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About *The Learning Assistance Review*

The Learning Assistance Review is an official publication of the National College Learning Center Association (NCLCA). NCLCA serves faculty, staff, and graduate students in the field of learning assistance at two- and four-year colleges, vocational and technical schools, and universities. All material published by *The Learning Assistance Review* is copyrighted by NCLCA and can be used only upon expressed written permission.

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NCLCA's Definition of a Learning Center

The National College Learning Center Association defines a learning center at institutions of higher education as interactive academic spaces which exist to reinforce and extend student learning in physical and/or virtual environments. A variety of comprehensive support services and programs are offered in these environments to enhance student academic success, retention, and completion rates by applying best practices, student learning theory, and addressing student-learning needs from multiple pedagogical perspectives. Staffed by professionals, paraprofessionals, faculty, and/or trained student educators, learning centers are designed to reinforce the holistic academic growth of students by fostering critical thinking, metacognitive development, and academic and personal success.

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Letter from the Editor

For those of you who know me, you may have noticed I've lost weight (not that I could afford to lose much) and I look bedraggled. I'm in the process of completing my MFA in Creative Nonfiction from the University of Arkansas - Monticello.

When I tell people I'm in school again, they get this look. It's not shock exactly; it's a furtive, steely, glassy-eyed look where their eyes cut my way but don't meet mine, instead staring through me, full of pity, while their mouths hang slack. Colleagues are in disbelief. With my track record of publishing, conference presentations, and editing their research articles or professional journals, many believed I already possessed a terminal degree and willingly chose to work as an undervalued staff member. Those outside of academia see my published comic book work, stage plays, and creative nonfiction publications and make wild assumptions. After publishing my first comic book on spec, a retrospective about the life of Christopher Reeve that was publicized on the Reeve Foundation's website, an actress in one of my plays, a technical writer who dreams of being a trashy romance novelist, bounced up to me and said, "You're doing it, Michael! You're living the dream!"

If only.

Obtaining a degree, in this case my fourth, is not without personal and professional risks. I'm constantly working, sometimes to meet publishing deadlines, sometimes to satisfy class requirements, and sometimes to complete the business necessary to remain gainfully employed. My wife thinks I'm having an illicit affair with my laptop. My publisher sings my praises while constantly prompting me to write more. The theatre company I write for wants "more!" My boss, the Associate Provost for Student Development and Public Affairs, a title so long that her business card is a fold-out, worries I'll burn out. My brothers think I'm crazy. My cousin, an editor in a small publishing firm in New York, is jealous. My students hesitate to tell

me they're busy when they hear all I do in a week. And me?

I type. I edit. I retype. I submit. Repeat ad nauseum.

For almost fifteen years, I've been arriving at my office around 6 a.m. where I write for almost two hours. Writing was a form of therapy for me, conducted by an untrained therapist. If doctors who treat themselves have fools for patients, what do authors who have no publisher call themselves? Oh, yeah...they call themselves writers.

There's millions of us, and I have the privilege to introduce you to the writing of Diana Garland, Tom Friedrich, Diane Huelskamp, Karen Gabrielle Johnson, Benjamin Jason Galluzzo, Melissa Thomas, Amanda Williams, Jinny Case, Cassandra S. Shaw, Karen E. Holmes, T. Gayle Yamazaki, Gary Packard, Douglas Lindsay, Edie Edmondson, Randall Gibb, Joseph Sanders, Heidi Schwenn, Scott Walchli, Steven Jones, Lorne Gibson, Kathleen O'Donnell, Andrew Katayama, Greta Winograd, and Jonathan P. Rust.

Enjoy!

Michael Frizell, Editor

Effects of Directed Learning Groups upon Students' Ability to Understand Conceptual Ideas

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Abstract

Mathematical modeling and directed learning groups were employed in a terminal mathematics course to encourage university students to conceptualize real-world mathematics problems. Multiple assessments were utilized to determine whether students' conceptual development is enhanced by participating in directed learning groups conducted in a learning center. Instituting directed learning groups early in a semester can have long-term effects on students' ability to apply concepts to future problems, feel comfortable participating in groups, increase their understanding of real-world applications, and maintain their confidence and self-efficacy in understanding mathematical concepts.

Common curricular goals for many disciplines in higher education include student development of critical thinking skills and application to real-world situations. Even though mathematics is often considered purely algorithmic because of the large amount of such content in college textbooks, developing conceptual understanding of foundational principles is crucial to deeper learning and application to real-world problems. Difficulties in grappling with conceptual understanding are not limited to developmental students; even good students who ask for help in understanding math problems seek the necessary, formulaic equations from instructors so they can simply insert the correct numbers without having to process the conceptual foundations underlying the algorithmic processes. By

incorporating directed learning groups — small study groups that consist of three to five students led by a peer tutor — instructors can provide student support that can help students develop conceptual understanding and apply algorithmic applications to real-world problems.

Literature Review

Teaching mathematics in a manner that encourages conceptual development requires approaches that employ application processes. Mathematical modeling is a pedagogy whereby instructors present real-world problems as a model for situating the study of mathematical concepts. Houston and Lazenbatt (1996) describe models as a mathematical description of a simplification of a phenomenon. They explain that a mathematical model is the result of the process where mathematical entities presented with statements describe how a modeler moved from a phenomenon to an abstract representation.

In practice, students in higher education may struggle with such methods because they may not have practiced mathematical modeling in secondary schools. Making the transition from solving equations to determining which equations are needed in mathematical models can challenge students whose prior educational experiences may have been characterized by instruction followed by independent completion of calculation exercises. Such practices may encourage memorization of steps or skills that require procedural knowledge, problems that are solved through one-step operations. However, successful completion of mathematical modeling exercises requires conceptual knowledge, a process that requires students to make a connection between a described practical event or activity and mathematics in order to determine the appropriate mathematical operation for use. University students may need alternative teaching methods and supplemental supports for helping them develop the conceptual thinking necessary for mathematical modeling.

Biddlecomb (2005) suggests that learning centers should develop courses or workshops to help students prepare for math modeling courses where tutors and staff can help students build on their current mathematical knowledge and learn to apply their understanding to modeling courses. Such tutoring models can help

students make sense of new forms of application because language is the primary means tutors employ for developing conceptual understanding. Vygotsky's (1978) theoretical underpinnings emphasize the importance of language to individual and social learning. Vygotsky explains that an essential feature of learning is using language to create a zone of proximal development where learning can occur when individuals interact with people in their environment and in cooperation with their peers. According to Vygotsky, once new concepts are internalized, independent achievement can take place. The value of courses or workshops exists in the facilitator's ability to use language interactions, which serve as scaffolds for students' development of conceptual knowledge, helping them develop associations and apply concepts to new experiences; nevertheless, helping students construct meaning should not be limited to courses or workshops.

Assisting students in mastering mathematics concepts can take place in a number of spaces, as long as a facilitator incorporates an effective process for learning. Valkenburg (2010) stresses the importance of communication as the primary means for learning. Valkenburg highlights the importance of communication because it is language that "allows humans to construct reality and to describe and define their experience" (p. 35). Valkenburg explains that language interactions allow learners to develop associations to improve their learning. Once a facilitator has identified the independent level of an individual, scaffolding, a technique to help students learn new concepts, can help students develop independence in applying new knowledge (Bruner, 1960). Valkenburg believes that tutors can serve as the means to help students learn by utilizing scaffolding to help students independently solve future problems.

For scaffolding to be successful and advance new learning, facilitators must intentionally connect new information to already-known information (Valkenburg & Dzuback, 2009). Valkenburg and Dzuback suggest that tutors work as translators by changing the language into one that students can understand, thereby intentionally creating contexts for formulating new ideas. Furthermore, tutors can help clarify content by presenting information in a different setting where students can freely ask questions (Laskey & Hetzel, 2011). Laskey and Hetzel suggest that students often feel

more comfortable asking a tutor questions because the tutor has no power to influence their grades. The comfort in asking a tutor questions exists in individual sessions or in small group tutoring sessions where tutors direct learning experiences. In a small group model, group discussions provide an open environment for discussing work with peers (Solomon et al., 2010) where tutors can lead discussions and intentionally scaffold conceptual knowledge.

Aside from serving as facilitators in students' learning processes, tutors' work with students is not limited to students' increased understanding of concepts. Tutors can help students improve their self-efficacy, confidence, and the ability to do well in school, which can help students connect to university life (Tinto, 1999). Retention may be an additional benefit of tutoring, especially for at-risk students. A number of studies have found that at-risk students who regularly attend tutoring sessions can also experience higher grades and increased confidence, which can lead to achievement and retention (Dowling & Nolan, 2006; Hodges, 2001; Laskey & Hetzel, 2011; Rheinheimer et al., 2010).

Even though many students may experience higher grades and increased confidence, researchers find it challenging to find reliable methods for directly measuring the impact of math tutoring upon students' achievement. To discover how institutions of higher education measure the effectiveness of mathematical support services, Gillard, Robathan, and Wilson (2011) conducted an email survey of 21 higher education institutions. Their results revealed that formal measurement of math tutoring effectiveness is very difficult, and most institutions were focused on assessing students' perceptions of math support. In the collective records from the institutions, anecdotal evidence indicated a positive impact on students who utilized support, leading administrators to conclude that math support is a valuable resource for students' academic development. Even though anecdotal evidence can be useful and compelling, learning center directors need more rigorous forms of assessment and evaluation of math support services.

Learning center directors can benefit from understanding the impact of tutorials on students' development of conceptual knowledge because this form of understanding can improve students'

critical thinking skills. Simply helping students gain proficiency with procedural knowledge does not require students to utilize higher-level reasoning skills for their computations. In contrast, guiding students to make gains in conceptual knowledge will challenge students to move beyond procedural steps, integrate higher-order reasoning skills, practice deep reflection on the underlying meaning of mathematical concepts, and apply mathematical operations to real-world problems. Discovering methods to measure gains in conceptual knowledge during tutorials could help learning center directors assess tutorials and provide more effective training for tutors.

Some researchers have utilized exam results to measure effectiveness of tutoring models. Bamforth et al. (2007) compared the passing rates of engineering students who used additional support to those who did not utilize support services. Their findings revealed that students who attended support sessions progressed to pass their mathematical modules while those who did not utilize the additional support failed the same mathematical modules. However, these results did not provide a clear explanation of whether gains in conceptual understanding contributed to the students' ability to pass the exams. One's ability to pass a math exam may be an indication of improvement in procedural knowledge, rather than gains in conceptual knowledge.

In addition to understanding whether individual tutorials contribute to development of conceptual knowledge, learning center directors and instructors could benefit from understanding whether small group tutoring contributes to the development of conceptual thinking. Group tutoring models can be more complex to evaluate because interactions between group members will be influenced by the composition of a group, which is crucial to a group's success. Houston and Lazenbatt's (1996) group tutoring model discovered that a majority of students surveyed reported a reluctance to form peer learning groups and did not find it a valuable experience. For groups to be beneficial, these students felt that groups should be selected by the instructor to reflect a mix of males and females and a variety of abilities, instead of allowing groups to self-select members on the basis of friendships. Despite students' reluctance to join a peer learning group, most agreed that they had developed better com-

munication skills and appreciated the presence and advice of math tutors. Student reluctance to rate group tutoring as valuable while valuing math tutors' advice seems contradictory, revealing a need to investigate dynamics within tutorials and whether gains in conceptual knowledge were made.

Webb's (1991) research of interactions within study groups—small groups directed by peer to help students master academic material—provides understanding about the importance of verbal exchanges. In Webb's study, verbal interaction and achievement were positively correlated when students received content-related explanations and listened to others. Thus, the success for small group tutoring appears to be dependent on a leader's ability to initiate and maintain productive conversations. For successful implementation in a learning center, learning center directors must provide direct training on how to lead discussions in small groups so a trained peer tutor can lead productive verbal exchanges.

The directed learning group model appears to offer opportunities for students to engage in language actions designed to improve their conceptual knowledge of math. However, formal measurements of conceptual growth and controlled experimental models that help measure conceptual growth are difficult to construct. Furthermore, first-year students may not understand the value of group tutoring models, so learning more about the impact of study groups can help professors determine ways to incorporate study groups into their courses. Understanding students' perceptions of study groups and any short-term effects of directed learning groups can help learning centers and math instructors develop effective directed learning group strategies to enhance students' development of conceptual knowledge in math. This study seeks to determine whether students' conceptual development is enhanced by participating in directed learning groups conducted in a learning center.

Research Questions

1. Will students who participate in directed learning groups at the Learning Center score significantly higher on conceptual assessments when compared to students who do not participate in directed learning groups at the Learning

- Center?
2. Will students who participate in directed learning groups demonstrate long-term benefits from their participation in the directed learning groups at the Learning Center?
 3. Are students satisfied with their experiences in the directed learning groups?

Method

Participants

Participants in the study included students enrolled in Applied Calculus (MAT 181) at a mid-sized comprehensive university located in the Mid-Atlantic region. MAT 181 is a terminal mathematics course that primarily serves first-year students in the College of Business. Most participants were first-year students between the ages of 18 and 20 and enrolled in their first spring semester at the university. Because most students who take this course are first-year students, the researchers decided to use this sample in order to introduce these students to the value of learning groups and learning center services early in their academic career. Since research has shown that tutors can help students improve their self-efficacy, confidence, and ability to do well in their studies (Tinto, 1999), first-year students could benefit from early exposure to services.

Two MAT 181 sections, which met for 15 weeks in three 50-minute periods per week, participated in two directed learning group activities completed at two different intervals during the semester. In Section A, 41 students participated in Directed Learning Group Activity 1 (DLGA1) during weeks two to four, while 36 students in section in Section B, Control Group 1, were not required to complete DLGA1. During weeks seven to nine, 32 students from Section B completed Directed Learning Group Activity 2 (DLGA2), and 38 students from Section A, Control Group 2, were not required to complete DLGA2. By alternating the directed learning group sessions, control and experimental groups were established for both groups. Students who did not complete the directed learning group activities, pretest, posttest, and surveys were removed from the final data set.

Students are admitted to MAT 181 based on one of three

criteria: an acceptable score on a college entrance exam, a passing score on the university-administered mathematics placement test, or the successful completion of College Algebra with a grade of “C” or better. The prerequisites for entrance into the course ensure that students enrolled in MAT 181 possess similar mathematical ability.

Procedures

During the second week, students who agreed to participate in the study completed an IRB-approved consent form. DLGA1 was conducted during weeks two, three, and four, while the DLGA2 was conducted during weeks seven, eight, and nine.

Three experienced Learning Center tutors, who were all upper-class math majors, were cross-trained by the MAT 181 instructor and the Director of the Learning Center. The math instructor discussed conceptual learning goals for the class and presented tutors with a variety of scenarios designed to prepare them for implementing a scaffolding approach with the student groups. The Director of the Learning Center focused on procedures for coaching, technology usage, recording student visits, and reviewing best practices in mathematics coaching.

Prior to the start of both iterations of the study, students received instruction focused on two mathematical topics commonly taught in the standard Calculus curriculum: limits and derivatives. The instruction provided an introduction to both topics and incorporated procedural and conceptual approaches on a regular basis. The instructor taught both sections, and each section completed four distinct activities:

1. Following instruction on a new topic, students were administered a pretest (Appendices A and D) consisting of six questions. Students were not notified ahead of time that they would be taking a quiz during that class period, and this pretest was not calculated into their course grade. This pretest provided a baseline of students’ understanding of the concepts and helped determine if there were significant differences between the groups.
2. After students completed their pretest and attended class, they were assigned a worksheet (Appendix B and E) con-

taining questions that required them to explore the curricular topic in real-world situations, which encouraged them to develop conceptual understanding.

3. Students in the experimental group formed small groups of three to five students and completed a one-hour group tutoring session with one of three trained Learning Center tutors prior to submitting the worksheet for a grade.
4. On the same day directly after students submitted the worksheet, they completed the posttest and survey. Students were not notified ahead of time that they would be taking a quiz (Appendices C and F) during that class period.

These procedures remained constant for both groups, although conceptual topics varied. For the first topic, Section A, the experimental group, was required to complete DLGA1 and Section B, the control group, was not required to complete DLGA1. For the second topic, Section B, the experimental group, completed DLGA2 while Section A, the control group, was not required to complete DLGA2 activities. Both groups completed worksheets for each unit.

During the implementation of the study, an unexpected turn of events occurred. Students who completed DLGA1 wanted to continue working in groups for the second unit. The researchers did not want to forbid the group meetings since students appeared to benefit from this learning activity, so students who voluntarily formed groups were instructed to identify their group members on their worksheet. Therefore, students from Section A, who engaged in learning groups when not required to do so, were identified.

Measurement instruments. This quasiexperimental study analyzed three types of collected data that included the following: (a) a comparison between students' achievement of learning outcomes before attending a directed learning group session and after attending a directed learning group session; (b) a comparison between students' achievement of learning outcomes with and without a directed learning group experience; and (c) student perceptions of the effectiveness of directed learning groups and the structure of this teaching model.

The assessment of learning outcomes in students' conceptual understanding of standard topics in calculus was completed by using multiple choice pretests and posttests that focused on subject matter

presented in the classroom prior to the administration of the pretest. The first unit quizzes on limits (Appendices A and C) each contained three questions requiring students to use procedural knowledge and three questions testing students' conceptual knowledge of mathematical ideas. For example, a procedural question on the limit quiz presented students with the function, $y = \frac{x^2 - 16}{x - 4}$, and then asked them to find the limit of the function as x approaches the number four, which is written in mathematical notation as: $\lim_{x \rightarrow 4} f(x)$. On the limit quiz, the conceptual question paired with the previously described procedural example asked the following: "Suppose that the cost C of removing $p\%$ of pollutants from a chemical dumping site is given by $C(p) = \frac{\$20,000p}{100 - p}$. Can a company afford to remove 100% of the pollutants? Explain."

In the second unit on derivatives, the two quizzes (Appendices D and F) each contained three questions requiring students to initially use a combination of conceptual knowledge and procedural knowledge of the derivative to help them solve the problems and three questions focused solely on testing students' conceptual knowledge of the derivative applied to a graph or function embedded in a word problem, with the second set of activities requiring a direct application of concepts.

Each group completed the same pretest and posttest for each module, resulting in a total of four quizzes for both modules. After both groups completed the pretest, the instructor discussed math concepts and then assigned a worksheet that required students to use applications on three multi-part, open-ended questions about real-world problems. These worksheets served as the focus point for discussion in directed learning group sessions.

The instructor collected data on students' perceptions of directed learning groups at the culmination of each topic through self-reported measures using the MAT 181 Student Learning Surveys, which were developed by the researchers. The experimental and control group surveys differed: the experimental group answered eight scaled questions while the control group responded to a seven-question survey with five scaled questions. The additional questions on the experimental group surveys were focused on identifying student experiences during the directed learning group sessions. Control group surveys focused queries on the assigned worksheet.

Analysis of data. After the pretests and posttests had been administered, the researchers collected all four sets of test data that included results from both groups for each directed learning group activity. Results of the MAT 181 Student Learning Surveys were also collected along with notes from the instructor and the student tutors. A quantitative analysis using independent and paired samples *t*-tests was conducted from both DLGA1 and DLGA2 test scores. The researchers conducted a descriptive analysis of student perceptions from the MAT 181 Student Learning Surveys. Only students who attended DLGA1 and DLGA2 sessions had their test and survey results included in the data set. Students who had not completed consent forms and both the pretest and posttest for a particular study were removed from the sample set. Descriptive statistics and paired samples *t*-tests were calculated to determine if significant differences in Conceptual Comprehension had occurred over the course of the study. Results from all measures were merged to determine common themes and student perceptions. Conclusions from these data were determined from the frequency of repeated themes and scores from the quantitative sections of the survey.

Results

Evaluations of Directed Learning Group Activity 1 (DLGA1)

The first research question sought to determine if there was a significant difference between students' achievement of learning outcomes before and after attending directed learning sessions in the Learning Center. For the limits unit, 41 students completed the pretest and posttest in the experimental group; 36 students completed both tests in the control group. An independent samples *t*-test, with an alpha level set at .05, was used to determine if a significant difference in students' mathematical abilities existed before instructional activities commenced. The results, $t(75) = .497, p < .05$, clearly indicate no significant differences existed between students' abilities in each class before DLGA1 began. Table 1 presents differences between the experimental (DLGA1) and control (CTRL1) groups' pretest and posttest results.

Results from the paired samples *t*-test reveal a significant difference for both groups on Question 1, which was a conceptu-

Table 1
Paired Samples t-test Comparing Pretest and Posttest Results for Unit 1

SLO	DLGA1				CTRL1			
	M(SD)	95% CI	t(40)	Sig.	M(SD)	95% CI	t(35)	Sig.
Q1 - CON	-.34(.57)	[-.52, -.16]	-3.80	.00	-.44(.50)	[-.61, -.27]	-5.29	0.00
Q2 - PRO	-.07(.57)	[-.25, .11]	-0.83	.41	-.03(.61)	[-.23, .18]	-0.27	0.79
Q3 - CON	-.27(.45)	[-.41, -.13]	-3.83	.00	-.03(.69)	[-.26, .21]	-0.24	0.81
Q4 - PRO	-.05(.50)	[-.21, -.11]	-0.63	.53	.00(.76)	[-.26, .26]	0.00	1.00
Q5 - PRO	-.12(.56)	[-.30, .05]	-1.40	.17	.00(.76)	[-.26, .26]	0.00	1.00
Q6- CON	-.29(.60)	[-.48, -.10]	-3.11	.00	-.03(.56)	[-.22, .16]	-0.03	0.77

Note. DLGA1= Students who completed Directed Learning Group Activities. CTRL1= Students in Control Group 1 who did not complete Directed Learning Group Activities. SLO = Student Learning Outcome; M = Mean; SD = Standard Deviation; CI = Confidence Interval that includes the lower and upper limits; t(40) = paired samples t-test with 40 degrees of freedom; t(35) = paired samples t-test with 35 degrees of freedom; Sig. = Significance (two-tailed); Q = Question; CON = Conceptual Mathematical Problem; PRO = Procedural Mathematical Problem.

ally-based question. However, there were no significant differences for other questions for the control group. Students who completed DLGA1 demonstrated statistically significant differences for the other two conceptual questions. Both groups did not demonstrate significant differences in procedural questions.

An independent samples *t*-test, with an alpha level set at .05, was used to determine if an overall significant difference in students' mathematical abilities existed between groups after all instructional activities had been completed. The results, $t(75) = 2.47, p < .05$ with a significance score of 0.016, clearly indicate an overall significant difference between the groups' abilities to apply mathematical concepts taught in the unit. DLGA1 students scored significantly higher in their overall understanding of concepts and procedures when compared to the control group.

Evaluations of Directed Learning Group Activity 2 (DLGA2)

A continuation of the first research question, DLGA2 on derivatives similarly sought to determine if there was a significant difference between students' achievement of learning outcomes before and after attending directed learning group sessions in the Learning Center. However, one major difference was that most of the students in the control group, while not required to meet in groups in the Learning Center, continued to independently meet in their groups. In the DLGA2 group, 32 students completed the pretests and posttests while 38 students completed the pretests and posttests in the control group. An independent samples *t*-test, with an alpha level set at .05, was used to determine if a significant difference between groups existed before instructional activities commenced for this second unit. The results, $t(68) = .523, p < .05$, clearly indicate no significant differences between groups' abilities before DLGA2 began. Table 2 presents student results on pretests and posttests for both groups.

Results for DLGA2 students on all conceptual questions reveal a significant difference between experimental students' pre-directed learning session and post-directed learning session. A statistically significant difference was not revealed in students' learning of conceptual/procedural material for either group.

The control group's results from the paired samples *t*-test

Table 2
Paired Samples t-test Comparing Pretest and Posttest Results for Unit 2

SLO	DLGA2				CTRL2			
	M(SD)	95% CI	t(31)	Sig.	M(SD)	95% CI	t(37)	Sig.
Q1 - CON	-.44(.56)	[-.64, .23]	-4.39	.00	-.55(.50)	[-.72, -.39]	-6.76	0.00
Q2 - C/P	.09(.64)	[-.14, .32]	-0.83	.41	-.03(.59)	[-.22, .17]	-0.27	0.79
Q3 - C/P	-.16(.51)	[-.34, .03]	-1.72	.10	-.21(.66)	[-.43, -.01]	-1.90	0.06
Q4 - CON	-.31(.64)	[-.54, -.08]	-2.74	.01	-.24(.59)	[-.43, .04]	-2.48	0.02
Q5 - CON	-.34(.70)	[-.60, .09]	-2.78	.01	-.26(.60)	[-.46, -.07]	-2.70	0.01
Q6- C/P	-.06(.62)	[-.16, .29]	0.57	.57	.08(.63)	[-.13, .29]	0.77	0.45

Note. DLGA2 = Students who completed Directed Learning Group Activities. CTRL2 = Students in Control Group 2 who did not complete Directed Learning Group Activities. SLO = Student Learning Outcome; M = Mean; SD = Standard Deviation; CI = Confidence Interval that includes the lower and upper limits; t(31) = paired samples t-test with 31 degrees of freedom; t(37) = paired samples t-test with 37 degrees of freedom; Sig. = Significance (two-tailed); Q = Question; CON = Conceptual Mathematical Problem; C/P = Conceptual/Procedural Mathematical Problem in which a procedural step follows conceptualization of the situation.

reveal significant differences in all the conceptual activities, which are similar to their results of their first unit and the experimental group's results for the second unit. An independent samples *t*-test, with an alpha level set at .05, was used to determine if a significant difference in students' mathematical abilities existed between the groups after all instructional activities had been completed. The result, $t(68) = .755$, $p < .05$ with a significance score of 0.811, indicates no overall significant differences between the groups' abilities to apply mathematical concepts taught in the unit.

MAT 181 Group Learning Surveys

After students completed their posttest for both units, they received the MAT 181 Student Learning Survey. Students completed the survey during class to provide a 100% response rate for both groups. The quantitative portion of the survey asked students about their attitudes concerning course components by using a scale from 7 to 1. Students who completed the DLGA1 received an eight question-survey in which five of the questions were stated in a positive fashion while three were stated negatively. In Control Group 1, students received a different survey that contained only five of the Likert questions from the test group survey because three of the experimental group questions were not applicable for the control group. Of the five questions given to the control groups, three of the questions were stated positively while two were worded negatively. Positive and negative questions were given in order to measure reliability of student responses. For the second unit, students who completed DLGA2 completed the eight-question survey and Control Group 2 completed the five-question survey.

Tabulating results on the scale required weighting of the responses. For the positively stated items, numeric values ranged from 7 to 1, with the highest rating given to favorable responses and respectively decreasing to unfavorable ones. Thus, Strongly Agree would have a rating of 7 while Strongly Disagree would be rated as 1. On the negatively stated items, the weighting is reversed with the Strongly Agree weighted as 1 and Strongly Disagree weighted as 7. Table 3 lists the questions and the mean scores obtained from students.

Students in DLGA1 appeared to experience more confidence

Table 3

Mean Scores of Statements on MAT 181 Student Learning Surveys

Survey Statement	Mean Scores			
	DLGA1	CTRL1	DLGA2	CTRL2
1. I experienced an overall improvement in my understanding of mathematical concepts after completing the worksheet.	3.93	2.86	3.53	3.58
2. My Leaning Center meeting helped me understand and complete the assignment.	4.67	---	4.12	---
3. The feedback I received from my group was helpful.	5.18	---	4.51	---
4. I am disappointed in the lack of improvement in my calculation skills.	3.80	3.78	3.52	3.63
5. Discussing the worksheet with a Learning Center Tutor did little to improve my understanding of concepts.	4.34	---	4.03	---
6. I feel more confident in my ability to calculate problems.	4.12	3.83	3.94	4.53
7. I feel comfortable sharing ideas with members of my group.*	5.95	4.64	4.97	4.82
8. I will not work in a group on future homework assignments and/or projects.	5.12	4.68	4.68	4.73

Notes. CTRL1 = Control Group. CTRL2 = Control Group 2. *Questions for Control Group 1 and 2 substituted the words “with my classmates” for “members of my group” in question 7. CTRL1 and CTRL2 did not answer questions 2, 3, and 5.

than Control Group 1 in their ability to understand mathematical limits, and they credited their Learning Center meetings as helpful in understanding the assignment. Despite fairly positive reviews of group meetings, students in DLGA1 did not consistently credit their tutor with helping them understand mathematical concepts. An item analysis of question five revealed that students who worked with two of the tutors ranked their tutors positively while students who worked with the third tutor rated this tutor's assistance less favorably. Finally, students in the DLGA1 felt more comfortable sharing ideas with group members than students who did not attend Learning Center meetings.

Students in DLGA2 did not demonstrate more confidence in understanding mathematical limits than students in the Control Group 2, which differed from the results from DLGA1 Survey. DLGA2 students rated their Learning Center meetings and feedback from their group favorably, but their ratings were less favorable than the ratings given by DLGA1. Surprisingly, DLGA2 students rated their confidence in their ability to calculate limits less positively than students in Control Group 2. Last of all, DLGA2 students positively rated their comfort in sharing ideas with their group, but even though their rating was higher with the tutors' facilitation of the group, their rating was not much higher than the rating from Control Group 2.

Discussion

Our results concur with conclusions by Gillard et al. (2011) that measuring effectiveness of math tutoring is very difficult. A simple look at the results may seem to reveal confounding effects; nevertheless, anecdotal records and observations provide insight into interpretation of these multiple measures. Sound assessment practices incorporate multiple measures to provide rich layers for interpretation, and results from this study illustrate the importance of following such practices.

This study sought to determine whether students who participate in directed learning groups score higher on conceptual assessments-- which require critical reasoning and application skills-- than students who do not participate in directed learning groups. Students in DLGA1 and DLGA2 demonstrated significant differences in

growth in all areas of conceptual knowledge (see Tables 1 and 2), and students in DLGA1 revealed an overall significant difference in growth for both conceptual and procedural knowledge when compared to Control Group 1 [$t(75) = 2.47, p < .05$]. These results appear to support the premise that directed learning groups were effective in helping students grow significantly in their conceptual knowledge. However, when comparing Control Group 1 and Control Group 2, a simple analysis cannot explain the outcomes.

In Control Group 1, students only demonstrated significant growth in one out of three conceptual areas, but Control Group 2 demonstrated significant growth in all conceptual areas, which required higher-order, conceptual thinking; therefore, students who completed DLGA1 experienced the same level of growth as students who completed DLGA2. At first inspection, these results do not appear to corroborate; however, students in Control Group 2, who had experienced the benefits of working in their learning groups, continued to meet in their groups without a math tutor for the second learning activity even though they were not required to do so. One might think that Control Group 2 began the second unit with a stronger conceptual foundation, yet, this does not appear to be the case since the pretest scores were similar and the t -tests for independent samples [$t(68) = .523, p < .05$] did not indicate any significant differences between groups before the unit was taught. Apparently, students in Control Group 2 were empowered to transfer successful learning strategies they had learned during their time in DLGA1 to new concepts they were learning in the second unit. Thus, it appears that first-year students who participate in directed learning groups may continue to meet in groups and employ practices learned in groups that enable them to achieve success. These results strengthen the results of Gillard et al. (2011) that concluded that math support is a valuable resource for students' academic development.

In procedural problems, students did not make significant gains in either unit. Several reasons account for a lack of significant improvement in this area. First, tutor training focused on scaffolding the problems from a real-world perspective because tutors are often comfortable with procedural coaching and may not naturally connect problems to real-life situations. Thus, tutors focused sessions primar-

ily on real-world problems, encouraging students to think more about concepts than procedures. Second, once students were empowered to conceptualize word problems, the word problems actually became easier because they understood the problems and could rule out false possibilities in the multiple choice quiz. Third, in solving conceptual problems, students were less likely to make calculation errors, and their responses were based more on reality and their understanding of the problem. Reasoning made it easier for students to select the correct answer while procedural exercises held more possibilities for error due to the calculation procedures students had to complete.

Student perceptions of their experience revealed valuable insights concerning the strategies and the importance of instituting directed learning groups early in the semester. Students who completed DLGA1 evaluated their ability to understand mathematical limits more positively than those who participated in DLGA2. Evaluations from students who participated in DLGA2 demonstrated their awareness of the effectiveness of directed learning group strategies that helped build their understanding, which corroborated with quantitative results shown in Table 1. Because students understood the value gained from participating in the groups, Control Group 2 continued to meet in their learning groups and maintained the positive momentum of active learning strategies, which helped them significantly improve their critical thinking and application skills for the second unit. Most likely, the early implementation of directed learning groups and students' continuance of meeting in groups made such an impact in students' development of conceptual understanding, that no significant difference in overall learning was determined between the two groups for the second unit. Instituting directed learning groups early in the semester appears to have long-term effects in students' ability to apply concepts to future problems, feel comfortable participating in groups, increase their awareness of their improvement in understanding real-world applications, and maintain their confidence in their ability to understand mathematical concepts.

Students' perception of the value of directed learning seemed to vary according to the composition of the group and the time in the semester when the group was formed. Those who participated in DLGA2 did not rate the groups as positively as students who partici-

pated in DLGA1, which may be a result of their initial decreased ability to understand concepts in the first unit. Since students in DLGA2 began meeting in groups later in the semester, they did not achieve the same level of early success as students in DLGA1. Even though students in DLGA1 met for just one hour for the first unit, the effectiveness of the group discussions helped students in DLGA1 experience enough success to build more confidence for future learning. By building students' confidence in their ability to solve more complex algorithms, their attitudes toward strategies may be more positive. As Houston and Lazenbatt (1996) found, group composition does determine the effectiveness of a directed learning group model, but in this study, problems were related more to the tutor leading the group rather than members of the group. Because the instructor formed the groups to avoid problems in social group compositions like those described by Houston and Lazenbatt, group effectiveness did not seem to be a result of student members. The results from this study support Webb's (1991) research that concluded that tutors leading the group set the tone and environment for learning.

Out of the three tutors leading the groups, one of the three tutors consistently received lower ratings than the other two tutors. The researchers noted that the tutor with the lowest ratings lacked essential interpersonal skills that hampered his ability to establish strong bonds with his groups. For directed learning groups to operate effectively, specialized tutor training should discuss strategies for building interpersonal communication and approaches for creating an environment conducive for active learning.

The directed learning groups provided a structure in which tutors were not only able to help students build conceptual knowledge, but, as Valkenburg suggests, the tutors also empowered students to independently apply knowledge to solve future problems. Tutors' ability to scaffold learning by directing language interactions appeared to help students understand, retain, and apply concepts to new situations. Given that students' greatest gains occurred with conceptual ideas that involve critical thinking skills and application of real-world problems, this strategy holds promise for instructors of mathematics courses. However, to be optimally effective, learning centers and mathematics instructors both need to actively train and prepare tutors

for scaffolding content and leading the groups. Additionally, instructors should support the formation of groups to launch the initiative and provide structure for students so that groups can be started at the onset of the semester.

Formal measurements of conceptual growth and effectiveness of math tutoring are difficult to construct, yet holistic measures of assessment in students' gains in knowledge and their perceptions of strategies are useful for both learning centers and instructors. The quasi-experimental model in this study and qualitative analysis provided a useful model for understanding how students gain conceptual knowledge and view such strategies. Directed learning groups can help students improve their understanding of difficult concepts through interactive discussions led by a skilled tutor. When students achieve early success in critical thinking strategies, they may tend to employ them again to new situations and enjoy working in groups when they experience success and comfort in the group. Therefore, when learning center personnel and math instructors collaborate to design extended learning opportunities such as directed learning groups, students are introduced to valuable resources that can enhance their academic development.

Recommendations for Future Research

This study involved two classes at one institution and is limited in its ability to transfer to other institutions. Replication of these methods would help confirm the findings of this study and allow the results to be generalized to larger populations. In order to fully understand the effect of directed group learning on students' perceptions of curricular material, tutoring, and group work in a math class, further investigations should include administering a student learning survey before and after the directed learning activity to determine changes in student perceptions. Furthermore, because quantitative and qualitative results of the control group following DLGA2 suggest that those who find success with directed group learning may continue to study using these techniques, additional studies could include longitudinal surveys, interviews, and focus groups that seek to investigate study habits and learning center usage of participants throughout that semester and subsequent semesters.

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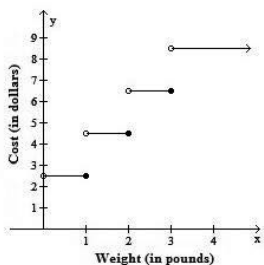
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Appendix A

REAL-WORLD LIMITS PRETEST

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. An express mail service uses the following graph to determine how much to charge for overnight delivery of packages. You have to mail two packages; one weighing 1.97 pounds, the other weighing 3.02 pounds. How much will it cost to send both packages using the overnight service?



- A) \$9.00
- B) \$11.00
- C) \$13.00
- D) \$17.00
- E) None of the above

Find the limit, if it exists.

2. Let $f(x) = \frac{x^2 - 3x - 10}{x + 2}$. Find $\lim_{x \rightarrow -2} f(x)$.

- A) -7
- B) -2
- C) 0
- D) 5
- E) Does not exist

Solve the problem.

3. Suppose the cost of removing $p\%$ of the pollutants from a

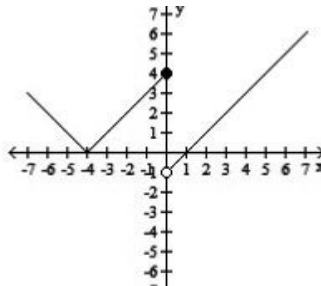
chemical dumping site is given by $C(p) = \frac{\$35,000p}{100-p}$.

Can a company afford to remove 100% of the pollutants? Explain.

- A) Yes, the cost of removing $p\%$ of the pollutants is \$35,000, which is certainly affordable.
- B) No, the cost of removing $p\%$ of the pollutants is \$350, which is a prohibitive amount of money.
- C) Yes, the cost of removing $p\%$ of the pollutants is \$350, which is certainly affordable.
- D) No, the cost of removing $p\%$ of the pollutants increases without bound as p approaches 100.
- E) Yes, the cost of removing $p\%$ of the pollutants is \$3,500, which is certainly affordable.

Use the graph to evaluate the indicated limit and function value or state that it does not exist.

4. Find $\lim_{x \rightarrow 0^-} f(x)$ and $\lim_{x \rightarrow 0^+} f(x)$.



- A) $\lim_{x \rightarrow 0^-} f(x) = 4$; $\lim_{x \rightarrow 0^+} f(x)$ does not exist
- B) $\lim_{x \rightarrow 0^-} f(x) = 4$; $\lim_{x \rightarrow 0^+} f(x) = -1$
- C) $\lim_{x \rightarrow 0^-} f(x) = -1$; $\lim_{x \rightarrow 0^+} f(x) = 4$
- D) $\lim_{x \rightarrow 0^-} f(x)$ does not exist; $\lim_{x \rightarrow 0^+} f(x)$ does not exist
- E) $\lim_{x \rightarrow 0^-} f(x) = 4$; $\lim_{x \rightarrow 0^+} f(x) = 4$

Provide an appropriate response.

5. If the limit at infinity exists, find the limit.

$$\lim_{x \rightarrow \infty} \frac{3x^3 + 5x}{4x^4 + 10x^3 + 2}$$

- A) $3/4$
- B) ∞
- C) 1
- D) 0
- E) None of the above

Solve the problem.

6. It has been determined that the value V of a certain product decreases, or depreciates, with time t in years, where

$$V(t) = 100 - \frac{60t^2}{(t+2)^2}$$

Find $\lim_{t \rightarrow \infty} V(t)$.

- A) \$100
- B) \$60
- C) \$40
- D) \$70
- E) Does not exist

Appendix B**Real-World Limits Worksheet**

This worksheet explores some possible applications of limits in real life. You are allowed to work in groups (< 5 people/group) to determine solutions to these problems; however, each individual must turn in a solution. If you do choose to work with others, you must write ALL the names of the members of your group on the paper you turn in.

1. Analyze the progression of men's and women's world record times in the marathon (Information can be found at this link: http://www.arrs.net/RecProg/RP_wwR.htm).

- a. When (if ever) will the men's world record drop below 2 hours? 1 hour and 45 minutes? Use the data to support your answer.
 - b. Give an example of a function that models the progression of men's world record times in the marathon.
 - c. Similarly use the data to determine when the women's world record will be within 5 minutes of the men's? Will the women's world record time ever surpass the men's?
2. The rates for two metropolitan parking ramps are given below:

Mid City Parking Lot:

 - \$4 per hour or fraction thereof
 - \$36 maximum for 24 hours.

Central Garage:

 - \$5 per hour or fraction thereof
 - \$21 maximum for 24 hours.
 - a. Draw graphs to represent both parking situations (let t = time in hours from 0 to 24).
 - b. You are in a line of cars waiting to exit the Mid City lot and notice that you have been in the parking ramp for 5 hours and 58 minutes. Do you want the cars in front of you to "hurry up, pay, and get out of the way"? Why? (Describe this situation using limits.)
 - c. You are in a line of cars waiting to exit the Central Garage and notice that you have been in the parking ramp for 5 hours and 58 minutes. Do you want the cars in front of you to "hurry up, pay, and get out of the way"? Why? (Describe this situation using limits.)
 - d. Which garage is more affordable?
3. Snow plows in Boatsville are working overtime this winter. Each time a plow makes a pass on a street (i.e. plows one side of the street), it removes 45% of the total snow on the road.

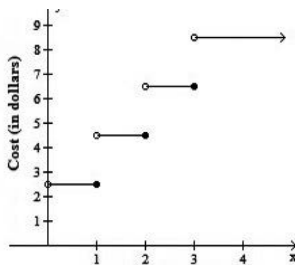
- a. Assuming no melting due to sun or salt, how many passes will it take to remove 90% of the snow?
- b. Boatsville's snow removal department has a contract with the borough that pays them based on the percentage of snow removed; specifically they get paid $400p/(100-p)$ dollars for removing $p\%$ of snow. How much do they get paid for removing 90% of the snow?
- c. At a borough meeting, a Boatsville resident stands up and says "I pay taxes to this town, so I demand 100% of the snow is removed from my street!" Is this a reasonable request? Explain why or why not.

Appendix C

REAL-WORLD LIMITS POSTTEST

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. An express mail service uses the following graph to determine how much to charge for overnight delivery of packages. You have to mail two packages; one weighing 1.03 pounds, the other weighing 2.98 pounds. How much will it cost to send both packages using the overnight service?



- A) \$9.00
- B) \$11.00
- C) \$13.00
- D) \$17.00
- E) None of the above

Find the limit, if it exists.

2. Let $f(x) = \frac{x^2 - 16}{x - 4}$. Find $\lim_{x \rightarrow 4} f(x)$.

- A) 8
- B) 2
- C) 0
- D) -8
- E) Does not exist

Solve the problem.

3. Suppose the cost of removing $p\%$ of the pollutants from a chemical dumping site is given by

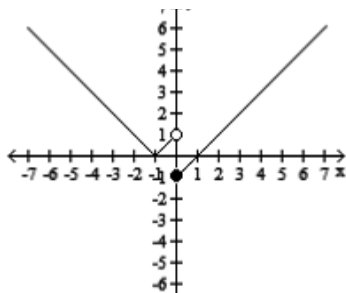
$$C(p) = \frac{\$20,000p}{100 - p}$$

Can a company afford to remove 100% of the pollutants? Explain.

- A) Yes, the cost of removing $p\%$ of the pollutants is \$200, which is certainly affordable.
- B) No, the cost of removing $p\%$ of the pollutants is \$200, a prohibitive amount of money.
- C) No, the cost of removing $p\%$ of the pollutants increases without bound as p approaches 100.
- D) Yes, the cost of removing $p\%$ of the pollutants is \$2,000, which is certainly affordable.
- E) Yes, the cost of removing $p\%$ of the pollutants is \$20,000, which is certainly affordable.

Use the graph to evaluate the indicated limit and function value or state that it does not exist.

4. Find $\lim_{x \rightarrow 0^-} f(x)$ and $\lim_{x \rightarrow 0^+} f(x)$.



- A) $\lim_{x \rightarrow 0^-} f(x)$ does not exist; $\lim_{x \rightarrow 0^+} f(x) = -1$
- B) $\lim_{x \rightarrow 0^-} f(x) = 1$; $\lim_{x \rightarrow 0^+} f(x) = -1$
- C) $\lim_{x \rightarrow 0^-} f(x) = -1$; $\lim_{x \rightarrow 0^+} f(x) = 1$
- D) $\lim_{x \rightarrow 0^-} f(x)$ does not exist; $\lim_{x \rightarrow 0^+} f(x)$ does not exist
- E) $\lim_{x \rightarrow 0^-} f(x) = 1$; $\lim_{x \rightarrow 0^+} f(x) = 1$

Provide an appropriate response.

5. If the limit at infinity exists, find the limit.

$$\lim_{x \rightarrow \infty} \frac{16x^5 + 5x + 11}{12x^6 + 16x^5 + 32x^3 + 2}$$

- A) 0
- B) 1
- C) $4/3$
- D) ∞
- E) None of the above

Solve the problem.

6. It has been determined that the value V of a certain product decreases, or depreciates, with time t in years, where

$$V(t) = 100 - \frac{20t^2}{(t+2)^2}.$$

Find $\lim_{t \rightarrow \infty} V(t)$.

- A) \$100
- B) \$20
- C) \$90
- D) \$80

E) Does not exist

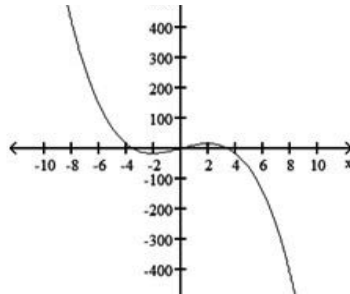
Appendix D

DERIVATIVE PRETEST

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the given graph of $f(x)$ to find the intervals on which $f'(x) > 0$ or $f'(x) < 0$ as stated below.

1.



- A) $f'(x)$ is always < 0
- B) $f'(x) > 0$ on $(-4, 4)$, $f'(x) < 0$ on $(-\infty, -4) \cup (4, \infty)$
- C) $f'(x) > 0$ on $(-\infty, -2) \cup (2, \infty)$, $f'(x) < 0$ on $(-2, 2)$
- D) $f'(x) > 0$ on $(-\infty, 2)$, $f'(x) < 0$ on $(2, \infty)$
- E) $f'(x) > 0$ on $(-2, 2)$, $f'(x) < 0$ on $(-\infty, -2) \cup (2, \infty)$

Solve the problem.

2. A company estimates that it will sell $N(x)$ pens after spending $\$x$ thousands on advertising as given by:

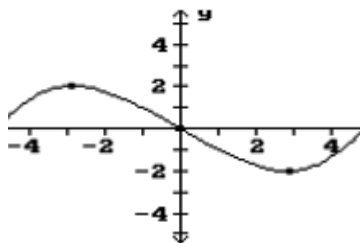
$$N(x) = -3x^3 + 450x^2 - 21,600x + 500,000 \quad \text{where } 40 < x < 70.$$

For which values of x is the rate of sales, $N'(x)$ increasing?

- A) $50 < x < 60$
- B) $x > 40$
- C) $40 < x < 50$
- D) $40 < x < 60$
- E) None of the above

Use the given graph of $f(x)$ to find the intervals on which $f''(x) < 0$ as indicated.

3.



- A) $(0, 3)$
- B) $(-3, \infty)$
- C) $(-3, 3)$
- D) $(0, \infty)$
- E) $(-\infty, 0)$

Solve the problem.

4. The percent of concentration of a certain drug in the bloodstream x hours after the drug is administered is given by $K(x) = \frac{2x}{x^2 + 36}$. How long after the drug has been administered is the concentration a maximum? Round answer to the nearest tenth, if necessary.
- A) 6 hours
 - B) 1.8 hours
 - C) 2 hours
 - D) 3.6 hours
 - E) 10 hours

Provide an appropriate response.

5. A drug that stimulates reproduction is introduced into a colony of bacteria. After t minutes, the number of bacteria is given approximately by:

$$N(t) = 1,000 + 36t^2 - t^3, 0 \leq t \leq 30$$

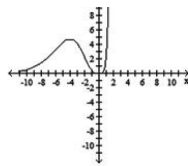
At what value of t is the rate of growth maximum?

- A) 24 minutes
- B) 12 minutes
- C) 6 minutes
- D) 30 minutes
- E) None of the above

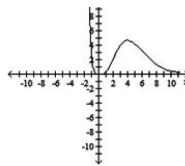
6. Use the given information about the first and second derivatives of the function $f(x)$ in order to determine which of the following graphs (if any) represents $f(x)$.

$$f'(x) > 0 \text{ on } (-\infty, -4) \text{ and } (0, \infty), f'(x) < 0 \text{ on } (-4, 0)$$

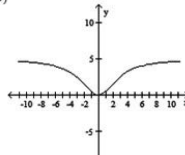
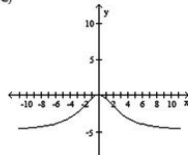
$$f''(x) > 0 \text{ on } (-\infty, -6) \text{ and } (-2, \infty), f''(x) < 0 \text{ on } (-6, -2), \text{ and } f''(x) = 0 \text{ at } x = -6 \text{ and } x = -2$$



C)



D)



- E) None of the above

Appendix E

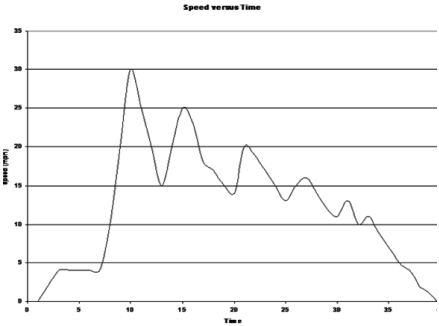
REAL-WORLD DERIVATIVES WORKSHEET

Real-World Rates of Change

This worksheet explores some possible applications of derivatives in real life. You are allowed to work in groups (3-5 people/group) to determine solutions to these problems; however, each individual must turn in a solution. If you do choose to work with others, you must write ALL the names of the members of your group on

the paper you turn in.

1. Below is a graph showing the speed of a roller coaster at all times during one ride.



- a. What does the roller coaster look like? (i.e., draw a graph that shows the height of the roller coaster versus time during one ride.)
- b. When (approximately) is the roller coaster traveling the fastest?
- c. When (approximately) is the speed of the roller coaster increasing at the greatest rate?
- d. On what intervals (list all) is the speed of the roller coaster decreasing?
2. Almost all states in the U.S. increased in population from 2000 to 2010 (see results of the 2000 and 2010 census, below). In accordance with the U.S. Constitution, after the results of the 2010 census were declared official, changes were made to each state's apportionment in the U.S. House of Representatives (also listed on the chart):

	Results of 2000 Census	Results of 2010 Census	Change in # of U.S. Reps.
Arizona	5,140,683	6,412,700	+1
California	33,930,798	37,341,989	0
New York	19,004,973	19,421,055	-2
Pennsylvania	12,300,670	12,734,905	-1
South Carolina	4,025,061	4,645,975	+1
South Dakota	756,874	819,761	0

Utah	2,236,714	2,770,65	+1
Washington	5,908,684	6,753,369	+1
Total - USA	281,424,177	309,183,463	N/A

- The population of California increased by more than the entire population of Utah, yet Utah gained a seat and California didn't. Explain why this makes sense.
- How can a state gain population but lose a seat? (e.g. New York or Pennsylvania) Explain.
- Using census results from 1950 – 2010, forecast the 2020 population of each of the states listed above. (A good place to find all this information is: <http://www.census.gov/>). Justify your reason for arriving at each number.
- Using the census results from 1950 – 2010 (again) determine the growth rate over each 10-year period (there are six; 1960 vs. 1950, 1970 vs. 1960, and so on...) for each of the eight states. In which state(s) is the rate of growth currently increasing?

3. In the United States the consumer price index (CPI) measures changes in price levels of goods and services frequently purchased by U.S. consumers. The rate of change of the CPI is often used to represent decreases (or increases) in the purchasing power of the U.S. dollar; this figure is more commonly known as the inflation rate (when the inflation rate is negative it's referred to as deflation). In an attempt to compare “apples to apples” the monthly inflation rate is often calculated as the change in the CPI over one year (for example, February 2011 is compared with February 2010). Use data found here: (http://inflationdata.com/inflation/Inflation_Rate/HistoricalInflation.aspx) to investigate and answer the following questions. (Only use monthly data, not the yearly “AVE”)

- Graph monthly inflation rate versus time from January 1976 to February 2011. (use Excell!)
- Using your graph, find the three consecutive 12 month periods during which the inflation rate decreased 11 out of 12 months (or 12 out of 12). When did each of these periods of continued deflation increasing inflation end? Can you find a contrasting 12 month period during which inflation

- increased 11 out of 12 months (or 12 out of 12)? If so, when?
- When did the greatest month-to-month inflation rate jump take place? What was the difference between the two consecutive months?
 - What is the greatest month-to-month inflation decrease? When did it occur?

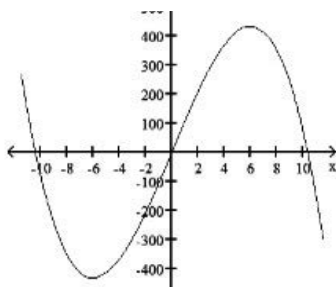
Appendix F

Real-World Derivatives Posttest

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use the given graph of $f(x)$ to find the intervals on which $f'(x) > 0$ or $f'(x) < 0$ as stated below.

1.



- $f'(x)$ is always > 0
- $f'(x) > 0$ on $(-430, 430)$, $f'(x) < 0$ on $(-\infty, -430) \cup (430, \infty)$
- $f'(x) > 0$ on $(-6, 6)$, $f'(x) < 0$ on $(-\infty, -6) \cup (6, \infty)$
- $f'(x) > 0$ on $(-\infty, 6)$, $f'(x) < 0$ on $(6, \infty)$
- $f'(x) > 0$ on $(-6, 6) \cup (6, \infty)$, $f'(x) < 0$ on $(-\infty, -6)$

Solve the problem.

- A drug that stimulates reproduction is introduced into a colony of bacteria. After x minutes, the number of bacteria is given approximately by the following equation.

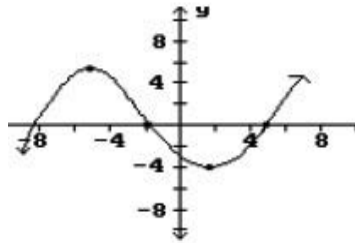
$$N(x) = 1,300 + 33x^2 - x^3 \quad \text{where } 0 \leq x \leq 30$$

When is the rate of growth, $N'(x)$ increasing?

- A) $11 < x < 22$
- B) $11 < x < 30$
- C) $0 < x < 11$
- D) $0 < x < 22$
- E) None of the above

Use the given graph of $f(x)$ to find the intervals on which $f''(x) < 0$ as indicated.

3.



- A) $(-5, 5)$
- B) $(-5, 2)$
- C) $(-\infty, 2)$
- D) $(-2, \infty)$
- E) $(-\infty, -2)$

Solve the problem.

4. The percent of concentration of a certain drug in the bloodstream x hours after the drug is administered is given by $K(x) = \frac{3x}{x^2 + 36}$. How long after the drug has been administered is the concentration a maximum? Round answer to the nearest tenth, if necessary.

- A) 1.8 hours
- B) 3 hours
- C) 3.6 hours
- D) 6 hours

E) 10 hours

Provide an appropriate response.

5. A company estimates that it will sell $N(x)$ pens after spending $\$x$ thousands on advertising as given by:

$$N(x) = -2x^3 + 318x^2 - 13,600x + 200,000 \quad \text{where } 10 \leq x \leq 90$$

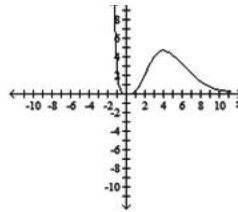
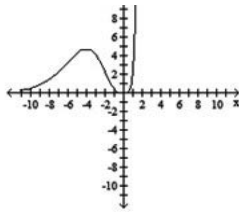
At what value of x do the rate of sales reach maximum?

- A) 29.7
- B) 53
- C) 76.3
- D) 90
- E) None of the above

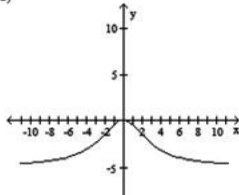
Use the given information about the first and second derivatives of the function $f(x)$ in order to determine which of the following graphs (if any) represents $f(x)$.

$$f'(x) > 0 \text{ on } (-\infty, 0), f'(x) < 0 \text{ on } (0, \infty)$$

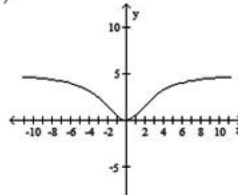
$$f''(x) > 0 \text{ on } (-\infty, -2) \text{ and } (2, \infty), f''(x) < 0 \text{ on } (-2, 2), \text{ \& } f''(x) = 0 \text{ at } x = -2 \text{ and } x = 2$$



C)



D)



Traditional/Block Scheduling, Gender, and Test Scores in College Biology Course

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Abstract

Block scheduling is the reallocation of a school day into longer class sessions to allow for more active teaching strategies and active engagement of students, in the effort to increase student performance. Various types of block scheduling exist. Traditional scheduling is when the school day is divided into six to eight sessions, with each session lasting from approximately 40 to 51 minutes. This paper seeks to find if test scores in a college biology course are significantly affected by high school scheduling type, gender, and the combined effects of both.

A Review of the Literature

Several studies have investigated the effect of gender on student test scores/achievement, and also the effects of instructional time on test scores/achievement. This study seeks to determine if there is an effect of both gender and scheduling style on test scores in an introductory college biology course. Instructional time is a key resource in education, and is assumed to be central in producing high levels of student achievement (Karweit, 1984). The productivity of instructional time depends not only on the amount of time students are in the classroom, but also on how this time is utilized. It can therefore be determined, in comparison, if the type of scheduling the students have had in high school affects their future academic performance in college.

Block scheduling involves extending class periods beyond the traditional 40 to 50 minutes per class session. Some studies suggest

that block scheduling can increase active teaching strategies, provide greater opportunity for student-directed instruction, and improve student performance. Although there has been a positive correlation between block scheduling and improved test scores in high school (Veal, 2000), other research suggests that traditional scheduling types have higher test scores (Bateson, 1990; Gore, 1996; Raphael, Wahlstrom, & McLean, 1986). The long term effects of block scheduling have not been studied extensively; most of the research attempts to correlate high school scheduling types with tests administered during a student's high school academic career, such as ACT, SAT, or graduation exit exams. Carryover of academic achievement into college, as determined by scheduling type in high school, should be addressed.

Project Factors Influencing College Science Success, FICSS, a research study designed and implemented by the Science Education Department of the Harvard-Smithsonian Center For Astrophysics, was a comprehensive study of the success of students in college, based on many elements of their high school experience, one subset being the difference of scheduling styles. Their data came from students entering college in the fall semesters of 2002 and 2003 (Maltese, et al, 2007). FICSS discovered that even when correcting for pedagogic methods there was no significant difference found between students from traditional scheduling high school and those using one of the two primary block scheduling models (4x4 and A/B) on success in introductory college science courses (Dexter, Tai, & Sadler, 2006).

Gender has also been implicated in student performance in various science classes. Research suggests that there is a difference between the sexes in how they learn; testing abilities between the sexes has also been found to be significantly different (Hanson, 1994), with female minorities scoring lowest on achievement testing in high school. Other studies suggest that although females may score somewhat higher on certain types of science achievement questions, males scored higher on other types of questions and these differences are found to be insignificant (Klein et al., 1997). There is some evidence that environmental factors and self-perception also play a major role in both who chooses to continue in the sciences and how they perform in introductory college courses (Hazari, Sadler, & Tai,

2008). However, there seems to be no significant research regarding how various scheduling styles affect college science scores between genders.

In 2009, a study was created to further explore whether or not high school scheduling types had shown progress in relation to teaching pedagogy to show a significant improvement with block scheduling versus traditional scheduling. This study was designed to determine if college success, as measured by grades achieved on the first two formal tests in an introductory biology class, is influenced by gender and high school scheduling type. If there are significant differences in scheduling type and college biology grades, then steps may need to be taken to ensure that entering college freshmen have had the most effective scheduling type in order to succeed in college. Gender differences in relation to scheduling types and classroom success, if found to be significant, may require further study to determine the possible cause(s) and potential solutions so that all may achieve success with equality.

The main research questions which guided my analysis were:

1. Does high school scheduling type (block versus traditional) affect test scores in an introductory college biology course?
2. Does gender affect test scores in an introductory college biology course?
3. Is there a combined effect of scheduling type and gender on test scores in an introductory college biology course?

Methods

Participants

An introductory biology course at a Midwestern university was utilized for this study. Seventy-four students were surveyed, both for their gender, and for the type of high school scheduling they experienced. Twenty-nine males and 45 females participated. Out of the 74 students, 45 reported the traditional type of scheduling in high school, 29 reporting block scheduling, and 1 reporting a different scheduling type.

Instruments and Procedure

These surveys were administered using an “iclicker”, a hand-held device with which students can answer multiple-choice type

questions during class meetings, and the results can then be immediately tabulated and downloaded by the instructor. The first question was with regards to gender, the second question gave four different types of scheduling choices: 4x4 (block), AB (block), traditional, and other. For this study, “other” was removed (selected by one student). In an effort to decrease confusion and allow students to effectively select their type of schedule, four choices were given. Each type of block schedule was verbally, and in writing, explained to the students, along with explanations of what was meant by traditional scheduling. The two block scheduling choices were then compiled into one group for comparison.

The comparison measure we decided to use was the student grades from Exam One and Exam Two which were averaged together. Each exam consisted of 50 questions and was administered electronically using “inQsit”. Exams consisted of multiple choice, matching, identifying, or true/false questions. The student scheduled their own time to take the exams in a proctored computer lab.

Data Analysis

The average of the exam grades were downloaded and matched with the student’s gender and scheduling style using Excel. Their identification was physically removed from the data and destroyed. A 2X2 Factorial ANOVA in SPSS was utilized to analyze the results. Cohen’s “large” effect size suggestion of having 18 people per group, with an $\alpha=.05$ was suggested; however, not all groups reached this level.

Results and Discussion

Descriptive Statistics

gender M1 F2	schedule; T1 B2	Mean	Std. Deviation	N
1	1	.7592	.11273	13
	2	.7500	.09230	16
	Total	.7541	.10016	29
2	1	.7000	.11846	32
	2	.7662	.12258	13
	Total	.7191	.12208	45
Total	1	.7171	.11870	45
	2	.7572	.10522	29
	Total	.7328	.11458	74

From the data table above, the average test scores, standard deviation, and number in each of the groups (gender by schedule type) are displayed. From this data, the block-scheduled women group had higher test scores than traditional scheduled women, and overall, block-scheduled students had higher means than traditional-scheduled students. However, these differences have not been shown to be significant, as can be seen from the following calculation;

Source	Type II Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.063*	3	.021	1.634	.189	.065
Intercept	35.755	1	35.755	2794.643	.000	.976
GENDER	.007	1	.007	.586	.447	.008
SCHEDULE	.013	1	.013	1.023	.315	.014
GENDER * SCHEDULE	.023	1	.023	1.794	.185	.025
Error	.896	70	.013			
Total	40.700	74				
Corrected Total	.958	73				

Since alpha is .05 and the hypothesis was that there was no effect on college grade outcome due to high school scheduling type for either gender the effect of gender, $F(1, 70) = .586$, $p = .447$ is not significant on test scores, the effect of scheduling type $F(1, 70) = 1.02$, $p = .315$ is not significant, and the combined effect of gender and scheduling on test scores $F(1, 70) = 1.79$, $p = .185$ is also found to be not significant. These findings suggest that, overall, there is no significant effect of gender, scheduling type, or a combined effect of gender and scheduling type, on the test scores in an introductory college biology course.

Conclusions

The first question this paper set out to explore was the effect of block scheduling on college biology test scores. Analysis revealed that no major differences existed between the two groups of students who responded to the survey: those with traditional versus blocked high school schedules had no significant difference in their test scores in the biology class.

The second question set out to explore the effect of gender on

test scores. Analysis revealed that although men scored higher than women, this difference was non-significant.

The third question sought to explore if there was a difference between male-blocked, male-traditional, female-blocked, and female-traditional type of students. The significance values for these groupings revealed no significant difference in gender with scheduling type and test scores.

There are multiple potential reasons for these results. First, there are different types of block schedules, and these types can affect student learning by how the teacher may utilize the time within the class period. For purposes of this study, AB block and 4x4 block types were lumped together as a single group. AB block is $\frac{1}{2}$ year in one class, with the other $\frac{1}{2}$ of the school year in another class; class times are extended, and by the end of the year, all subjects are “covered”. However, there may be retention problems with, for example, a student who has science in the A, or first $\frac{1}{2}$ of the year, and they may forget most of the material by the time they go to college, due to a longer lapse of time between the subject in high school and college.

Perhaps, even though a school may have block scheduling, there is no significant difference in the way the instructor is teaching the class; some teachers may have continued to teach their classes in the traditional way under a blocked schedule. Some suggest that scheduling type be matched to an instructor’s teaching style (Thomas, 2001), although that seems cumbersome.

This data serves to confirm elements of the FICSS data, in that I found no significant correlation between the type of scheduling a student was involved with in high school and their ability to do well in college introductory science classes. On top of their data, I have also shown that there does not seem to be any significant importance as to the type of scheduling that is preferable for a specific gender.

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A “Shared Repertoire” of Choices: Using Phenomenology to Study Writing Tutor Identity

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Abstract

Tutoring services often restrict their data collection and analysis practices to publicizing session counts and tutee GPAs. This study suggests that programs that offer writing consultation may enhance their sessions’ epistemic power by researching their tutoring staff’s instructional choices. After explaining why and describing how a phenomenological methodology was used to map one program’s tutors’ choices in sessions, this article closes by sharing the implications of this research for the program of interest and other sites.

In 2003, Nancy Grimm argued that when writing centers restrict their research activities to such practices as tracking and publicizing session counts and tutee GPAs, these programs tend to reinforce their status as “narrowly defined service units” (Pemberton & Murphy, p. 46). To “serve students better,” she added, centers might expand their research activities to include study of “the conceptions, attitudes, and belief systems of the individuals involved in literacy activity” in their own programs (Pemberton & Murphy, p. 46). In other words, Grimm was calling on writing centers’ staffs to document and make sense of what they knew and who they were—of the identities they (re)constructed—in their consultations.

Grimm’s argument made finding research methods for doing such self-studies a priority, and some writing center scholars have since attempted to answer her call. Recently, White-Farnham, Dye-house, and Finer have suggested writing centers’ staffs may empirically “map” their “context-shifting practice”—their tutorial interac-

tions—to better understand who they are and what they do (2012, p. 6). The authors add, however, that the understanding this mapping aims to yield is an elusive “ideal” (White-Farnham et al., p. 6). This elusiveness should not trouble center professionals; rather, it should encourage them to keep looking for methods for doing such program-based, interaction-level research well.

To that end, I began designing a phenomenological study for my center. I was guided by this question: what is the experience of making choices in sessions as a tutor in one writing center? By choices, I mean decisions such as setting an agenda through gaining a sense of a writer’s rhetorical situation, acting in accordance with a strongly held belief regardless of a writer’s intent, and so on. I had two guiding assumptions I continue to hold today. First, I agreed with Geller, Eodice, Condon, Carroll, and Boquet that a tutor constructs an identity as a member of a community organized around a “shared repertoire” of practices (2006, p. 82-83). Second, I believed these practices could be particularly epistemic or knowledge-producing when taken up in “the interaction of individuals within [particular] discourse communities” (Berlin, 1987, p. 16-17). My center was such a community. In this light, creating a shared repertoire of our choices seemed a reasonable way for us to better serve students.

In this article, I first turn to writing center scholarship to explain that researchers today agree that tutorial interactions are knowledge- and identity-producing events but not on ideally how. Second, I explain how my study, using a phenomenological design, addresses this disagreement; in doing so, I describe a replicable method of data collection and analysis other writing centers could use to create maps of their own choices. Third, I present my results, a map of my own center’s choices, including a close examination of three of its staff’s choices. Fourth, I share the implications of this research for my own center and other sites.

How Writing Tutor Identity is Constructed in Choices That Can Be More or Less Epistemic: A Review of Research

Tutorial exchanges have always created tutor identities, but today these identities have the potential to be more epistemic than ever. In the 1980s, a single tutor identity was identified in popular

handbooks: the process era, non-directive consultant. Specifically, this tutor’s aim was to be a writer-centered, “nonjudgmental, non-evaluative helper” who refused to write on tutees’ work and asked open-ended questions (Harris, 1992, p. 376-377; Meyer and Smith, 1987). Since the late 1980s, this orthodox image has been challenged as a desirable standard. At that time, sociocultural approaches to teaching and tutoring writing began to emerge. From a sociocultural perspective, each act of writing or its instruction is a situated, social “event” (Phelps, 1988, p. 13). That is to say, when individuals write or instruct others in the craft of writing, they are manipulating social signs in a context. Sociocultural writers or tutors are not aimless. Rather, their literate acts are works of “practical reason,” of “dialogic, context-bound negotiation based on values as they are applied to concrete situations” (Phelps, 1988, p. 23-24). As Carino puts it, sociocultural tutors are pragmatists who “learn to shift between directive and nondirective methods” to make sessions as epistemic as possible (Pemberton & Murphy, 2003, p. 110). Because they are encouraged to act based on situated assessments rather than orthodox principles, sociocultural tutors’ knowledge-making potential is great.

But what choices should the sociocultural tutor make to be as epistemic as possible? Researchers today are divided on this matter. On the one hand, scholars such as Geller et al. (2006), Denny (2010), and Welch (1999; 2002) argue that the most epistemic tutoring privileges what Pemberton calls “critique” (2006, p. 265). In this approach, writers and tutors place primary emphasis on trying to transform ideas, views of what genres and modalities count as college-level writing, and more. For example, in the first of two related articles, Welch argues a tutor’s identity should be constructed through her/his “inability to conform” to social laws s/he engages with as “transitional objects” (1999, p. 55). In the second study, she describes how “all the [consulting] stories being told” in an undergraduate practicum class became transitional objects. In the class, students used loop-writing responses and discussions of these stories to imaginatively “converse” with rather than “correct” these past events (2002, p. 213). As a result, the students engaged in practical reasoning, inventing multiple possible responses and identities (2002, p. 213).

On the other hand, scholars such as Pemberton and Murphy argue tutoring for “conformity” or assimilation is a more valuable goal (Pemberton, 2006, p. 261). To tutor for conformity means to approach consultations as goal-oriented enterprises wherein writers may acquire important social capital (Pemberton, p. 261). In this vein, Murphy agrees tutors may help writers “interrogate the everyday routines and habitual ways of operating in academic environments” (2006, p. 277). Still, she advises consultants to encourage writers’ “identification” with the “social capital” of the academy and community—a body of publicly-valued knowledge that writing center workers are authorities on (Murphy, p. 277). It is not clear, then, just how sociocultural tutors should seek to be flexible.

For my purposes, this division among researchers reveals two things. First, tutor identities are likely to be particularly varied and reflective of their particular centers’ tutoring cultures. Second, this division reveals that flexible tutoring has many supporters today who are nevertheless divided on how it should be practiced to serve students best. In this light, methods for empirically mapping tutors’ choices appear to have considerable value and currency. Therefore, I ask this question: What is the experience of making choices in sessions as a tutor in one writing center?

A Suitable Methodology: Why Use Phenomenology in This Study?

Because I wanted to reveal my center’s shared repertoire of choices, I needed a research methodology and data collection and analysis methods that valued these events as epistemic, knowledge- and self-making acts. A phenomenological approach met this demand.

First, this methodology was suitable because the purpose of a phenomenological study is to understand the meaning of lived experience. As Van Manen writes, “[t]he aim of phenomenology is to transform lived experience into a textual expression of its essence—in such a way that the effect of the text is at once a reflexive re-living and a reflective appropriation of something meaningful” (1997, p. 36). This methodology appeared likely to work here because I wanted to develop a reflective tool for making sessions more epistemic.

With its mission of providing “face-to-face and online collaborative consultations...[to] help students develop productive writing habits and revision strategies,” this service at a Midwestern public research university saw writing and its instruction as sociocultural acts where writers “generate[d] ideas” while learning tutor-selected “identifiable writing skills” (Hillocks, 1986, p. 123). Tutors were encouraged to be flexible guides here.

This sociocultural emphasis could also be seen in the center’s training activities and self-authored tutor biographies. Novices and veterans read literature that framed writing and tutoring as social activities for their practica and staff meetings (Bruffee, 1984; Welch, 1995). Reinforcing the view of writing and tutoring as social events were staff meetings addressing the needs of specific populations and one on universal design. Finally, tutors’ biographies emphasized their own experiences of writing as a difficult, knowledge-making struggle to contribute to the “conversation of mankind” (Bruffee, 1984, p. 647). For example, one tutor writes that he “understands how enormous the roadblocks to a finished paper can seem, having learned the hard way to write on in the face of persistent, daily urges to throw his computer in the garbage and skip town forever.” For these tutors, though, the struggle to compose also meant having a chance to add to subject matters they valued. As another tutor says in his biography, “his reading and writing involves some combination of politics, armchair economics, indie rock, Parliament Funkadelic, and baseball,” yet “he welcomes the opportunity to get his hands dirty in just about any subject.”

The sociocultural approach to tutoring valued in this service made it a likely place to see both tutoring for assimilation and critique. Furthermore, it positioned its staff to use a shared repertoire of choices as it was intended: as a tool for reflexively reliving decisions made in past sessions in order to improve future ones.

Second, to study the practical reasoning of tutors in choices, I needed to know tutors’ perceptions of what they chose to do in particular sessions. In a phenomenological study, participants share their stories of the phenomenon of interest either in “long interviews” with researchers (Moustakas, 1994) or in writing “Lived Experience Descriptions” or LEDs (Van Manen, 1997). LEDs are written, narra-

tive accounts where a person aims to describe, not interpret, an experience he has had. LEDs seemed well-suited to my study, given that these tutors were skilled writers who needed to record their sessions within a busy center. After I modeled what an LED for this study should look like (see Figure 1), twelve tutors chose to participate in my study. These tutors included undergraduate tutors in their second term of service, graduate students who had more than five years of consulting experience, and one non-native speaker specialist.

Finally, I needed a methodology that could help me uncover the meaning of the tutors' experience of making choices. To do this, I used the approach to phenomenological data analysis I describe now. First, I read each account in order to select "phrases or sentences that directly pertain to the experience" of making a choice (Polkinghorne, 1989, p. 53). To illustrate, here is an excerpt from one undergraduate male tutor's LED. He is describing a session with an undergraduate female who was "having problems with her thesis" in a literary analysis essay relating "themes of food and drink in *Jane Eyre*...to other themes in the novel." At one point, the tutor, Jeremy (a pseudonym, as with all names in this article),

asked how it [the food paragraph] related to her overall argument and she started talking about how rich people had a lot of food and poor people didn't in the novel. I told her that this was a good start on an arguable thesis about class. She then started talking about themes and pointed out a paragraph that was about food and punishment as a theme. The themes also appeared in her thesis. We looked back at the assignment, and it became clear to me that stating how the theme of food related to the other themes in the text was a huge part of the assignment. I told her that was what I thought, so that it was definitely good that she was sticking to themes.

In working as an alternatively directive and non-directive flexible guide here, Jeremy seemed to be making a number of choices in this moment in his LED. Second, to identify these choices, I drew forward slashes (/) between the choices, drawing a line through other material, so that the previous excerpt looked like this:

I asked how it [the food paragraph] related to her overall argument / ~~and she started talking about how rich people had a~~

~~lot of food and poor people didn't in the novel. I told her that this was a good start on an arguable thesis about class. / She then started talking about themes and pointed out a paragraph that was about food and punishment as a theme. The themes also appeared in her thesis. We looked back at the assignment, / and it became clear to me that stating how the theme of food related to the other themes in the text was a huge part of the assignment.~~ I told her that was what I thought, so that it was definitely good that she was sticking to themes.

As the reader can see, only Jeremy's, and the student and Jeremy's joint, choices remain. Third, I created a list of choices for each tutor. Fourth, I engaged in member checking by giving each participant his or her account along with a list of choices I had identified in that account. This step allowed me to amend the choices on the lists for each individual so it reflected the participant's experience. Fifth, I combined individual tutors' choice lists into a single one. Finally, I clustered related choices under more general types, the synthesis represented in Figure 1.

Figure 1. Choices Made by Tutors in LEDs

Choices based on a tutor's...

1. Sense of the plan (such as moving on to one section of a conference settled upon at the start to another, indicated by statements such as “then we moved onto” and “there were a few more questions about”)
2. Identification with the writer (choosing to “get picky” when working with a writer perceived to be particularly skilled)
3. Support for the writer as a writer (using false confusion to inspire a writer to explain her purpose)
4. Reflexivity (asking herself, “why did I spend so much time on that point?” as a judgment on her own performance in a session)
5. Limits (experiencing confusion and both feeling the need to turn and turning to the writer for clarification or explanation)
6. Desires (directing a session so it might end with the tutor

- “feeling good”)
7. Strategy use (ambivalently connecting praise with criticism in the interest of taking a writer further)
 8. Theories of how one writes in general (recommending that a student work on her/his own with teacher comments and then come back for another appointment)
 9. Theories of what a session is supposed to look like (focusing on affective matters in the interest of resolving a problem fully or enough in order to “get something done” on the writing project of concern)
 10. Identity-as-tutor (silently reflecting on the tutor’s own sense of the quality of a student’s teacher’s work (“that’s a good assignment,” “that’s bad feedback,” etc.))
 11. Reflection on conference quality (silently critiquing her/his usual methods)

Synthesis: Tutor Identity Construction in a Shared Repertoire of Choices

Sharing a common training and ownership in the center’s work, this center’s tutors revealed their shared repertoire in their LEDs. In their choices, these consultants revealed they were tactful practitioners who shared a common, pragmatic, “get something done” identity. In pedagogical terms, they were nondirective process and flexible sociocultural tutors. When they were flexible, they focused more on assimilation than critique. In other words, this staff had a shared repertoire here wherein multiple tutor identities were under construction. Looking at a few choices closely reveals this repertoire.

Theme #1: Tutor’s Effort to Take Part in Agenda Setting Through Gaining a Sense of the Rhetorical and Social Situation in Which the Writer is Working

One typical choice made in this center involved a tutor initiating agenda setting. When tutors asked “what’s the assignment?” or “what are you working on?” to begin, then, they were understanding this choice differently. Here is one example:

When Leroy sat down, I told him my name was Makela. He said he remembered from when we met before, which con-

firmed my thought that we had met before. I was pleased that I had recognized his name. *I asked how his day was going so far.* He said he'd been feeling rushed trying to get here because he did not want to be late. He took out his paper and assignment while saying this. *We read through his assignment.... I asked him to tell me about which film he chose.*

Hearing Leroy's concern about being late helps Makela focus on the task at hand. Her first choice is to review his assignment. This is in part a response to Leroy and to her knowledge of the center's policy that all writers bring assignment sheets along with them to their tutorials. Only after reviewing this document does she ask him about the film he chose, getting close to his purpose in this essay. In another tutor's initiation of agenda setting, the beginning exchange starts out similarly, but the tutor—instead of directly turning to the assignment sheet—asks the writer about her response to the task:

I greeted her, and she also asked me how I was doing. This led to some friendly chatting, which established rapport and led easily into my question about *what she was working on*. She explained that she had a medical history paper that needed more formal language.

Asking a writer “what she was working on” is simply not the same invitation to agenda setting that reading the assignment sheet together is. These different agenda setting choices suggested that this center's tutors' identities were under construction in diverse yet related ways.

Theme #2: Acting in Accordance With a Strongly Held Tutor Belief Regardless of Writer's Intent

How a consultant's choices helped constitute his or her identity as a particular type of tutor in this largely sociocultural service could be hard to parse out. This was not the case, however, when a conference led a tutor to draw on some of his or her strongest beliefs, values or attachments. If a writer's subject matter or a tutor's previous experience with similar requests touched on these commitments, the writer's intent could recede from the tutor's attention. In these cases, particular tutor identities might appear and not necessarily those associated with particular pedagogical models. One undergraduate

consultant takes on the role of disciplinary insider in the following example:

My student comes back, and I say “You’re Anne?” Whoops. Her name is Anna....She’s a freshman working on an English Comp paper about comparing biases in news articles. *Great—I’m a journalism major. I think that this will be easy, and I relax.*

After first focusing on establishing rapport, the consultant is put at ease upon discovering that this is a journalism essay. Is the tutor likely to share a world with the writer or professionals in her discipline in this moment? That is impossible to say, but there is a tension for this consultant in terms of what social ties she should value most. In this choice is this tutor’s identity—the belief that when a paper deals with her major’s subject matter, response is easier to give and a more directive conference may be justified.

In this choice, the tutor also reinforces the center’s dominant, pragmatic tutor identity. In another tutor’s use of the same choice, the effect is to frustrate that “get something done” stance. Minding the center’s policy that tutors may consult on a take home exam only when the center has the professor’s consent, one tutor fails to hear a writer’s goals for their session. Instead, the tutor tries to ferret out a potential violation of the policy. As the tutor writes,

As she [the writer] extracts her papers from her backpack, she mentions that this was “kind of a midterm exam” for her art history class. *I am distracted by this comment and try to remember the policy for discussing take home exams with students. I contemplate interrupting her and asking Jessie [the director], who is working as the front desk attendant. I realize that I have only half heard her.* She is now talking about her concerns about the paper; the moment to ask has passed. I let her talk for a few more seconds. An opportunity presents itself and I ask her, “Did you say this was a take home exam?” She said, “Yes.” ...I hope I have...ask[ed] the right question. ...”Yes, [the student says,] she told me that it was okay to come for...grammar errors and flow.” ...I feel myself relaxing.

Instead of having to end the session or—as she had done in other similar cases—needing to focus only on grammar, the tutor discovers higher order concerns are not off the table. Thus, the tutor sees that

particularly rich forms of knowledge-making are possible here.

In these instances, tutors’ disciplinary and policy attachments cause them to tune out the writers they are working with momentarily. In the case of the first example, though, tutor-specific attachments and the center-wide pragmatic tutor identity are strengthened. By contrast, the tutor’s policy mindedness ends in a frustration of expectations—and of the center-wide “get something done” stance. These choices do not reflect pure pedagogical models or exclusively assimilative or critical flexibility. Rather, they are center-specific, individually tailored identities under construction.

Theme #3: Tutor Experiencing the Moment of Needing to Speak, and Telling the Writer What She Sees as a Necessary Revision or Place in the Paper to Target

In some cases, my colleagues made decisions that appeared to be particularly epistemic. One such choice is a tutor reaching a moment where s/he needs to tell the writer about a necessary revision or place to target in draft.

I saw this choice used when tutors found nondirective pedagogy was productively frustrating an effort to get something done. As one tutor writes,

I was about to make a suggestion about her use of detail in her example when she was talking about herself, when she told me she didn’t feel like her two example paragraphs fit and asked me if she should get rid of them. My first reaction was “Is she kidding?” And then I thought, “She really is unaware about what is good in this paper, which means she probably doesn’t know what it is about and is looking for direction.” So I told her to keep the two example paragraphs and drop everything else. And she seemed more engaged at that point and appeared open to that idea. I thought, “Eureka! I know what we need to do for the remaining 15 min.”

At this point, the tutor’s choice to communicate a necessary revision shows the belief that improvisation is, in this situation, more important than the plan. He prefers being text-centered to being writer-centered in this situation. Furthermore, this is flexible tutoring for critique.

Another tutor's experience of the moment of needing to speak reflects more resistance to adopting a sociocultural identity. Like her male colleague in the previous example, a tutor forgoes nondirective, process era writer-centeredness for flexible text-centeredness in order to get something done. Unlike him, she regrets this choice:

I...wanted to try and find some aspect that she could write about in more detail. ...[I was] preoccupied with trying to find SOME organizing idea. Eventually I suggested that maybe a theme to this paper might be that your "family" makes you a better person.... Then she started asking me lots of really specific questions about what she should write and how exactly she should write it and I started to feel a little uncomfortable—I'd already created her organizing idea.

Had the writer in the first example displayed the same dependent behavior, perhaps the tutor would have expressed similar regret. Still, what the tutor experiences in the second example is regret at having used a flexible approach, implying that she either does or should ascribe to a more nondirective professional identity than the tutor in the first example. Like the more predictable choices, identifying the choice of needing to speak to communicate a necessary revision reveals some of this center's shared repertoire.

Choosing Our Most Epistemic Futures: The Value of This Research

Did this choice map reflect our shared repertoire? The map implied our center's tutors tended to construct sociocultural identities where being goal-oriented was valued more than exploratory critique. The map also implied that when critical flexibility was present, it tended to play an epistemic role. Specifically, tutors appeared to use critical flexibility to extend writers' higher order thinking. Epistemic yet rare, tutoring for critique warranted greater emphasis in this center's tutor training efforts.

These findings suggest what the experience of making choices as a tutor in one writing center was. What, though, is the value of this study for practitioners elsewhere? I want to make three points. First, by demonstrating what a shared repertoire of a center's tutors' choices is and can do for a center's staff, this research calls attention

to what Ackerman calls the conflict between “what tutors believe they already know about their tutoring and new evidence reveals” (2007, p. 38). Creating a shared repertoire of choices can allow tutors to critique past and envision alternative future choices and identities as members of a community. Second, this study uses empirical evidence to affirm the sociocultural view that writing tutors are flexible guides who use semiotic tools to construct professional identities. Among these tools are critically flexible choices that may be rare but should be encouraged because of their epistemic power. In representing such choices here, I show how study of a center’s shared repertoire may reveal a program’s shared life in order to improve it. Finally, making this shared repertoire visible was the fruit of a phenomenological approach. This is a valuable methodology for writing center constituents because it bases its findings on tutors’ self-reported, everyday stories of writing center work, and it is inexpensive to perform. Most importantly, phenomenology offers an epistemology that values individual writers’ and tutors’ exploration as the essential foundation of literate events—a fact that should be embraced in every writing consultation.

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The Graduate Writing Institute: Overcoming Risk, Embracing Strategies, and Appreciating Skills

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Abstract

The purpose of this paper is to highlight the results from the Graduate Writing Institute, a week-long graduate writing workshop at a research-intensive HSI university in the southwest. Sixty-three graduate students who worked on large writing projects, such as theses or dissertations, volunteered to attend one of four separate Writing Institutes. These students took a pre- and post- Writing Inventory of Skills and Preferences (WISP) with significant increases in the WISP scores from pre-test to post-test, which indicated that the non-contextualized, cross-disciplinary content and structure of the Writing Institute successfully increased students' knowledge of academic writing skills, including higher order concerns and lower order concerns. Additionally, evaluation survey results confirmed that attending the Graduate Writing Institute helped students overcome feelings of "academic risk." Providing graduate students working on their thesis/dissertation with this type of specialized learning assistance (non-course based, interdisciplinary, non-contextualized holistic approach to addressing lower order concerns, higher order concerns, and academic risk) in a week long intensive institute with instructional time, peer interaction, individual writing time, and one-on-one writing consultations should be replicated for the benefit of graduate students at other institutions.

Key words: Graduate students, academic writing, academic risk, non-contextualized, writing assistance

In academia, an outdated assumption exists that graduate students possess sufficient academic writing skills that they acquired prior to entry into graduate school (Gaillet, 1996; Turner & Edwards, 2006) and, therefore, do not need writing assistance (Sullivan, 1991). Traditionally, this assumption goes hand-in-hand with a lack of graduate writing assistance. This absence of graduate-level support has at least three possible causes: a) faculty members' apprehension of anything remedial (Rose & McClafferty, 2001); b) the general acceptance that graduate writing is a "solitary activity" (Mullen, 2006, p. 30); and c) that "acts of writing are both marginalized and privatized in the graduate classroom" (Sullivan, 1991). However, Rose and McClafferty (2001) make the argument that each institution must have its own discussion and decision about whether these types of supports are needed. At the research intensive Hispanic-serving institution where this study was conducted, the graduate faculty overwhelmingly responded (95%) to an initial survey stating that graduate students do need writing assistance, and the Writing Institute was crafted to respond to that need.

Rose and McClafferty (2001) go on to explain that graduate students face various writing problems. Such problems include being new to their academic field at the professional level and therefore unfamiliar with the field's conventions, discussing both qualitative and quantitative data, being unsure of mechanics and punctuation conventions, or struggling with ESL issues (Rose & McClafferty, 2001; see also, Snively, Freeman, & Prentice, 2006). Additionally, many graduate student writers experience anxiety because writing has always been difficult for them (Rose & McClafferty, 2001). However, within this broad range of issues, some concerns can be addressed in a non-contextualized venue outside of their individual departments, while others cannot (Snively, Freeman, & Prentice, 2006). Therefore, scholars and practitioners continue to question what kind of writing assistance graduate students need and how these writers can best receive that assistance.

Background

This project was originally externally funded as a two-year student services grant designed to assist graduate students through a variety of new services, including individual writing consultations, peer mentoring, and biannual Writing Institutes. The researchers, a writing faculty member and a learning assistance administrator, chose intensive four-day Writing Institutes (a combination of writing workshop and seminar) because other institutions had successfully used similar models, with dissertation boot camps being a popular example (Liechty, Liao, & Schull, 2009). Subsequently, the Council of Graduate Schools (2008) released a report recommending dissertation retreats or boot camps as a promising practice to promote doctoral student success. What distinguished our Writing Institute from these boot camps was a unique combination of instructional time each morning, working lunches in cross-disciplinary groups, intensive writing time each afternoon, peer editing at the end of the week, and individual writing consultations with a researcher/instructor or graduate writing consultant. This format drew from best practices in the vast amount of literature, offering students a variety of strategies and readers.

With limited time for actual instruction during the Writing Institutes (three hours a day for four days), pragmatism dictated each day's chosen content. Material needed to be not only useful, but also to fulfill the attendees' specific needs. Because the Writing Institutes were aimed specifically at those graduate students who had already begun working on large writing projects (such as a thesis, dissertation, or paper for publication), most of the applicants did not identify issues with formulating ideas or topics for assignments. Their focus, stated through their applications, was primarily on improving the writing they had already done, improving their writing skills in general, or improving their motivation and accountability to complete their project.

Two sources helped the researchers refine the content for the Institutes. First, an initial survey of graduate faculty asked, "Are there specific issues with graduate student writing that you feel need to be addressed (i.e., conciseness, organization, the writing process, etc.)?" Although this might have been a leading question, the researchers'

experience with graduate faculty was that they were not writing pedagogy experts; therefore, with no guidance, their answers would be too generic. Second, the graduate student applicants identified their biggest challenge regarding writing on their Writing Institute applications. Responses from both the faculty survey and the applications fell into the following categories: organization, clarity, formality, syntax, grammar, citation, and motivation. Therefore, three distinct classes of needs emerged that the researchers hoped to address at the Institutes: higher order concerns, lower order concerns, and writing anxiety (or what we refer to as “academic risk”). Faigley and Witte (1981) defined higher order concerns as those revisions that affect the meaning of the completed work and lower order concerns as those revisions or edits that do not necessarily affect meaning. But the distinctions are not so clear: as Rose and McClafferty (2001) discovered through their graduate writing course, the lines between these topics very often blur; for instance, an instructional moment about semicolons led us to a discussion on voice and formality.

Literature Review

In order to better understand the needs that graduate students have in regards to their writing, we must understand (a) how actual problems in writing are identified as either higher order concerns or lower order concerns; (b) how motivation affects writing, as seen through academic risk; and (c) how graduate students are currently receiving writing assistance, in either contextualized or non-contextualized settings.

Higher Order Concerns

Bean (1996) developed a more concrete definition of higher order concerns and lower order concerns, listing specific categories of revisions and edits that are included in each. Bean (1996) defined HOCs as “concerns of ideas, organizations, development, and overall clarity” (p. 243). HOCs can also include problems with the purpose of a work and/or following the assignment; quality/clarity/originality of the thesis; the quality/logic of the argument; development and organization of ideas; transitions between ideas and paragraphs; the use of sufficient evidence and detail; paragraph organization; and

unity and coherence within the paragraphs themselves (Bean, 1996). Writers address these issues during various stages of revision.

These HOCs are not unique to graduate writers. Many writers, regardless of academic level, have problems with organization and transitions, for example. However, because graduate students write papers that typically address concepts, ideas, and arguments quite a bit larger in scope and scale than undergraduate writers, HOCs can become all the more daunting (Sullivan, 1991). While undergraduate papers tend to be conceptually singular, graduate papers tend to cover multiple key concepts and terms (Thomas, 2012). Therefore, many graduate students concern themselves with logical order issues, such as which key terms or concepts should be introduced first and how to determine which predicates the other (Pemberton, 2002).

Lower Order Concerns

Bean (1996) identified LOCs as “grammatical errors, misspellings, punctuation mistakes, and awkwardness in style” (p. 246). LOCs also include excessive passive construction, chopiness, wordiness, redundancies, misuse/vague use of pronouns, misplaced modifiers, fragmented or run-on sentences, and issues of parallelism. Writers should address these LOCs during the editing stage (Rose, 1984).

Graduate students’ LOCs tend to vary tremendously. Many graduate writers may simply need a quick review of comma rules and conventions, while others struggle a great deal with concepts like pronoun usage, subject-verb agreement, the use of articles, and punctuation conventions when joining clauses (Rose & McClafferty, 2001). These lower order concerns do not necessarily differ from the lower order concerns that undergraduate writers face; however, graduate writers may be less likely than undergraduate writers to seek assistance in these areas of writing because of a perceived stigma (Gaillet, 1996). In addition, graduate students may be unfamiliar with grammar rules or punctuation conventions simply because of the length of time since they have received writing instruction (Snively, Freeman, & Prentice, 2006). Finally, they may feel they have received too little or even conflicting instruction on things like where to put a comma or how to use a semicolon and, therefore, have given up on learning the conventions at this stage in their academic career (Rose

& McClafferty, 2001).

Academic Risk

Pamela Richards addressed risk in her chapter in Howard Becker's groundbreaking book on academic writing for graduate students (Richards, 1986). Scholars and practitioners know that graduate students express negative feelings in regards to writing. For example, they may feel that writing is scary, frustrating, and isolating, and they may feel vulnerable as a writer (see Aronson & Swanson, 1991; Gaillet, 1996; Hadjioannou, Shelton, Fu, & Dhanarattigannon, 2007; Mullen, 2006; Turner & Edwards, 2006; Zuber-Skerritt & Knight, 1986). Additionally, researchers discuss how the stakes can be higher for graduate students than undergraduate students because they perceive their writing as being tied to their academic identity (see Bloom, 1981; Nielsen & Rocco, 2002; Rose & McClafferty, 2001). Some graduate students question their ability as writers and as academics (Nielsen & Rocco, 2002). Researchers term these negative feelings writing anxiety (see Bloom, 1981; Hadjioannou et al., 2007; Nielsen & Rocco, 2002), but the term "academic risk" seems more descriptive because it encompasses a broad range of negative feelings and cognitions toward writing and effectively links graduate-level writing to academic success and academic identity.

The feeling that writing is risky places obstacles in the writer's way, such as "stuckness," procrastination, perfectionism, and isolationism (see Aronson & Swanson, 1991; Kiley, 2009; Mullen, 2006; Nielsen & Rocco, 2002; Zuber-Skerritt & Knight, 1986). These obstacles can lead to a lack of productivity and motivation, which is why graduate writers can make use of assistance in overcoming these obstacles. For instance, perfectionism can be addressed through peer discussions that debunk the common myth that there is "one right way" to write a paper (Becker, 1986, p. 43). Procrastination is commonly addressed through accountability and encouraging daily writing (Boice, 1990). Isolation can be addressed through both inter- and intra- disciplinary peer interaction and discussion about the challenges in writing at the graduate level (Sullivan, 1991).

In order to overcome writing apprehension, or stuckness, many experts recommend strategies such as fast writing, freewriting, and

writing in alternative forms such as haiku (McKinney, 2003). Rose (1984) believes that the roots of writing blocks come from cognitive messages that writers tell themselves, such as employing rigid writing rules, editing too early in the composition process, lacking appropriate planning, having a negative attitude towards writing, or evaluating writing with incorrect lenses. Hidi and Boscolo (2006) link this cognitive model of writing to notions of self-regulation and motivation. Thus, these skill-based approaches rely on the psychology behind writing to reduce academic risk and build the graduate writer's self-efficacy and confidence (Hidi & Boscolo, 2006).

Contextualized versus Non-Contextualized Writing Assistance

Previous research on graduate writing assistance has primarily focused on addressing graduate writing issues contextually within the discipline (Rose & McClafferty, 2001). Graduate students typically gain most of their graduate-level writing experience through immersion into the field in what could be considered a type of mentor/mentee relationship between the student and his or her graduate faculty advisor (Liechty, Liao, & Schull, 2009). In this way, a student receives one-on-one attention from an advisor about one particular project at a time. Riebschleger (2001) described the entire process of developing and writing a dissertation as "an apprenticeship" (p. 582). This contextualized focus on one particular project certainly has its advantages, but also has limitations in its narrow focus. Despite individualized attention, this discipline-specific, contextualized writing assistance may not always provide a student with a set of generalized skills applicable to future projects when the advisor may not possess pedagogical writing knowledge (Blakeslee, 1997; Gaillet, 1996). Moreover, Snively, Freeman, and Prentice (2006) point out that some advisors might not even have a desire to be writing instructors. Additionally, the mentor/mentee relationship may hinder the student's freedom to explore his or her own academic voice and authority (Turner & Edwards, 2006; Blakeslee, 1997). Turner and Edwards (2006) go on to explain that issues of power must be discussed and dealt with in these writing mentorship relationships in order for individual voice and authority to be validated.

To remedy the various drawbacks of contextualized assistance

is an emerging trend of non-contextualized assistance at the institutional level that provides graduate students writing support (see Liechty et al., 2009; DiPerro, 2007). Liechty et al. (2009) categorized the factors and support affecting dissertation completion as individual characteristics, relational factors, or structural factors. Individual characteristics include a) psychological factors, such as fear, anxiety, procrastination, and locus of control and b) skills preparation, such as “the knowledge of how to plan, implement, and write up a large-scale independent project” (Liechty et al., 2009, p. 486), both of which can be influenced by institutional supports. Additionally, they demonstrated that assistance in relational arenas included support from peers and faculty, while structural factors viewed the institution as a partner in the student’s success (Liechty et al., 2009). Support at all levels has included, among others, mentorship, writing studios, dissertation camps/retreats, workshops, writing groups, courses, peer groups, and peer groups with a professor presence (see Aronson & Swanson, 1991; Gailett, 1996; Hadjioannou, Shelton, & Dhanarattigannon, 2007; Kiley, 2009; Mullen, 2006; Rose & McClafferty, 2001; Turner & Edwards, 2006; Zuber-Skerritt & Knight, 1986).

This body of literature, pertaining to graduate student writing needs and best practices in providing graduate student learning assistance, points to a holistic approach of the graduate student writer outside of his or her discipline. This holistic approach must model “authentic discourse” (Mullen, 2006, p. 33) that reveals the seemingly mysterious steps to writing academic texts (Sullivan, 1991) while providing a community of support for overcoming writing risk, embracing writing strategies, and appreciating the skills necessary for academic writing success.

Research Aim

In this study, the Writing Institute content and delivery method aimed to first, and foremost, address students’ needs. Only after analyzing the results of our two assessment tools, the Writing Inventory of Skills and Preferences (Symons, 2007) and an evaluation survey, did it become clear that the content and format of the Writing Institute addressed graduate students’ needs. Therefore, the project’s research goal was to assess through pre-test/post-test and

survey evaluation how well the Writing Institute addressed graduate students' HOCs, LOCs, and academic risk in a non-contextualized setting. It was only then that our research aim became clear: to share the content, format, and measures that work in addressing graduate student writing needs.

Methods and Procedures

The Writing Institute was taught by two of the researchers four times during the grant period, twice over spring break (2008 and 2009) and twice during the maymester (2008 and 2009). These instructors facilitated writing workshops Monday through Thursday from 9:00 a.m. to 12:00 p.m., which included instruction on overcoming writing blocks, initiating drafting methods, employing appropriate punctuation, creating appropriate organization, following logical order, citing sources, utilizing concrete language, and participating in peer editing. Additionally, the instructors or a graduate writing tutor provided individual one-on-one writing consultations to those participants who desired them in the manner that Snively (2008) describes as working best with graduate students: "collaborative talk, affective support, and decoding academic jargon to assure students they are on the right track" (p. 91).

Materials

At the first Institute, the instructors provided the students with a pocket-sized writing manual. Additionally, subsequent cohorts received a self-published workbook, which included visuals and handouts for all the activities of the Institute. The Institute also provided lunch each day so that students could work in collegial, cross-disciplinary groups applying that day's content into their own projects. They were grouped into roundtables with those at similar stages in their respective programs, allowing them to formulate peer relationships.

Participants

More than 80 graduate students submitted applications for the first four Writing Institutes. Seventy-three students were chosen to attend based on their application and writing project status. The instructors chose to keep the group sizes small (under 20 participants)

in order to facilitate deeper discussion and build group cohesion more quickly. Because several students were unable to attend the entire week due to emergencies, sickness, or travel, 63 students successfully completed the Institute measured by completion of the pre- and post- Writing Inventory of Skills and Preferences (WISP) and Writing Institute survey evaluation.

The Writing Institute focused on students working on large writing projects (theses, dissertations, or seminar/exit papers) because research suggests that these projects can be obstacles to graduation (Liechty et al., 2009). For example, Peters (1992) found that approximately one-fifth of doctoral students who attain candidacy do not finish their dissertation. Lovitts (2001) and the Council of Graduate Schools (2008) confirmed that approximately 50% of doctoral students do not complete their Ph.D.s and acknowledge that between 15-25% of students who advance to candidacy never graduate.

The grant which funded the Writing Institutes targeted students who have historically been underserved, and the institution is a large HSI (Hispanic Serving Institution) in the southwest with a growing graduate student population, seeing an increase of 20% from fall 2007 to fall 2011 (UTSA OIR, 2011). Brus (2006) notes that, over the past three decades, demographics of the graduate student population in the United States are moving toward a more diverse and less traditional population, including women, minority students, international students, students of nontraditional age, and students with dependents. Brus (2006) contends that this changing demographic should encourage service providers to view graduate students as not one homogenous population, and we argue that with this in mind, there is a growing need for more and varied assistance to these students.

The demographic breakdown of this university's graduate student population reflected this national trend; moreover, this trend was reflected in the breakdown of the Writing Institute participants (UTSA OIR, 2008). The majority of the initial participants were of minority students (52% were Black, Hispanic, or Asian Pacific Islander), and the majority were women (65.8%). Additionally, 47% of the Writing Institute participants were first generation college students, and 70% were first generation graduate students. In summary, the

Writing Institute met the needs of what Brus (2006) believes to be the new graduate student demographic.

Content

The content presented during the week of the Institute varied slightly per offering, yet focused on covering all stages in the writing process (prewriting through editing) and on those self-identified writing weaknesses of the particular participants. The content of the Writing Institutes was conveyed through both discussion as well as activities that simultaneously addressed more than one area of need (see Appendix A). This blended approach made the Writing Institute similar to both a seminar and a hands-on workshop, the latter of which has proven to be a successful approach with graduate students (Mullen, 2006).

Instruments

A pre- and post-Writing Inventory of Skills and Preferences (WISP) was administered to the 63 participants who completed the Writing Institute to see if they developed certain writing skills. Laura Symons (2007) created the WISP in order to develop metacognitive skills in students concerning their writing skills, preferences, and style. Symons (personal communication, January 4, 2013) reflects on the creation of the WISP and its theoretical foundation:

A few years ago, I was working with the Learning and Study Skills Inventory (LASSI) in conjunction with information from Rita Smilkstein on how the brain works in learning. The combination was extremely useful in helping students understand themselves as learners, a kind of self-reflection that often leads to metacognition. It occurred to me that an inventory on writing could have a similar value for student writers.

As a student of Donald Murray in the 1970s, I learned to look at writing as a process and used an understanding of the process to help students in the classroom, conference teaching, and tutoring, to develop fluency in writing. I started thinking about what kind of information about the engagement in the writing process would be useful for a student. The result, with help from Rita Smilkstein and others, was the Writing Invento-

ry of Skills and Preferences (WISP).

The WISP evaluates students' writing skills and preferences based on self-reported answers to questions concerning their knowledge about the skills necessary to write and their preferred approach to the task of writing. The results are divided into two sections: skills and preferences. The skills portion of the WISP measures students' awareness of the skills needed to write, such as prewriting, argument, organization, transition, conclusion, editing, and revising. Although knowledge of writing skills is important, researchers, teachers, and learning assistance specialists know that every writer has a preferred approach to writing. The philosophy behind the WISP is that the more flexible a writer can become in his or her approach to writing, the better chance the writer has of "receiving the full value of the process and practice of writing" (L. Symons, personal communication, May 4, 2011). Moreover, the participants in this study enjoyed taking the WISP as it gave them insight into their personal writing strategies and enabled them to see the impact that the Institute had on their writing.

Finally, researchers surveyed all participants at the end of the Writing Institute to measure their satisfaction with the program, asking them what they found to be most and least beneficial and whether attending the Institute helped them make positive progress either toward completion of their writing project or graduation. Researchers also asked students to rate on a five point satisfaction survey scale, if participating encouraged them to continue writing, if the book and resource materials were helpful, if the leaders were sensitive to the needs of the attendees, if the amount of structure provided was appropriate, and if the discussion of topics was useful to their current writing skill level.

Results

The Writing Institute successfully addressed the needs of the participants as evidenced through three different mechanisms: WISP, satisfaction survey scaled response questions, and an open-ended question asking what the participants liked best about the Writing Institute. Participants' post-tests on the WISP showed statistically significant increases in scores across all writing skills elements

($t(63)=7.874, p=.000$), while their responses to general satisfaction questions showed overall satisfaction with the Writing Institute. Additionally, one-third of the responses to the open-ended question demonstrated how the Writing Institute helped the participants address academic risk.

Researchers measured the results of the Writing Institute through the WISP, review of the scaled satisfaction survey items, and an open-ended question on the evaluation survey about what the participants found to be most beneficial about the Writing Institute.

WISP. In order to determine whether participants' knowledge of writing skills improved during the Institute, the researchers performed repeated measures t-tests¹ on each writing skills element of the WISP. The post-tests showed statistically significant increases in scores across all writing skills elements (see Table 1), including the total score ($t(63)=7.874, p=.000$). There was an average increase for the 63 participants of 1.4 points on a 16.0 point scale. This means that, on average, students increased their knowledge of a skill by 1.4 points on each skills element. Additional details regarding score differences on each element can be seen in Table 1.

Satisfaction Survey Scale. In regards to student satisfaction, every Writing Institute participant either Strongly Agreed or Agreed with the following statements that (a) "Participating in this Institute has encouraged me to continue working on my writing project" and (b) "The book and resource materials were helpful" as seen in Table 2.

Furthermore, the majority of participants (96.8% or more) either Strongly Agreed or Agreed with all the other scaled survey items (Table 2). Also noteworthy was the overwhelmingly positive response to an additional question about the Writing Institute: Almost 99% of

¹ The repeated-measures t-test is the appropriate method for evaluating the alternate hypothesis that a significant difference exists between measures taken from two samples that are highly related, in cases where subjects are matched across treatments, or in a single sample where measurements are repeated (Gravetter & Wallnau, 2009). This test is most often used in the evaluation of pre-intervention and post-intervention measurement on a given variable. Since measures of the same individuals violate the assumption of "independence of replicates," the repeated-measures t-test produces a more valid test of hypotheses (von Ende, 1993). Here the null hypothesis that no difference exists in the same sample measured in two different points in time is tested against the alternate hypothesis that a significant change in measures occurred. Measurements on a continuous variable at Time 2 are subtracted from measurement on the same variable at Time 1 to obtain a "difference score." (Gravetter & Wallnau, 2009) The assumption of the null hypothesis tested by this statistical method is that the average of difference scores in a population will be zero.

Table 1
Differences in pre-and post-test writing scores for all workshop participants

	Paired Differences					
	<i>Mean</i>	<i>Std. Deviation</i>	95% Confidence Interval of the Difference		<i>t</i>	<i>Sig.</i>
			<i>Lower</i>	<i>Upper</i>		
Assignment	0.746	1.425	0.387	1.105	4.155	.000
Prewriting	0.857	2.047	0.342	1.373	3.324	.001
Theory	1.238	2.022	0.729	1.747	4.861	.000
Argument	1.381	2.106	0.851	1.911	5.206	.000
Evidence	0.683	1.767	0.237	1.128	3.065	.003
Organization	1.762	2.212	1.205	2.319	3.322	.000
Paragraph Organization	2.048	2.331	1.461	2.635	6.973	.000
Transition	1.841	2.294	1.263	2.419	6.369	.000
Conclusion	1.762	2.34	1.173	2.351	5.977	.000
Revision	1.349	2.223	0.789	1.909	4.818	.000
Editing	1.270	2.336	0.681	1.858	4.314	.000
Total Score	14.937	15.056	11.145	18.728	7.874	.000

Table 2
Writing Institute Survey Evaluation Results, 2008-2009

	1 (strongly agree) 5 (strongly disagree)				
Evaluation Item	1	2	3	4	5
Participating in this Institute has encouraged me to continue working on my writing project.	82.5%	17.5%	0.0%	0.0%	0.0%
Discussion of the topics covered was useful and applicable to my skill level.	74.6%	22.2%	0.0%	3.2%	0.0%
The leaders were sensitive to the needs of the attendees.	76.2%	22.2%	1.6%	0.0%	0.0%
The amount of structure provided by the leaders (exercises, strategies, etc.) was appropriate.	65.1%	33.3%	1.6%	0.0%	0.0%
The book and resource materials were helpful.	85.7%	14.3%	0.0%	0.0%	0.0%

*n=63

the participants stated that the Writing Institute helped them make positive progress either toward the completion of their writing project and/or graduation.

Open-Ended Question. Researchers coded the survey evaluation responses to the open-ended question “What I liked best about the Writing Institute was” in order to look for how the Writing Institute addressed academic risk. Almost one-third of the responses contained phrases associated with academic risk; therefore, we can conclude that discussions and activities surrounding academic risk were useful to the participants. The key terms classified or coded were, on the negative end of the scale, fear, anxiety, and isolation, and on the positive end of the scale, encouragement, motivation, and confidence. The key activities that were coded for included the ones that addressed risk, such as color blocking, cross-disciplinary discussion, free writing, and writing before they were ready to write.

Additionally, the researchers categorized other positive comments, other than risk, as addressing HOCs (18.8%), LOCs (12.5%), the instructors and the format (42.2%), the peer review and the professional writing consultation (26.6%), the materials (14.1%), the lunch (15.6%), and most generally, “all of it” (18.8%). This is significant because we found that the participants were overwhelmingly satisfied with their experience at the Writing Institute.

Discussion

While contextualized writing assistance as discussed in this research can be helpful on individual projects, the Writing Institute demonstrated that this type of non-contextualized assistance is not only appreciated by graduate students, but it is also effective in addressing the long-term concerns of graduate writers. Though the instruction of the Writing Institute is non-contextualized, it should be noted that none of the content would be considered remediation because the participants were learning new skill sets in terms of writing, revising, and editing large works. More specifically, the Writing Institute provided the participants with a skill set that they can apply to future projects, including drafting techniques, methods of revision, and source management.

The Writing Institute effectively addressed all three problem

areas for graduate writers: HOCs, LOCs, and academic risk. Most activities and discussions throughout the week focused on the students' issues with HOCs because 73% of the participants expressed having difficulty in these areas on their Writing Institute applications. Since the researchers introduced most of the content in a non-disciplinary specific and non-contextualized environment, students were able to first practice these skills and techniques on the projects they brought with them to the Institute and later apply these techniques to future writing endeavors. For example, "color blocking," the free writing activity, and the process analysis activity all helped students understand the importance of prewriting, drafting, and revision techniques. The "blurbing" and "rabbit hole prevention" activities helped those students who struggle with organization, both within individual paragraphs as well as overall organization of their projects. The WISP results confirmed our observations, showing gains in all of these areas with significant gains in overall organization and paragraph organization.

Most LOCs were addressed through brief instruction on passive voice, use of person, and punctuation followed by a question/answer session dictated by the students. They were free to ask questions (without the intimidating presence of an advisor) about any punctuation issues they had or, for example, the appropriate place for first person. It is also interesting to note that most students expressed concerns about the effective use of transitions. We have found that students expected a single transition to magically connect their disparate thoughts. Because of this, the instructors first addressed their problems or questions about organization and then discussed transitions so that students were able to see that transitions came more naturally with a well-organized paper. The WISP results showed that the students gained knowledge about the importance of editing and transitions.

Most importantly, academic risk was addressed during the Writing Institute through its very structure as a cross-disciplinary, non-contextualized workshop/seminar about how challenging writing is at this level. Students responded in their surveys that they were comforted by meeting others with similar struggles, inspired by the confidence they gained during the week, and newly motivated to

complete their projects. They appreciated the techniques that helped them “un-jar the writing process,” helping to relieve some of their anxiety and writing blocks. Most students felt that the help they received with HOCs and LOCs also helped relieve some of the writing risk. One student put it this way: “Although I love the finished product from writing, I really dreaded the process. It has been always full of anxiety for me. Now I am enjoying the process and my anxiety level is much less.”

Mullen (2006) confirms that not only by “revealing personal vulnerabilities,” but also sharing “fruitful ideas and strategies for enabling novice writers to open up and take risks,” (p. 33) students overcome their issues of anxiety and their lack of motivation and confidence. The Writing Institute created an open atmosphere of trust through an intimate setting with fewer than 20 participants that allowed free discussion and inquiry. Additionally, because students were grouped into round tables with those at similar stages in their respective programs, they were free to formulate peer relationships and to feel less isolated. Rose and McClafferty (2001) confirmed this structure in their research by stating that everyone “feels they’re in the same boat-- struggling to make their writing better” (p. 32). The other way that the instructors addressed risk was by opening each week with a discussion of the negative feelings associated with writing, which the participants commonly shared. They then addressed the issues that often cause writing blocks (procrastination, perfectionism, isolation, and stuckness), thereby helping the participants dispel certain myths about writing.

In summary, the structure of the Writing Institute, with its combination of hands-on activities and open discussion in a cross-disciplinary setting, addressed the areas of concern for these graduate writers. Students first overcame academic risk through immediate discussions of shared myths of academic writing, including no “one right way” to write, methods to overcome writing blocks, the importance of daily writing and accountability, and the activity of writing a haiku based on their research. Students addressed HOCs through “blurbing,” freewriting, and “rabbit hole” prevention activities, plus drafting and source management discussions, to name a few. They tackled LOCs through discussion and exemplification of gram-

mar, punctuation, passive voice, person, citation styles, and transitional expressions. The researchers believe that this unique combination of varied content and delivery mechanisms effectively addressed the needs of these graduate students.

Limitations and Recommendations

This study is limited by several factors, including utilizing a self-reported instrument, relying upon a small sample size, not assessing the long-term effects, and only assisting those students who were nearing completion of their graduate studies. Our pre-/posttest consisted of a self-reported inventory instead of an actual writing examination. Although the researchers could have easily chosen to utilize a grammar examination or sample writing to assess each writer, they chose to use the WISP because it served as a teaching tool on the first day of the Institute to highlight the difference between varied writing preferences and essential writing skills. And finally, our survey evaluations were also self-reported levels of satisfaction.

The sample size was small, but the Writing Institutes have continued beyond this initial grant funded period, and the results have been consistent. The researchers recommend measuring the long-term, lasting effects of the Writing Institute. Finally, selecting graduate students nearing completion of their graduate studies and interested in attending the Writing Institute may have caused self-selection bias. However, the original concern in designing the Graduate Writing Institute was not this particular study, but simply to assist those students who felt inclined to improve their writing. Other limitations exist with the four-day writing institute model and how it fits into the span of a semester. Four days for instruction limits what can be accomplished, and it is up to the students to continually apply the strategies they have learned beyond those four days.

The researchers recommend that further research be completed to identify a difference between the results achieved with a cross-disciplinary institute versus an interdisciplinary writing institute. Additionally, there is opportunity to further research academic risk and which coping mechanisms successful graduate students utilize to overcome that issue. Finally, the researchers recommend assessing pedagogical writing knowledge in graduate faculty and developing

methods for enhancing the mentor/mentee academic writing relationship.

Conclusion

The Writing Institutes have continued since the grant period expired because of their success and popularity. This model of a graduate Writing Institute that addresses the wide range of concerns of graduate students in a non-contextualized environment can be effectively replicated at other institutions in order to serve the changing demographics of the graduate student population. In summary, this student's comment states it best:

The information presented was made simple and easy to understand. I[t] was extremely helpful to breakdown the COMPLEX writing process into digestible and easy to follow steps. While we were all taught these in basic English courses, the application of them in graduate writing escaped our minds. This writing institute re-established those fundamentals of writing back into graduate writing and most importantly provided us with the tools to be successful writers in our field. At least for me, this course has given me the confidence to face my writing fears, and not give so much undo power to the roadblocks in [the] writing process (getting started, writing, re-writing, editing, revising). Thank you for making this course available and for giving me the confidence I needed to get my dissertation done and done well.

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Appendix A

Day	Activity/ Discussion	Explanation	Need Addressed	Benefit to Student
Day 1	WISP Discussion of Results	The WISP results were explained and normed via a group discussion which led into a discussion of the circular nature of the writing process.	HOC, LOC, & Risk	The WISP served as a self-actualization tool for many of the attendees as they began to understand why they wrote the way they did.
Day 1	Freewriting Exercise	Students participated in a generative freewriting activity, drafted a paragraph from an idea found in the freewriting, and finally revised this paragraph in one of two ways.	HOC & Risk	Attendees experienced different stages in the writing process in this activity including prewriting, drafting, and revision. This last step was helpful because revision was one step in the writing process that many, if not most, of our participants admitted to habitually skipping altogether. The activity also addressed academic risk by allowing them to discuss the merits of writing multiple drafts and of overcoming the idea that there is only “one right way” to convey a specific meaning (Becker, 1986, p.43).
Day 1	Color Blocking	Participants used the text color feature in their word processors for different drafting stages. For example,	HOC & Risk	This discussion/activity gave students a concrete strategy to draft while expecting multiple revisions. Encouraging the participants to draft in different colors

initial drafts may be written in “pink” and would be considered very rough. All subsequent passes might use a different color. The writer can pick as many stages of drafting that they might need.

helped them effectively overcome initial fears of writing (for example, the fear of not getting it down “the one right way”) or any feelings of inadequacy while encouraging them to make multiple revisions.

Day 1	Productivity & Accountability	Students were shown research by Boice (1990) about the importance of daily writing and an accountability partner. A discussion about this ensued and students were challenged to notate their writing times for the week.	Risk	This aimed to hold students accountable for their productivity at the Writing Institute and beyond, helping them to work past any “writing blocks” they had.
Day 1	Concrete Language	Students brainstormed words and terms or, more specifically, concrete language associated with their projects—nouns, verbs, adjectives, and adverbs—that would help them focus on the basic who, what, where, when, how, and why of their projects.	LOC & Risk	This was a strategy to help students overcome writing blocks. Returning to these simple yet concrete concepts was a way for the writers to become unblocked by reminding them of their goal and purpose for writing. In addition, having a list of subjects and objects at hand helps students to write more actively and with clarity and concision.

Day 1	Haiku	Students attempted to simplify their complex paper topic into a Haiku formatted poem	Risk	Writing about their topics in a new way may help students overcome writing blocks and see their work as a simpler task (McKinney, 2003). It also gave them something to write towards.
Day 2	Process Analysis Exercise	Participants drew a simple picture and then wrote a set of instructions so that their audience could replicate that picture.	HOC	This activity helped illuminate some habits in the students' own writing, such as the tendency to write passively, while opening the discussion to topics like audience, purpose, and logical order.
Day 2	Transitions	Students were exposed to a variety of transition styles and their place and purpose in writing.	HOC	This discussion helped to show students that no matter how good the transition was, if the organization was lacking, the transition would not work.
Day 2	"Blurbing"	Students practiced writing summary statements, or "blurbs," of individual paragraphs in the margins of their own writing.	HOC	These "blurbs" helped illuminate snags in organization as well as paragraph cohesion. For instance, if the order of the blurbs in the margin did not reflect or create an "after the fact" outline, then the paper or section was not logically organized. In addition, if the student writer could not create a blurb in the first place then maybe the paragraph was not cohesive to begin with.

Day 2	“Rabbit Hole” Prevention Method	Participants brainstormed new topics for a paper or a new section of their current paper and divided these topics onto note cards that they could then organize and develop as necessary.	HOC	This activity aimed to help those students who tended to write tangentially. Following these tangents, or “rabbit holes,” is a common problem for graduate writers who like to explore and learn while they write. This activity gave them the opportunity to see which topics would coalesce and which topics they might save for another paper while also helping them with a potential organization schema for the project.
Day 2	Literature Review Structure & Methods	We discussed the purpose and process of writing a literature review, including ways to organize sources by sub-topic, not author.	HOC & Risk	By demystifying how to write a literature review and how to organize it and its sources, the students were able to move past the anxiety that seemed to come with the literature review process.
Day 3	Grammar and Editing Instruction	Though the specific content varied with each of the four Writing Institutes based on students’ self-identified needs, we always covered a few basics based on our own observations while working with graduate writers: Discussion began with the	LOC & Risk	While the obvious benefits of this lesson included a good refresher course on punctuation usage for some and brand new information for others, the unexpected benefit from this day’s discussion concerned Risk. Some participants found it easier to ask a grammar question in an environment like this where everyone was on

various ways to join multiple clauses and then moved on to other troublesome punctuation marks. We made sure to leave time for a question/answer session where students could articulate individual concerns with grammar or editing.

the same level and in the same position. These were questions they may have been hesitant to ask an advisor for fear of seeming somehow incompetent. Many students expressed feelings of relief that they were not the only ones who were confused about a particular usage or comma placement.

Day 3	Person Construct- ion and Passive Avoidance	This day always led to a discussion of passive construction in writing, how to identify this construction, and how and why to avoid it when possible. This inevitably led to a discussion of the use of first person in formal writing.	LOC & Risk	This was not a topic that many students were comfortable speaking with their advisors about, but they knew that modern publications were becoming friendlier with first-person and passive avoidance. This discussion was always viewed with a disciplinary lens as many disciplines view passive as a positive, such as the sciences.
Day 4	Plagiarism Avoidance	Students were asked to identify their citation style, which followed with a discussion about the purposes of and differences in citation styles. Additionally, various source management tools were discussed as	HOC	By Day 4, we hoped to have built a trusting environment so that participants could openly discuss any misconceptions they had about when to cite, how to cite, or secondary source citations.

a means to avoid plagiarism.

Day 4	Source Integration Activity	Participants worked in groups examining the integration of sourced material into three samples of writing.	HOC	This activity helped students to distinguish good synthesis and integration from some not-so-good examples. This activity usually led to a discussion about paraphrasing versus using direct quotations and the benefits of both.
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Critical Thinking and Online Supplemental Instruction: A Case Study

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Abstract

A wealth of research is available regarding supplemental instruction; however, a dearth exists regarding online supplemental instruction and critical thinking. This case study explored what was assumed to be known of critical thinking and investigated the extent to which critical thought was promoted within a university's online supplemental instruction program. Survey and persistence data indicated the university's online SI program was successfully facilitating critical thinking. However, after conducting online session observations, based upon the Paulian critical thinking theory and the adoption of Bloom's taxonomy as a critical thinking model, the case investigation revealed the initial assumption was flawed.

Since its inception over four decades ago, Supplemental Instruction (SI) has consistently established a positive impact on student performance (University of Missouri, 2007). Ubiquitous studies, ranging from K-12 to higher education settings, have consistently replicated outcomes demonstrating that participation in SI is positively associated with higher academic performance as compared to those who do not participate in SI (Arendale, 2001; McGuire, 2006; Zaritsky & Toce, 2006; Zerger et al., 2006). Yet, there exists another contributor to higher course grades: critical thinking.

Facione (2011), a leading expert in critical thinking, posits a significant correlation exists between critical thinking skills and college grade point average (GPA). It logically follows that if one's

thinking improves then one's performance might improve as well. Facione (1990) proposes an educational responsibility toward fostering a "critical spirit" that includes building and strengthening core skills in interpretation, analysis, evaluation, inference, explanation, and self-regulation. Interestingly, these core skills are an ideal complement to Bloom's taxonomy—a critical thinking model employed by a leading online university that offers bachelor's, master's, and doctoral degrees to domestic and international students.

Capella University's SI program is one of the few, if only, *100 percent online* SI programs in higher education. Akin to university curricula objectives, SI session planners and online activities are designed to promote critical thinking through the application of Bloom's taxonomy. SI Leaders then facilitate the activities during synchronous sessions with the intention of cultivating a critical spirit. A question that came to the forefront of this case investigation was "How well does SI facilitate critical thinking skills?" A preliminary data examination of SI evaluation surveys and course grades revealed that students were gaining critical thinking skills through participation in SI. The data suggested that these critical thinking skills not only helped students with the current course, but also provided transferable critical thinking skills that could be applied to other courses.

Literature

Defining the construct of critical thinking was a significant first step toward establishing a foundation from which to conduct the case study. Halpern (2003) stated critical thinking generates new knowledge and that knowledge and thought are intrinsically linked to human cognition. Petress (2004) cited critical thinking as a "mode of thinking" and an "intellectually disciplined process." Facione (2011) stated critical thinking is a process in which the resulting outcome includes "thoughtful judgment" and "reflective decision making." These interpretations led to the inference that critical thinking facilitates the ability to address issues and solve problems through a disciplined process by which the end result can be justified by reason and evidence. As the construct of critical thought became more apparent through the literature, a question emerged as to what was assumed to be known of critical thinking. This propelled the case study into a

deeper realm in which skepticism usurped assumption.

Underpinning the interpretations by Halpern, Petress, and Facione, is the *what*, *why*, and *how* components of critical thought. The *what* component of critical thinking exemplifies characteristics of an intellectual mode of thinking, such as applying a logical, reasoned, rational, academic, or scholarly approach to thinking whereby justifications are accomplished through reason and evidence. Opinions and conjecture are prohibited as means for justification.

The *why* component examines the importance of critical thought: in other words, why should one think critically? Critical thought is of benefit or value to individuals, society, and culture because it is the global facilitator of enhanced thinking abilities and expanded breadth of knowledge (Facione, 2011). When justification is achieved through reason and evidence, human thought can generate new knowledge, ideas, and solutions, as well as practice fair-mindedness in thinking (Paul, 2011). Given the propensity of the average person to supply opinion as a means to substantiate an argument, it is not difficult to deduce that human nature is challenged to think critically.

So how can a person who is not inclined to think critically facilitate critical thinking? The *how* component of critical thinking refers to an intellectually disciplined process used to promote thoughtful judgment, reflective decision-making, and evidence-based reasoning (Facione, 2011; Huitt, 1998; Petress, 2004). The process alludes to methods used to increase awareness of critical thought so as to acquire basic critical thinking skills and intervene in faulty thinking. Subsequently, this case study needed to locate a fitting framework for facilitating the process of tackling the how component of critical thinking. The resulting outcome was the adoption of the Paulian critical thinking theory.

Paulian Critical Thinking Theory

The Paulian critical thinking theory purports the application of a specific critical thinking model. At the heart of defining Paulian critical thinking, lay three key facets (Elder, 2010, p. 2): Although it is human nature to think, it is not human nature to think well or critically. “Therefore, we need to be able to intervene in thinking, to

analyze, assess, and where necessary, improve it.” Critical thinking is purposeful, has a goal, and utilizes reasoning (Halpern, 1998). According to the Paulian theory, there are multiple processes that should ensue, such as developing fair-mindedness through the eight elements of reasoning and harnessing critical thinking abilities. When incorporated into one’s reasoning, these processes can strengthen critical thought and the incumbent nature to think well and to think without prejudice or illusion.

The eight elements of reasoning (Figure 1), or structures of thought, become the idea that all reasoning contains parts, and that these parts enable one to analyze thinking in order to best understand it (Paul, 2008). Each element has influence and is influenced by another. Where one element exists, the other seven exist, like a chain with eight links. All *products* of reasoning can be analyzed according to these eight elements (Figure 1) since all human reasoning contains the eight parts (Paul, 2008). These eight elements also impact our ability to develop fair-mindedness.

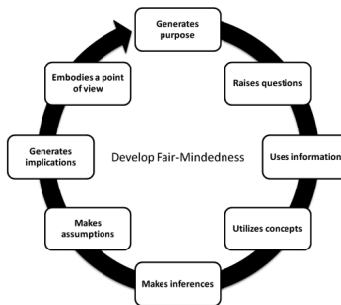


Figure 1. Flow chart depicting the process of developing fair-mindedness through the eight elements of reasoning.

According to Paul (2011), critical thinking ability can be described as a process or object of thought and an intellectual standard. Critical thinking ability involves the act of gathering relevant information. Connecting this ability to Paul’s process of developing fair-mindedness, information gathering is used to generate a purpose, clarify issues, distinguish relevant from irrelevant information, raise questions, question deeply, practice Socratic discussion, and read critically (Paul, 2008). When making logical inferences, one uses information to compare and evaluate perspectives or theories and to compare

analogous situations to transfer insights to new contexts. Logical inference further helps to utilize concepts to generate or assess solutions, which leads to a refined generalization that avoids oversimplifications and leads to plausible interpretations (Paul, 2008).

Next, generating justifiable assumptions is tied to the process of making assumptions that arise when reasons are given and evidence and facts are evaluated. To pursue critical thought logically, one must generate implications by noting significant similarities and differences. Incorporating critical thinking with developing fair-mindedness can be accomplished by checking information for accuracy, through criterion development for that evaluation by clarifying values and standards. This further includes evaluating the credibility of sources where information was mined.

The essence of the Paulian theory purports that to think critically requires people to develop fair-mindedness at the same time they learn basic critical thinking skills, and thus begin to practice fair-mindedness in thinking. According to Halpern (1998), critical thinking utilizes cognitive abilities to increase a desirable outcome. Higher order cognitive skills are synonymous with critical thinking skills with a goal of providing useful feedback to improve thinking (Halpern, 1998). The Paulian theory of critical thinking purports the application of a specific critical thinking model. At Capella, Bloom's taxonomy is that model integrated into courses and student learning.

Bloom's Taxonomy

From academic, learning, and training perspectives, Bloom's taxonomy is familiar to many as a means to construct educational objectives. By crafting distinct objective statements that describe what a student is expected to learn, the use of Bloom's taxonomy for the classification of educational objectives defines and categorizes predetermined instructional learning outcomes (Krathwohl, 2002). The objective statement includes the application of a unique action verb that is aligned with a cognitive delineation of the taxonomy, whereby six delineations are representative of thinking from a simple to complex cognitive operation (Halawi, McCarthy, & Pires, 2009; Huitt, 2011; Krathwohl, 2002).

Conversely, Bloom's taxonomy also serves as a critical think-

ing model—in fact, its greater strength rests in its ability to facilitate critical thought rather than define educational objectives. The overarching taxonomy comprises three central domains: cognitive, affective, and psychomotor skills (Clark, 2010; Halawi, McCarthy, & Pires, 2009). However, the cognitive domain was the focus of this case study whereby the taxonomy represented “a systematic classification of cognitive operators” successively ordered from simple to complex, concrete to abstract (Krathwohl, 2002). The cognitive domain is comprised of six levels that sequentially reflect how thinking builds—beginning at a foundational level of thinking (knowledge) and working upwards to a more advanced, complex level of thinking (evaluation). Although the original model has since been revised, the newer version has not been universally adopted, and this study used the original model, which is also employed by the university.

Based on the original model, the six levels include—from simple to complex—knowledge, comprehension, application, analysis, synthesis, and evaluation. Each of these six levels implies a *magnitude of thought* and is further delineated into two realms of thinking: lower-order thinking (simple) and higher-order thinking (complex). As illustrated in Figure 2, knowledge, comprehension, and application comprise lower-order thinking and analysis, synthesis, and evaluation comprise higher-order thinking. Levels of the taxonomy are intended to be successive and imply that a level must be mastered before moving to the next level (Huitt, 2011). In addition, for purposes of this case study, the taxonomy was further delineated by academic levels whereby cognitive operations were aligned with academic settings. Overall, Bloom’s taxonomy can be delineated by six cognitive levels, two realms of thinking, and three academic application levels (Figure 2).

As mentioned, the typical thrust of Bloom’s taxonomy rests in its useful framework for creating and categorizing educational objectives, which involves the application of action verbs that are aligned with the taxonomy’s cognitive delineations. However, to use the taxonomy as a means to explicitly promote critical thinking one needs to look past objective statements and contemplate the nature of the cognitive operations at each level. Beyond the action verbs, each level provides a description of how thinking builds and ascends a cognitive

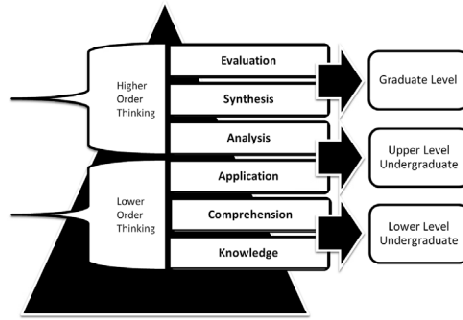


Figure 2. Graphical illustration depicting the delineation of Bloom's taxonomy according to cognitive levels, thinking realms, and academic levels.

echelon of operations (Table 1). Opportunely, the taxonomy's framework provides an excellent canvas to apply a questioning strategy, as the cognitive levels and associated action verbs provide the scaffolding for designing powerful questions.

Table 1

Description of the Cognitive Echelon of Operations

Level	Description
Evaluation	Presenting and defending opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.
Synthesis	Compiling information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Analysis	Examining and breaking information into parts by identifying motives or causes, making inferences and finding evidence to support generalizations.
Application	Solving problems by applying acquired knowledge, facts, techniques, and rules in a different way.
Comprehension	Demonstrating understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.
Knowledge	Exhibiting previously learned material by recalling facts, terms, basic concepts and answers.

For SI Leaders in an online synchronous environment, interaction with the students is vital and the means by which to interact can vary significantly from the traditional classroom environment. Ques-

tioning techniques provide a powerful tool toward challenging critical thought. However, an essential aspect concerns the matter of how to construct the questions so that there is significant alignment with the appropriate cognitive levels of the taxonomy. While the action verbs provide the scaffolding, construction of the question takes serious thought. For the case investigation, Paulian theory and Bloom's taxonomy afforded a foundational method to evaluate the extent to which SI Leaders were facilitating critical thought and a method to construct powerful questions for use during SI sessions.

Methods

A case study strategy was used to initiate the process of determining the strengths of Capella's SI program and to make recommendations for improvements. The original focus of the investigation was to identify the program's strengths of incorporating critical thinking skills in SI sessions; what was found, though, was that improvements were needed—How can an online SI program incorporate critical thinking skills? The answer was revealed through a two-part case study that began with an analysis of collected data that was comprised of ABC grade distributions and persistence rates of students that attended SI and student self-assessments of critical thinking skills learned as a result of participating in SI. Second, SI Leader observations were conducted using the critical thinking SI observation form developed from the creation of the evaluation model (Appendix A). Using data results, an erroneous theory was established that critical thinking strategies were being employed. From the data collection four drivers of perception materialized, which spurred two assumptions: 1) some programs/courses may present more or less opportunity for higher order thinking and 2) some SI Leaders may have more or less understanding of how to apply a critical thinking model.

The 1st perception driver consisted of data from the first critical thinking survey question in which students were asked to rate on a scale from 1-5, with 5 being the highest, their agreement that SI helped critical thinking skills for the current course. Figure 3 shows that between Q4 2011 and Q1 2012, 70%-75% of students strongly agreed or agreed that SI helped their critical thinking skills for their

current course. Through self-reports of positive changes and appropriate instruction, students become better critical thinkers (Halpern, 1998).

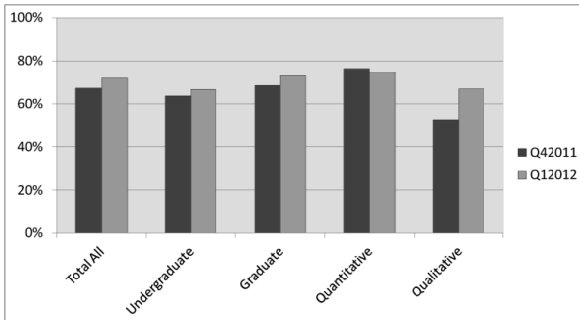


Figure 3. Excel output for bar chart agreement (percent of students) of end of quarter survey question (SI helped my critical thinking skills for this course).

The 2nd perception driver was data from the second critical thinking survey question where students were asked to rate on a scale from 1-5, with 5 being the highest, their agreement that critical thinking skills were learned in SI that can be carried forward to future courses. Figure 4 demonstrates that 60%-70% of students from Q4 2011 to Q1 2012 strongly agreed or agreed that they learned critical thinking skills that could be carried forward to future courses. This supports Yeh's research of integrating e-learning into a direct-instruction model that enhances critical thinking (2009); this integration can improve critical thinking not only for the student but for the SI Leader as well.

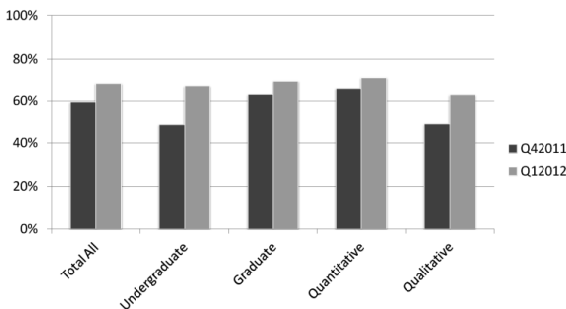


Figure 4. Excel output for bar chart agreement (percent of students) of end of quarter survey question (I learned critical thinking skills in SI that I can carry forward to other courses).

Persistence data drove the 3rd perception driver: did the SI student stay in the current course past the census date? In Figure 5, persistence rates for 2011 were quite high at 97%. The 4th perception driver involved the ABC distributions of SI students, and it revealed an overall average of 86% (Figure 6) of students that participated in SI for 2011 earned an A, B, or C. This led to the assumption that a correlation existed between grades and critical thinking, based on research from Facione (2011). Persistence and ABC distribution data helped to drive the perceptions that critical thinking was being employed in SI sessions and was being facilitated by the SI Leader based on work by Malm, Bryngfors, & Mörner (2012).

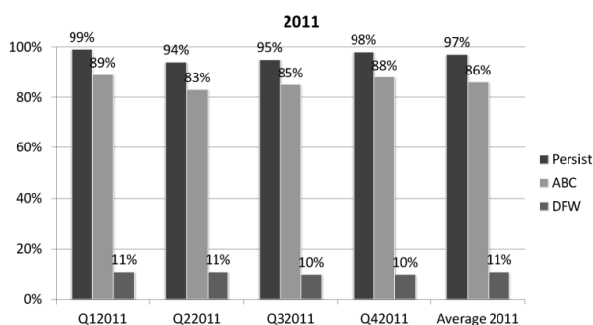


Figure 5. Excel output for bar chart persist rates and ABC versus DFW grades of students that attended SI for the year 2011.

To evaluate SI instructional practices, and the extent to which SI Leaders were actually facilitating critical thinking during SI sessions, it was necessary to develop an evaluation strategy that assimilated the constructs of Paulian critical thinking, Bloom's taxonomy, and online SI. By adopting principles from the Paulian theory and using the framework of Bloom's taxonomy, a method was created from which to devise a new model for evaluating SI instructional practices (Appendix A). The first step toward creating the new evaluation model involved targeting specific components of the Paulian theory that would serve as the foundation from which to construct the model. Accordingly, Paulian critical thinking theory components included: 1) explicit instruction, 2) critical thinking model, and 3) instructional practices. These three components provided the underpinning for assimilation of Bloom's taxonomy and online SI into the model.

The final step in creating the evaluation model involved assimilating all components from which the following implications evolved: development of fair-mindedness; use of Bloom's taxonomy to achieve higher-order thinking, as well as application of the taxonomy to academic program levels; implementation of a powerful questioning strategy to promote critical thought; and, application of tools and techniques to enhance online learning and collaboration. The result of the assimilation was a highly inter-related model (Figure 6). The upper row of the evaluation model reflects the targeted components of the Paulian theory that served as the foundation from which to construct the model. Recall that these components dictated the necessity to choose a critical thinking model and to implement specific instructional strategies, which is represented in the center row. The third row illustrates the complete assimilation of the Paulian theory, Bloom's taxonomy, and SI whereby the eight elements of reasoning are necessary to develop fair-mindedness; the upper echelon of Bloom's taxonomy is needed to promote higher-order thinking; and, the use of a powerful questioning strategy is used to promote critical thought in conjunction with enhancing learning and collaboration.

The evaluation model led to the construction of a critical thinking SI observation form (Appendix A). This observation form subsequently served as the method by which to effectively observe a range of SI sessions, and to evaluate the extent to which the SI program was achieving the goal of promoting critical thought in SI sessions.

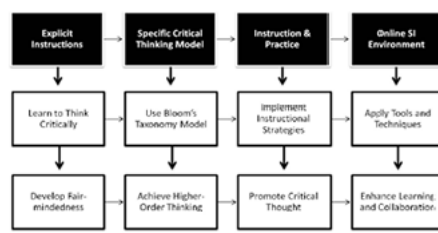


Figure 6. Graphical illustration of the new evaluation model involving the assimilation of the Paulian theory, Bloom's taxonomy, and online SI.

Results

In order to fully understand the baseline of critical thinking in SI sessions—what was being accomplished if critical thinking was

not evident—three SI Leaders were each observed during their own SI session: Business Undergraduate course, Advanced Statistics Graduate course, and Research Methods Graduate course. This offered a cross-sectional look at undergraduate and graduate as well as qualitative and quantitative course content. The case study of undergraduate and graduate level SI sessions occurred by using observations, student survey data, and hard data (persistence and grade distribution) with a purposeful random sampling. The following associated SI sessions were used for this study: in the undergraduate school—finance and accounting (BUS3060); in the graduate school—advanced statistics (PSY7625) and research methods (PSY7650).

During the Research Methods graduate SI session, opportunities for the SI Leader to develop critical thinking were observed, which meant a minor change by the SI Leader—reconstructing questions. The SI Leader was not taking the students past comprehension (level 2); they were not reaching a higher order of thinking needed for critical thinking (Halpern, 1998) in a graduate level course. Table 2 represents questions of opportunity for the SI Leader, which demonstrates how critical thinking can be integrated in a simple manner—through appropriate construction of questions.

Table 2

Opportunity Questions from an Observation for the SI Leader of a Graduate Level Course So Students Can Reach Higher Order Critical Thinking

Level	Level Name	Question
Level 2	Comprehension	What can you say about the topic?
Level 3	Application	What questions would you ask in an interview with a generation Y member to support the research problem?
Level 4	Analysis	What would the assumptions be for this research problem?
Level 5	Synthesis	What would be your expected results?
Level 6	Evaluation	How would you justify your intended methodology?

The second SI session observed was for undergraduate Business, which incorporated finance and accounting. It was expected that critical thinking would reach analysis (level 4) based on survey

data and that this was a Bachelor’s level course. It was found that the SI Leader presented an income statement that purposely contained errors and that students were asked to identify the errors. Because students were correctly answering the questions, the SI Leader assumed she was incorporating critical thinking when in fact it occurred at level 1 of Bloom’s Taxonomy—list the errors. While identifying the mistakes can involve a degree of application (level 3), higher order critical thinking stalled because the students were asked to list the errors and then move on. Table 3 represents the opportunities noted to elevate critical thinking.

Table 3

Opportunity Questions from an Observation for the SI Leader of an Undergraduate Level Course So Students Can Reach Higher Order Critical Thinking

Level	Level Name	Questions
Level 2	Comprehension	Why do you think that we need to double underline “Net Income”?
Level 3	Application	What would result if incorrect accounting was not acknowledged?
Level 4	Analysis	Why do you think it is important to ensure that each transaction is properly documented under the correct account?

The third observation was of a graduate level SI session—Advanced Inferential Statistics. At this level, a 700-level course, it was expected that critical thinking would reach the evaluation level of Bloom’s Taxonomy (level 6). The realization was that instructional strategies were reduced to a demonstration of how to solve the problem whereby the SI Leader offered an explanation of how to perform every step. In this manner of “show and tell,” learning was reduced to lower-order thinking—the memorization of calculation processes and answers, which was representative of knowledge (level 1). In reality, critical thinking strategies ranged within the lower order and up to analysis (level 4) and sometimes a hint of synthesis (level 5). For a graduate level SI session of this magnitude it should be reverse—a hint of lower order. Table 4 shows the opportunities found for this SI Leader, which again represent a simple change in construction of

questions being asked by the SI Leader to the students.

Table 4

Opportunity Questions from an Observation for the SI Leader of a Graduate Level Course So Students Can Reach Higher Order Critical Thinking

Level	Level Name	Questions
Level 4	Analysis	What evidence can you find to support using ANOVA?
Level 5	Synthesis	How would you design this using a stratified sampling?
Level 6	Evaluation	How will you defend your conclusion / point of view?

Discussion

It is undeniable that successful planning of any type of pedagogy, such as SI, can serve as the scaffolding to enhance critical thinking through the incorporation of ideas and strategies that represent the ways students organize knowledge and learn (Halpern, 1998). However, to transfer critical thinking skills through learning, SI Leaders must have sound critical thinking skills themselves and professional knowledge (Yeh, 2009) SI Leaders demonstrated professional knowledge through content knowledge of the particular subject matter. Conversely, the SI Leader’s pedagogical knowledge of selecting appropriate questioning techniques using Bloom’s Taxonomy was not effective.

Integrating Paulian critical thinking with Bloom’s Taxonomy, Appendix B demonstrates the flow of the Paulian theory to cognitive ability to Bloom’s Taxonomy. Through observations it was found that none of these factors were being incorporated in the SI sessions even though the idea that it was occurring was present; this really challenged perceptions and assumptions. SI Leaders were not being explicit with directly stating to students that they would be learning to think critically; it was an erroneous assumption. A specific critical thinking model had not been incorporated, such as Bloom’s Taxonomy, and if this was not established then how were students to think critically? Further, the realization that the right questions were not being asked led to the conclusion that higher order critical thinking skills were not being integrated in the SI sessions. Finally, SI Leaders

offered the majority of the explanations and provided less practice for the students, which was in direct conflict of allowing students to think critically.

Prior to this investigation, the assumptions and perceptions were based on data. Because of the convergence of these assumptions with perceptions, it was theorized that critical thinking throughout the SI program was being promoted. It was an error to assume that SI Leaders understood critical thinking and how to incorporate it (Yeh, 2009). Through critical thinking research, it was found that not all SI Leaders understood the full meaning of critical thinking and its impact on students and their learning and thus most were not reaching a higher order level of thinking. Just asking questions was not sufficient. Questions must be constructed correctly according to Bloom's levels to elicit the correct response. Higher order skills, such as analysis and synthesis, are often needed for critical thinking to occur (Halpern, 1998). SI Leaders sometimes struggle with crafting good critical thinking questions that get at the heart of the problem and challenge thinking.

Encouraging peer-to-peer interaction and student learning furthers this enhancement of critical thinking skills and comes full circle with student independent practice (Halpern, 1998; Yeh, 2009). This process is in direct correlation with Paul (2011) who stated that to have critical thinking one must have explicit instruction, using a specific model for critical thinking, and providing instruction and practice using that model in how to think critically. SI sessions that can focus on application and practice of critical thinking through strategies used by the SI Leader and practiced by the students should support the Paulian theory that explicit instruction improves student performance and knowledge. It should also be noted that these three steps should occur in order; for instance, students cannot practice critical thinking if they are not given a model to use.

Conclusion

Not all courses offered the opportunity for higher order critical thinking, not because of the course but due to the lack of pedagogical knowledge and planning by the SI Leader. SI Leaders needed to incorporate Paulian's three-fold process of critical thinking (telling

the students they will be thinking critically, using a specific model, and providing instruction and practice). Yeh (2009) supports this type of direct-instruction model of incorporating pedagogical skill for critical thinking. Online communities that use collaboration can enhance the effectiveness of e-learning integration. SI is one such type of online community that not only offers the chance for learning collaboration but also provides a social community (Ashwin, 2003). However, students need to be encouraged, held accountable for their learning, and allowed the opportunity for reflection in order to have critical thinking skills learned (Yeh, 2009). Such integration is necessary for students when it is expected that they will use these skills for future courses and in everyday life (Maclellan & Soden, 2012).

This case study imparted a perception versus reality check; the perception was that critical thinking was occurring in online SI, based on data and student self-assessments, but in reality, it was not. Further, through observations, it was realized that hard data did not offer a complete picture; the qualitative nature of the observations revealed that measuring the construct critical thinking needed to be evaluated through observations. As a result, training on what critical thinking really is and how to integrate it into the online SI program will be developed and implemented.

The lessons learned from this investigation created short and long term plans for the online SI program. First, end of course evaluations needed to change to reflect appropriate verbiage. The questions were not explicit for the students, and purposeful questions were not being asked; this explains why students answered so strongly that they were learning critical thinking skills. Also, the critical thinking survey questions needed to be revised to alleviate possible misinterpretations of defining critical thinking. Because observations offer critical value, it was recognized that a self-observation form was necessary for SI Leaders to reflect on their own sessions.

While research has been able to show that SI consistently establishes a positive impact on student performance (University of Missouri, 2007), less research has investigated online SI as well as critical thinking in an online SI program. This investigation not only helped fill that gap but also changed the SI Leader paradigm from imparting knowledge to providing direction for critical thinking skills.

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Appendix A

Critical Thinking SI Observation Form

SI Leader Name: _____

Course Name: _____

Program Level: ☐ Graduate-Level ☐ Upper-Level Undergraduate ☐ Lower-Level Undergraduate

Course Type: ☐ Quantitative ☐ Qualitative

		Bloom’s Taxonomy <i>Use action verbs to describe instructional strategies.</i>	Instructional Strategies <i>Design explicit strategies that promote critical thought.</i>	Online Tools & Techniques <i>Use tools and techniques that enhance instructional strategies.</i>
Higher-Order Thinking	Graduate-Level	Level 6 Evaluation		
		Level 5 Synthesis		
	Upper-Level Undergraduate	Level 4 Analysis		
		Level 3 Application		
Lower-Order Thinking	Lower-Level Undergraduate	Level 2 Comprehension		
		Level 1 Knowledge		

Appendix B

Paulian Theory	Cognitive Ability	Bloom's Taxonomy
Gather <i>relevant</i> information <ul style="list-style-type: none"> • Generate purpose • Raise questions 	<ul style="list-style-type: none"> • Clarifying issues, conclusions, or beliefs • Questioning deeply: raising and pursuing root or significant questions • Practicing Socratic discussion: clarifying and questioning beliefs, theories, or perspectives • Reading critically • Distinguishing relevant from irrelevant facts 	Knowledge Comprehension
Make <i>logical</i> inferences <ul style="list-style-type: none"> • Use information • Utilize concepts • Make inferences 	<ul style="list-style-type: none"> • Comparing and evaluating perspectives, interpretations, or theories • Comparing analogous situations: transferring insights to new contexts • Generating or assessing solutions • Refining generalizations and avoiding oversimplifications • Making plausible inferences, predictions, or interpretations 	Application Analysis
Generate <i>justifiable</i> assumptions <ul style="list-style-type: none"> • Make assumptions 	<ul style="list-style-type: none"> • Giving reasons and evaluating evidence and alleged facts 	Analysis
Follow out implications <i>logically</i> <ul style="list-style-type: none"> • Generate implications • Embody point of view 	<ul style="list-style-type: none"> • Noting significant similarities and differences • Thinking precisely about thinking: using critical vocabulary 	Synthesis
Check information for accuracy	<ul style="list-style-type: none"> • Developing criteria for evaluation: clarifying values and standards • Evaluating the credibility of sources of information • Analyzing or evaluating actions or policies 	Evaluation

Book Review: *Academic Transformation*

Sellers, Dochen & Hodges, eds. 2015. *Academic Transformation: the road to college success – Third edition*. Pearson Education: Boston, MA.

Reviewed by Diana Garland

The textbook opens with a prechapter entitled “Packing the Essentials” and packed it is. Even before the first chapter the authors provide exercises and succinct information for students regarding such topics as the student’s attitude, commitment, and reflection; self-care and time management; testing strategies; even how students should check their course management systems or email on a daily basis. I feel the “Essentials” prechapter is one of the strongest features of this text.

Throughout the book the authors connect current theory and research from neuroscience, education, educational psychology, cognitive psychology, and related fields to practice in each of the student friendly chapters. It is clear that the three author’s experience in Student Learning Centers and teaching learning frameworks courses will be beneficial to students using this text.

Although not provided for this review the book is supported with an online instructor’s manual and online PowerPoint presentation slides. The authors assert that by utilizing the access to MyStudentSuccessLab students can become more engaged in their own personal and professional development with exercises linked to the textbook chapters.

The book is arranged similarly to most textbooks for first-year student success courses with a topic related case study and opening focus questions guiding students toward the learning objectives. A nice reminder is included on the first page of each chapter about how

MyStudentSuccessLab can help the student develop skills to succeed. Within the chapters the authors have provided exercises and figures to further student understanding of the chapter topic. Each chapter ends with a very brief summary, key concepts, and a thinking critically section. With the exception of chapter 1 the thinking critically section of each chapter also include a “Challenge Question” that requires more self-reflection of the student’s personal traits to the chapter content. Another nice touch to this book is “The Last Word” at the end of each chapter. Here one of the three authors provides a sentence or two personal reflection about the subject matter of the chapter. For instance, in chapter 7, Establishing Direction in Your Life, Dr. Russ Hodges writes, “My fantasy growing up was to be world famous. As I grow older, I dream of leaving this world a better place than I found it.”

The first chapter does a good job setting the foundation for the academic transformation of the student to an autonomous learner. Here the authors identify and explain what they believe are the seven characteristics of autonomous learners and therefore successful college students. The remaining eleven chapters contribute to this academic transformation by mixing theories of Bloom (Taxonomy of educational objective), Gardner (Theory of multiple intelligence), Perry (Theory of cognitive and moral development), Chickering (Vectors of student development) and student success skills (note taking, time management, academic listening and reading, studying, stress management, dealing with anxiety and procrastination, goals, motivation and willpower). While most of the book is easy to follow there were a couple of places where the academic nature of the book might lose a few students. However, with less than 250 pages and only 12 chapters completing the book, self-assessments and exercises during a normal college semester is achievable.

I believe first year students and faculty teaching learning frameworks would enjoy using this textbook and supplemental material.

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Book Review: *Teaching Graphic Novels in the Classroom*

Novak, R.J. (2014) *Teaching Graphic Novels in the Classroom: Building Literacy and Comprehension*. Waco, TX: Prufrock Press, Inc.

Reviewed by Michael Frizell, Editor

Though Ryan Novak's whimsical and intelligent book, *Teaching Graphic Novels in the Classroom*, is intended for use in high schools as it aligns with the common core standards, I believe institutions of higher education may find the book useful and informative. Teachers teaching graphic novels as literature is on the rise, and comic books are enjoying a renaissance in popularity thanks to the dominance of superhero movies at the box office. While recognizing the super-heroic roots of the medium, Novak divides the book in a smart way that ultimately makes the book required reading for those interested in the genre.

The first chapter of the book is dedicated to history, describing the dawn of the medium as it matured into graphic fiction and non-fiction, profiling the experts of the craft while cementing their legacies in the formation of this burgeoning field. Chapters two through eight focus on the varied genres inherent in graphic fiction, describing the superhero, fantasy, science fiction, manga, fiction, biography/memoir, and the teenage experience angles of writing graphic literature. The chapters take the form of a workbook, allowing guided practice in the various genres that the writing consultants of any Writing Center would find valuable while instructors will find assistance in engaging reluctant readers. The clever illustrations, drawn with heavy pen by Zachary Hamby, engage the reader and offer clear demonstration of the craft.

Graphic novels are often dismissed, their relevance in the

classroom thought of as “less than” when compared to other forms of literature. I find that somewhat dismaying. This combination of literature and artistic expression could aid visual learners in picturing a moment, thus strengthening their ability to visualize what they read. In the preface, Novak writes that *Teaching Graphic Novels in the Classroom* is “a textbook that presents a wide array of graphic novels as they deserve to be presented...as literature to be read and discussed.” I can’t agree more, especially when it comes to those in the biography and memoir category.

On the surface, such a book may be seen as fitting with the mission of a learning center. Indeed, there may be those of you reading this that feel graphic novels have no place in academia. Colleagues have stated that the teaching of a comic book is more proof we are dumbing down course content. I urge you to look at the class offerings at your home institution. You will find that graphic novels are being taught in the English department, the education department, the art department, and more. The act of writing a script for a comic book is akin to playwriting or screenwriting, and genre writers use Writing Center’s as frequently as academic writers. If you find the act of writing or reading a graphic novel confusing or daunting, buy this book.

Pertinent Publishing Parameters

The Learning Assistance Review (TLAR), the national peer reviewed official publication of the National College Learning Center Association (NCLCA), publishes scholarly articles and reviews that address issues of interest to learning center professionals (including administrators, teaching staff, faculty, and tutors) who are interested in improving the learning skills of postsecondary students. Primary consideration will be given to articles about program design and evaluation, classroom-based research, the application of theory and research to practice, innovative teaching and tutoring strategies, student assessment, and other topics that bridge gaps within our diverse profession.

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- Topics: TLAR will accept manuscripts that address our purpose: to publish scholarly articles and reviews that address issues on program design and evaluation, classroom based research, the application of theory and research to practice, innovative teaching and tutoring strategies, student assessment, etc.
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The National College Learning Center Association (NCLCA) is an organization of professionals dedicated to promoting excellence among learning center personnel. The organization began in 1985 as the Midwest College Learning Center Association (MCLCA) and “went national” in 1999, changing the name to the National College Learning Center Association (NCLCA), to better represent its nationwide and Canadian membership. NCLCA welcomes any individual interested in assisting college and university students along the road to academic success.

NCLCA defines a learning center as a place where students can be taught to become more efficient and effective learners. Learning Center services may include tutoring, mentoring, Supplemental Instruction, academic and skill-building labs, computer-aided instruction, success seminars and programs, advising, and more.

Join NCLCA

NCLCA seeks to involve as many learning center professionals as possible in achieving its objectives and meeting our mutual needs. Therefore, the NCLCA Executive Board invites you to become a member of the Association.

The membership year extends from October 1 through September 30. The annual dues are \$50.00. We look forward to having you as an active member of our growing organization.

Membership Benefits

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- Discounted registration for the Fall Conference and for the Summer Institute
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Complete an application and send it with your dues payment to the NCLCA Membership Secretary. Be sure to check whether you are a new member or are renewing your membership. If you are renewing your membership, please provide updated information.

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