here, student responses in both courses indicated that these students gained in academic self-confidence—a necessary and often missing ingredient in student success. Anticipating this result based upon the Fall 2009 experience, knowledge surveys (Nuhfer and Knipp, 2003) asking all students to rate exam questions according to how confident they were in their answers, were introduced to provide some additional evidence of the effect that faculty-led SI may have had on student self-confidence. Using a five-point scale, students rated whether they were, (1) Very Unconfident, (2) Unconfident, (3) Neither Unconfident nor Confident, (4) Confident, or (5) Very Confident, that they had answered the exam question correctly. After rating their level of confidence in the first two exams roughly the same for all students (prior to the bulk of the SI sessions), the average for Contemporary World students who only attended faculty-led SI sessions prior to Exams 3, 4, or 5 rated their confidence level higher on each exam than did those students who only attended peer-led sessions (Table 7). For example, students who only attended faculty-led SI sessions between Exam 3 and 4 rated their average confidence level for Exam 4 questions at 4.52, while students who attended only peer-led sessions rated their average confidence level at 3.44.

Table 7:

Knowledge Survey (KS) Averages in CW

	Exam 3 KS Avg	Exam 4 KS Avg	Exam 5 KS Avg
Students who only went to Faculty-led SI sessions while preparing for this exam	3.95 n=32	4.52 n=36	4.29 n=38
Students who only went to Peer-led SI sessions while preparing for this exam	3.59 n=23	3.44 n=33	3.56 n=29

In contrast to the Contemporary World course, knowledge surveys in the Analytical Reasoning course indicated that students who were significantly less confident on the first two exams tended to attend faculty-led SI sessions for the remainder of the semester. Here, students who primarily attended

faculty-led SI sessions throughout the semester had a confidence average of 3.83 (n=25) on their first exam, while students who attended mostly peer-led SI sessions had a confidence average of 4.26 (n=27). However, correlation analysis showed that confidence on the first exam in no way predicted actual student performance.

The AR results for the second exam were similar, in that students who primarily attended faculty-led SI again had less confidence in their answers (4.01 for faculty-led and 4.36 for peer-led). Surprisingly, the correlation between faculty-led SI attendance up to Exam 2 and test answer confidence on Exam 2 was negative, $r(115)= -.189$, $p < .05$. The more often a student attended faculty-led SI during the semester, the more likely they were to lack confidence relative to their peers on Exam 2. However, unlike Exam 1, where confidence in no way predicted performance, confidence on Exam 2 and all other exams strongly predicted performance. The net result of this data is that underperforming and less confident students tended toward faculty-led SI. In contrast, no statistically significant relationships held for students who attended peer-led SI and their overall exam confidence.

How might the differing knowledge survey results for the two classes be explained? While additional research is warranted, the common ground in these data sets may be that students who are less confident or underperforming when compared to their classmates tend to choose faculty-led over peer-led SI sessions. As CW students with lower initial exam scores went to faculty-led sessions, less confident AR students did the same. In doing so, they may have been seeking assistance from the most trusted and knowledgeable source available to them, their professor. Here, it was observed that students regularly reported in their focus groups that they trusted their professor's knowledge more than the peer-leaders. In a frequently and, at times, strongly expressed theme in both the fall and spring, many students stated how they believed all SI should be faculty-led. In addition to the frequent statements that the instructor-led sessions were more effective, one student who only attended instructor-led SI sessions (much the same as the focus group from the fall, which also did not have peer-led SI experience) stated that he or she had "not attended (peer-led sessions) because they don't have as much knowledge as the professors" and another stated that the professor "has more confidence when explaining the information." Interestingly, however, this is directly counter to the often-claimed reason supporting peer-led SI, which is

that students with less confidence in their ability and more in need of help would be more likely to attend peer-led SI (Arendale, 2002; University of Missouri-Kansas City, 2006).

As was the case in the fall semester, many students in both courses responded that they began attending SI for the extra credit; however, they continued to attend because it helped them to learn course content. Here, 52% of students in the CW and 42% in the AR class stated that extra credit was the most important reason why they first decided to attend an SI session. In addition, when asked why they continued to attend SI sessions, 40% more CW and 71% more AR students selected the learning "important course concepts" response over the extra credit response, with the other possible selections coming far behind. Finally, when asked which had the greater impact on their overall course grade, improved knowledge or extra credit, 45% more CW and 64% more AR students responded that their improved knowledge helped their grade more than the extra credit. Thus, it seems that extra credit provided an initial motivation for students to attend, their improved grades on exams and quizzes, though unaffected by the additional extra credit, helped them to learn more and thereby do better in the class.

Surprisingly, the relative difficulty of the AR course does not appear to have been a factor in determining attendance at SI. Unlike in the Fall 2009, students from each course attended SI in roughly the same numbers and with similar motivations—they found it helpful and wanted to do better in the course.

Conclusion: Challenges and Opportunities

While getting students to attend SI can be a challenge for many programs, faculty-led SI attracted many more students than did the peer-led sessions. It also attracted more of the students who most needed to attend SI. While these were important findings, data from the AR course raised an additional challenge for building block type courses—getting students to attend SI early enough in the semester to make a difference. This is where the types of courses, being quite different, became important. With hindsight, it is not surprising that it took students eight or more visits to AR's faculty-led sessions, which would have necessitated that they attended a number of sessions early in the semester, to perform significantly better on course quizzes and to display signs of being more engaged in the course (better course attendance being one). Thus, it will be important to find ways to initiate student attendance as early in the semester

as possible; perhaps by including a required SI lab component that may be waived later in the semester if the student is succeeding in the course—though further research is warranted here.

Another potential area for further research involves courses that do not generally fit the typical formula for SI, those that might not be as difficult or have high DFW rates, may offer a unique opportunity for institutions to help their students learn how to become more successful. As with the students who attended faculty-led SI sessions in the CW course, students could connect with faculty members and begin to grow as confident and successful students without the added stress associated with difficult courses. They could also falter at the beginning, as so many first-year student do, and still recover by working harder and using the SI model of devoting additional time on task reviewing, practicing, and processing course content. Thus, students can voluntarily learn how to learn under less stressful and more positive course conditions—a key to long-term student success.

A recent "ProfHacker" article in the *Chronicle of Higher Education* entitled "How Sociable Are You? How Much Does It Matter?" highlights the benefits that engaging students emotionally can have on their learning. Quoting from research done by William Kennedy, the article states "that some portion of student failure is clearly due to the **lack of emotional engagement** rather than a lack of intellectual ability." While the benefits of connecting with students on a more personal and emotional level has been studied at our own institution (Drake, 2010; Kaufka, 2010), it is interesting to note that many of the recommendations in the ProfHacker article constituted elements of student-faculty interaction, an important part of student engagement. Learning students' names, meeting with them outside of the classroom, engaging them actively in the course content, are all, according to this *Chronicle* article, recommendations for helping students become more emotionally involved in an academic course—they also intersect with faculty-led SI.

While the importance of engaging students academically and emotionally are increasingly necessary given institutional emphasis on student retention and success, the financial realities in higher education today may be pushing institutions to larger classes and slashed academic support services. As such, engaging students efficiently both inside and outside of the classroom will become increasingly important. Faculty-led SI, by connecting greater effort and work outside of the classroom with improved grades, stressing the importance of course attendance and preparation, engaging students actively with

the course material, emphasizing the benefits of effective collaboration, assisting students to become better aware of their academic strengths and shortcomings, and discovering, often for the first time, how it feels to succeed in an academic setting, models how to become a successful student—regardless of the size of the class or the academic support services available to students.

It should be acknowledged that these benefits alone may not be sufficient to move already taxed faculty members to lead SI sessions. However, reductions in office hours, the use of graduate students to assist faculty with other tasks, and perhaps institutional recognition that SI is both teaching and service (and can lead to research), could all help busy faculty members move toward this model. We believe that some, once they have led SI sessions, will discover the intrinsic rewards motivation enough. Finally, while this study suggests that there are advantages to faculty-led SI as compared to the traditional peer-led model, it also suggests the need to study SI and other student intervention strategies in different types of courses and in diverse contexts. By doing so, SoTL practitioners will likely be surprised by what they find—just as we were.

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Appendices

Table 1:

DFW Rates

Course	Fall 2009 SI Attendance	Fall 2008 DFW Rate	Fall 2009 DFW Rate
Contemporary World (CW)	577	16.7%	16.3%
Analytical Reasoning (AR)	1257	37.8%	27.0%

Table 2:

Fall 2009 Pilot Study Exit Survey Results

Survey Statement	Mean	% of Agree or Strongly Agree
I am learning more in this course as a result of participating in SI.	3.4435	93.5%
SI sessions are worth my time.	3.5645	96.8%
My grade in this course has improved as a result of participating in SI.	3.6048	97.6%
SI sessions changed the way I study for this course.	3.1452	78.2%
I would have participated in SI sessions even without earning extra credit.	2.8226	68.5%
I would recommend SI to a friend.	3.7317	100.0%

n=124 Scale: 1=Strongly Disagree; 2=Disagree; 3=Agree; 4=Strongly Agree

Table 3:

Contemporary World Exam Grades

	Exam 1 and 2 Average (pre-SI)	Exam 3 (SI sessions available)	Exam 4 (SI sessions available)	Exam 5 (SI sessions available)
Average: Entire Class; n=196	69.9	68.8	80.3	77.4
Average: Faculty-led SI; 4+ sessions n=30	68.8	78.2	90.2	90.1
Average: Peer-led SI; 4+ sessions n=28	73.3	73.4	86.8	87.7

Table 4:

Analytical Reasoning Correlations

		Total	F-Led	P-Led	Quiz Average	Class Attendance
Total	Pearson Correlation	1	.586**	.585**	.298**	.316**
	Sig. (2-tailed)		.000	.000	.001	.000
	N	122	122	122	122	122
F-Led	Pearson Correlation	.586**	1	-.314**	.208*	.259**
	Sig. (2-tailed)	.000		.000	.022	.004
	N	122	122	122	122	122
P-Led	Pearson Correlation	.585**	-.314**	1	.141	.111
	Sig. (2-tailed)	.000	.000		.121	.222
	N	122	122	122	122	122

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5:

Exit Surveys

Survey Statement	Faculty-Led (CW)	Faculty-Led (AR)	Student-Led (CW)	Student-Led (AR)
	3.60	3.67	3.18	3.24
	3.58	3.62	3.26	3.21
The SI instructor keeps me focused on learning the material.				
I am learning more in this course as a result of participating in SI sessions.	3.58	3.72	3.21	3.24
SI sessions are organized and structured.				
SI sessions are worth my time.	3.67	3.68	3.34	3.37

Strongly Disagree=1; Disagree=2; Agree=3; Strongly Agree=4

Table 6:

Exit Surveys (con't)

Survey Statement	CW n=51	AR n=51
My grade in this course has improved as a result of participating in SI sessions.	3.69	3.53
SI sessions changed the way I study for this course.		
Attending SI sessions helped me develop better overall study habits/skills.	3.31	3.18
Attending SI sessions helped me better recognize the course content I need to study.		
Attending SI sessions helped me become more aware of my academic strengths and weaknesses.	3.31	3.16
Attending SI sessions increased my confidence on course exams.		
Attending SI sessions increased my overall academic self-confidence.		
	3.45	3.52
Overall, I prefer instructor-led SI sessions to student-led SI sessions.		
	3.39	3.41
	3.53	3.43
	3.39	3.24
	3.37	3.46

Strongly Disagree=1; Disagree=2; Agree=3; Strongly Agree=4

Table 7:

Knowledge Survey (KS) Averages in CW

	Exam 3 KS Avg	Exam 4 KS Avg	Exam 5 KS Avg
Students who only went to Faculty-led SI sessions while preparing for this exam	3.95 n=32	4.52 n=36	4.29 n=38
Students who only went to Peer-led SI sessions while preparing for this exam	3.59 n=23	3.44 n=33	3.56 n=29