

THE
LEARNING
ASSISTANCE
REVIEW

Journal of the National College Learning Center Association



NATIONAL
COLLEGE LEARNING CENTER
ASSOCIATION

NCLCA

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 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.

Editor

Michael Frizell
Director of Student Learning Services
Bear CLAW (Center for Learning and Writing)
Missouri State University

Layout & Design

Meghan Smith
Missouri State University

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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2016-2018**

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Letter from the Editor

I love words and enjoy challenging myself to write better each time I set my mind to writing. My life as a logophile stems from the joy of cracking open a new book, smelling the pages, feeling the rough paper between my fingers, and finding myself lost in the paragraphs.

As a child, I learned to read earlier than most, spurred by my fascination with Star Trek, monster movies, and comic books. My father, a Navy Vietnam veteran, understood the power of education and encouraged my voracious appetite for words by purchasing any paperback that caught my eye, despite that many of them were never meant for my age group. I read William Peter Blatty's *The Exorcist* in second grade, movie tie-ins like Roger Corman's *It's Alive!* (featuring a mutant infant transformed into a killing machine by fertility drugs - a novel written in the aftermath of the thalidomide scare), and *Grizzly* (complete with the tagline, "18 feet of gut crunching, man-eating terror!" and featuring a bear so large that it attacks a helicopter in a climactic scene written decades before *Sharknado*).

By junior high school, I found it hard to relate to people. It didn't help that while my peers grew tall, sprouted wispy facial hair, and filled out, my asthma prevented me from enjoying the rigors of the gym or the competition on any court or field where the hallowed sport is played. On the rare occasion I was approached by a member of the perfumed, fairer sex, the vast vocabulary lent to me by reading a steady diet of Stephen King, Terry Brooks, Alan Dean Foster, and Arthur C. Clarke failed me in spectacular ways. I seemed to find the top of my shoes more fascinating than the intoxicating blue eyes of the woman standing before me. My shyness wasn't isolated to the opposite gender as I soon discovered I suffered from glossophobia (a fear of public speaking). My case was so profound that, after delivering a speech, my teacher smiled, cleared the class, and asked

me, “Were you formerly a stutterer?”

“Y-yes,” I muttered as I scampered out of the room. I bought a copy of Ira Levin’s *Rosemary’s Baby* and *The Cave Girl* by Edgar Rice Burroughs and withdrew into their pages.

I was, in the vernacular of the modern teen, a hot mess - or is that too millennial? I needed help if I ever hoped to hold down a meaningful job, ask a girl on a date, or even inquire to the stocking associate in K-Mart on what aisle cat litter was stored. In my brief flirtation with public speaking, I remember how vibrant actors at my high school seemed. They stood in front of hundreds, showed no fear, and exuded confidence. It was decided: I would enroll in a speech and debate class my freshman year.

My teacher, Mary Overholser, as diminutive as she was talented, threw me head first into the deep end – improvisational duet. “You like words, like to write,” she said, ignoring my pleas for mercy. “Think of this as writing without paper.” When I cocked my head like a startled poodle, she said, “Just say the words you’d normally write out loud.” By my sophomore year, I was competing in improvisation, duet, dramatic solo, and humorous solo acting, poetry, and extemporaneous speaking despite the fact I failed to break for semi-finals for two years. Then, it happened – I’m still not sure how. I started to win. I swept tournaments. I was cast in a few high school plays. By my senior year, received a one rating at state in duet acting and in both dramatic and humorous acting.

I even scored a few phone numbers.

Today, I hold a BA and MA in theatre, a MA in creative writing, and a MFA in creative nonfiction. I’ve performed in perhaps a hundred plays, been featured as a comedian, a public speaker at dozens of conferences, and teach at Missouri State University. I direct the In-School Players, a troupe that performs for area school children. I write professionally for a comic book company and edit this research journal. I owe my successes to patient teachers who saw something in me that I didn’t see. They taught me to embrace the words I loved.

It is with pleasure that I present the work of fellow logophiles Misty L. Knight, Karen G. Johnson, Frances Stewart, Mark E. Walvoord, Jacob D. Pleitz, Cherie Ichinose, Jennifer Clinkenbeard, Luann Walker, Ellen Toby, Timothy P. Scott, David Migl, Elizabeth Kilodzeij, and Debra Fort.

Best,
Michael Frizell
February 17, 2016

National College Learning Center Association 2014 Survey Report

Marcia Toms
Edited by David Reedy

NCLCA 2014 Benchmarking Survey

The material in this article is a compilation of the results of an NCLCA study conducted by Dr. Marcia Toms under the auspices of NC State University which came from 211 unique institutions during the Spring of 2014. Invitations to complete the survey were sent to all past and present NCLCA members as well as to national listservs. The survey questionnaire was based on previous NCLCA surveys and the Writing Center Research Project survey (Griffin, Keller, Pandey, Pedersen, & Skinner, n.d.; Truschel & Reedy, 2009).

The intent of this article is to provide a baseline for center administrators to use when assessing their operations. Additionally the outcomes have provided the association with topics of interest identified as a future trend by respondents. The survey and full breakdown of responses are available to NCLCA members at www.NCLCA.org.

Location

Learning centers were coded based on the state of their institution according to US Census Maps (U.S. Department of Commerce, n.d.). The largest percentage of responses came from the South and the Midwest (see Table 1).

Table 1
Learning Centers by Region

Region	Sub-region	Number of Learning Centers
Midwest	East North Central	42
	West North Central	17
North East	New England	11
	Middle Atlantic	37
South	East South Central	11
	South Atlantic	44
	West South Central	26
West	Pacific	14
	Mountain	11
Canada		3

Institution Type

Next, the responses were divided by Carnegie classification (Center for Postsecondary Research, n.d.).

Table 2
Learning Centers by Institution and Funding Type

Institution Type	Public	Private	For Profit
2-year	60	1	1
4 year liberal arts	13	36	
4-year comprehensive	23	12	2
4-year research	38	3	1
Other	2	4	

Age of Learning Center

While two of the responding learning centers were founded before the 1970s, the vast majority were founded in the past 50 years. More than two-thirds of the centers were founded since 1990.

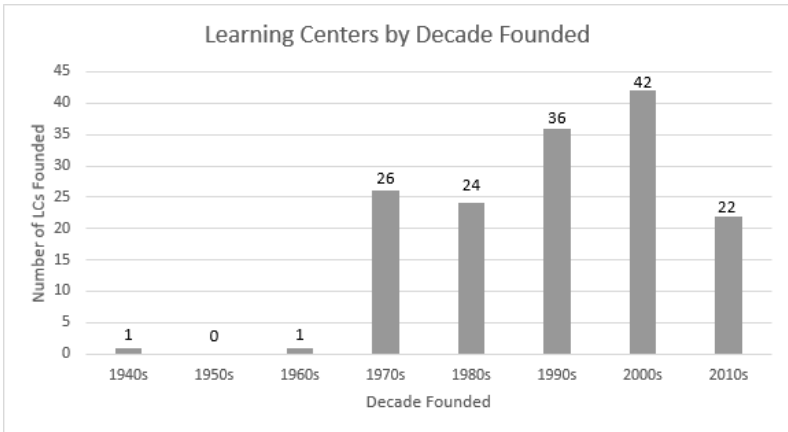


Figure 1. Learning Centers by Decade Founded

Physical Location and Sizes

The majority of learning centers (n=119) occupy only one type of physical location, however many are now providing services in multiple locations, yet administered as one. The remainder of 150 responses include: 2 locations for 23 centers, 3 locations for 7 centers, 4 locations for 2 centers, and 5 locations for 3 centers. The most common locations for a learning center were the library and classroom buildings (See Table 3).

Table 3

Learning Centers by Physical Location

Physical Location	Number of Learning Centers
Library	79
Classroom Building	68
Student Center	21
Free-standing Building	19
Residence Hall	9
Other/Additional	59

When asked about square footage, 112 learning centers responded, with responses ranging from 20 sq. ft to 40,000 sq. ft. The average square footage was 3,972 and the median was 2,000.

Visits per year and Students per year

Data for visits and students per year was requested because institutional academic calendars vary (i.e., quarter, semester, etc...).

The average number of visits per year was 21,635 (N=132), ranging from 200 to 245,000. The median number of visits per year was 10,000. The average number of unduplicated students served per year was 2,853 (N=116), ranging from 175 to 18,000. The median number of unduplicated students served per year was 1,500.

Table 4

Average Visits and unduplicated Students per Year by Institution Type

Institution Type	Average Visits per Year	Average Unduplicated Students per year
2yr	25,659	2,591
4yr Comp	14,295	2,912
4yr Liberal Arts	6,183	1,107
4yr Research	36,522	4,998
Other	10,680	1,233
All Institution Types	21,635	2,853

Types of Services

Tutoring and Study Skills Workshops were the most common services provided. Details about “Other” services included services for veterans/service members, disciplinary services, study abroad, study areas, and conditional admissions programs.

Table 5

Learning Centers by Type of Service Provided

Service	Number of Learning Centers	Percentage of respondents (N=155)
Tutoring	152	98.1%
Study Skills or Learning Strategy workshops/courses	127	81.9%
Supplemental Instruction (SI)	89	57.4%
Services for students on academic probation/warning	89	57.4%
Services for students with disabilities	77	49.7%
Computer lab	74	47.7%
Organization of Study Groups	73	47.1%

Academic Coaching/Counseling	73	47.1%
Services for student-athletes	58	37.4%
Peer Mentoring Programs	46	29.7%
Academic Advising	34	21.9%
Assessment/Placement Testing of Students	28	18.1%
First Year Experience Programs	25	16.1%
Summer Bridge Programs	24	15.5%
Trio Programs	14	9.0%
Personal Counseling	9	5.8%
Financial Aid Counseling	7	4.5%
Career Services	7	4.5%
Other	50	32.3%

Types of Tutoring

Table 6

Learning Centers by Type of Tutoring Offered

Type of Tutoring	Number of Learning Centers	Percentage of respondents (N=151)
Drop in	126	83.4%
Small Group Tutoring	122	80.8%
One-on-one appointments	120	79.5%
SI	81	53.6%
Online Asynchronous	54	35.8%
Online Synchronous	49	32.5%
Other	16	10.6%

Other types of tutoring included by respondents include exam reviews, weekly course reviews, course-embedded tutoring, and large-group drop-in tutoring.

While sessions ranged from 15 to 270 minutes in length, the average session length was 52 minutes (N=144). The mode (most often length) was 60 minutes.

Other Tutoring Programs

Two thirds of the respondents (N=151) indicated that there was at least one other tutoring or learning center at their institution. These include population specific tutoring programs such as athletics, TRiO, 1st generation student centers, multicultural student centers, disability centers, and programs for provisionally admitted students. The other major sources of additional tutoring programs were departmental specific programs.

Institutional Affiliation

Learning centers are located within a variety of organizational areas at an institution. Of the 150 responses, learning centers were affiliated with Academic Affairs 60% of the time, Student Affairs 23%, and with a specific academic division, college, or schools 14%, and the remaining 3% in other locations such as Enrollment Services or a joint academic and student affairs department.

Funding

Most of the learning centers are funded as a budget line item. Other sources of funding include: Federal Work-Study dollars; donations and support from other colleges, departments and/or Student Government; and private (1-time) donations.

Table 7

Learning Centers by Funding Source

Funding Source	Number of Learning Centers	Percentage of respondents (N=148)
Budget Line Item	138	93%
Grant Money	32	22%
Student Fees	25	17%
Endowment	12	8%
Other	24	16%

Staffing

Table 8 shows who the learning centers utilize to serve as tutors, SI leaders, and peer mentors.

Table 8

Tutor, SI Leader and Peer Mentor Descriptive Statistics

		Respondents	Ave	Min	Max
Tutors/SI Leaders	Undergraduate	145	51.6	0	400
	Graduate	120	3.9	0	65
	Faculty	109	5.9	0	467
	Professional	117	5.7	0	75
	Volunteer	105	1.2	0	35
Peer Mentors	Others	10	36.6	16	60
		125	4.7	0	85

Regarding professional and administrative staffing, the most common model included one full-time professional employee and one full-time administrative employee.

Table 9

Professional and Administrative Staffing Descriptive Statistics

		Respondents	Ave	Min	Max
Professional (Non-Tutor) employees	Full-Time	146	3.6	0	28
	Part-time	124	3.8	0	86
Administrative employees	Full-Time	139	1.4	0	21
	Part-time	118	0.5	0	7
Student Workers	Graduate Assistants	119	1.7	0	15
	Undergraduates	143	10.5	0	145

Compensation

Hourly wages were the most common compensation for tutors. Other types of compensation included volunteer/internship credit hours and a dedicated quiet study area.

Table 10*Learning Centers by Type of Compensation offered to Tutors*

Type of Compensation	Number of Learning Centers	Percentage of respondents (N=151)
Hourly Wage	145	96.0%
Work Study	71	47.0%
Stipend	14	9.3%
Course Credit	10	6.6%
Tuition Remission	9	6.0%
Course Release	2	1.3%
Other	5	3.3%

Directors

There were 147 responses identifying they were directors of Learning Centers. Most directors (n=138) enjoy a full-time position. Part-time positions were spread across large 4-year institutions (n=3), small 2-year institutions (n=1), and very large 2-year institutions (N=2).

Part time positions were 6-30 hours per week. Notably, one of the part-time respondents held a faculty position with 6 hours of release time per week to work in the center but the actual hours the director spends in the center is approximately 35 hours/week. Over half of the director positions are devoted entirely to the learning center (see Table 11).

Table 11*Learning Centers by Percentage of Position Devoted to Learning Center*

Percent of position in LC	N	Percentage
1-25	6	4%
26-50	14	10%
51-75	23	16%
76-95	22	16%
100	75	54%

Of the 147 responses, the majority of directors reported having a 12 month contract (80%), with 8% having 11 month, 9% having 10 month, and 3% having 9 month contracts. The average length of time in the position was 6.85 years with a maximum of 28 years, as well as an average of 18 years in higher education and a maximum of 43 years. Concerning the nature of appointments, 86% were considered professional staff, 5% tenured faculty, 1% faculty in tenure track, and 8% non-tenure track faculty. Additionally, highest level of degree held was reported as 5% Bachelor, 65% Master, 27% Doctorate, and 3% other including law degrees and ABD. Almost half of learning center directors have degrees in Education (see table 12).

Table 12
Learning Centers by Director's Degree Field

Director's Degree Field	Number of Learning Centers	Percentage of Respondents (N=130)
Education	62	47%
Liberal Arts and Humanities	40	30%
Social Science	12	9%
Counseling	6	5%
Natural Sciences	6	5%
Management	2	2%
Law	2	2%

Trends and Growth

Common themes emerged concerning growth and trends. Respondents were primarily concerned with continuing budget restrictions. Many also saw a growing connection between assessment, accountability and funding. The need to keep up with changes in technology was another major trend.

Finally, respondents were observing changes in the students they serve. Many noted that the changes in developmental education occurring across the country affected what services they need to provide. Many also noted the increased numbers of students with

disabilities and underprepared students arriving at their institutions.

When asked how their learning center will change over the next five years, many saw growth regarding the number of students served and new modalities to serve them. Many also identify a move towards a “commons approach” with multiple services being joined which caused some of the respondents to fear such moves would put their learning centers at risk because of duplicate services.

References

- Center for Postsecondary Research. (n.d.). Carnegie Classifications | Standard Listings. Retrieved January 29, 2015, from http://carnegieclassifications.iu.edu/lookup_listings/standard.php
- Griffin, J. A., Keller, D., Pandey, I., Pedersen, A.-M., & Skinner, C. (n.d.). Local practices, institutional positions: Results from the 2003-2004 WCRP National Survey of Writing Centers. Retrieved February 5, 2008, from <http://coldfusion.louisville.edu/webs/a-s/wcrp/reports/analysis/WCRPSurvey03-04.html>
- Truschel, J., & Reedy, D. L. (2009). National survey: What is a Learning Center in the 21st Century? *Learning Assistance Review*, 14(1), 9–22.
- U.S. Department of Commerce. (n.d.). Census Regions and Divisions of the United States. Retrieved January 29, 2015, from http://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

Book Review: *Completing College: Rethinking Institutional Action*

Tinto, V. (2012). *Completing College: Rethinking Institutional Action*. Chicago: The University of Chicago Press.

Reviewed by Debra Fort, Ed. D.

Although the number of students attending college has doubled in the last forty years, half of those students do not graduate within the first six years of enrollment. In his new book, *Completing College: Rethinking Institutional Action*, Vincent Tinto seeks to move from the “why are they leaving” question to the “how can we get them to completion” answer. Tinto analyzes great quantities of data to identify essential components of university completion.

Findings can be summed up in three main components: goals, policies, and actions. Institutions must establish a climate containing clear and high expectations for success. Academic and social support must be combined with frequent assessment. Providing feedback about performance, and finally, active involvement with others on campus complete the goals. Tinto points out that while it is the students’ responsibility to do their part to be successful, the university has a shared responsibility in establishing a climate that promotes student success. Each of the conditions, with appropriate actions, is discussed in separate chapters.

Tinto’s second component is policies. The institution must accurately reflect the systemic nature of the available programs and align all of its members and the actions of the various components toward the same goal—the successful completion of the degree. Chapter 6 discusses the types of policies that must be adopted and implemented for sustainability.

Finally the author explores the actions that the university must implement in order to increase retention and graduation of students. Institutions must behave in an intentional, systemic, and structured

manner. Faculty, student affairs staff, and administrators are equally responsible for enhanced student success that leads to completion.

Tinto provides a list of items that institutions should do to increase completion. They include:

1. Establish a cross-functional team comprised of administrators, support staff, and faculty whose main task is to oversee institutional planning and action designed for student success.
2. Assess student experiences and establish progression patterns at benchmark points.
3. Invest in long-term program developing with continuous assessment of programs and how the institution functions.
4. Align actions to each other and to benchmark points identified by analyzing data.
5. Establish and utilize early warning systems for key first-year courses that provide feedback and trigger support.
6. Provide learning community experiences to all first year students.
7. Provide advising to all new students and to individual students when they change majors.
8. Provide professional development to all faculty, particularly to new faculty and those who teach the key first-year courses.

The challenge before us is great. As an institution, we must ask ourselves, how are we meeting each of the eight items listed? Do we see them as unsurmountable challenges or opportunities for success? A great beginning point would be to focus at the classroom level. It is the pivotal point where change can happen. In order to make significant gains in graduation rates, we must focus on student success, enrich the classroom experience, and align the classroom experiences to each other as to have a coherent pathway that leads to completion.

Persistence to graduation is a moral obligation we each have to our students. This book provides a synthesis of the latest available research, and describes many practical solutions which institutions can tailor to their students that will lead to increased completion rates. Tinto has laid the framework for us. We have to make a collaborative commitment to reframe our efforts toward our students that will ultimately lead to success in life by obtaining knowledge and skills that lead to the degree.

Reducing Student Apprehension of Public Speaking: Evaluating Effectiveness of Group Tutoring Practices

Misty L. Knight, Karen Gabrielle Johnson, and Frances Stewart
Shippensburg University

Author Note

Correspondence concerning this article should be addressed to Misty L. Knight, Department of Human Communication Studies, Shippensburg University, Shippensburg, PA 17257. Phone: 717-477-1767. E-mail: mlknight@ship.edu

The authors wish to express our gratitude to Michael L. King and Joy Smithson from the University of Southern Mississippi for their work as speech evaluators in this study. Through their evaluations, we were able to obtain reliable and valid results from our research sample.

Building Strong Communication Skills: Evaluating Effectiveness of Interventional Strategies

Communication anxiety impacts individuals both emotionally and physiologically. Specifically, the fear of public speaking caused by “the threat of unsatisfactory evaluations from audiences” is cited as one of the chief apprehensions for Americans (Schlenker & Leary as cited in Bodie, 2010, p. 71). Individuals with communication anxiety may experience changes in blood pressure and heart rate as well as other symptoms such as sweaty palms, gastrointestinal issues, and numbness of body sensations (Bodie, 2010).

Research indicates that the fear of public speaking is an extraordinarily common phobia and that a significant portion of the population experiences some form of anxiety over public speaking. Earlier research on communication anxiety and apprehension from Richmond and McCroskey (1998) found at least 70% of all people

suffer while more recent examinations suggest that the number is closer to 61% (Dwyer & Davidson, 2012). Despite the difference in findings, the percentage of those who suffer with Communication Apprehension (CA) is significant. If these numbers are accurate, university professors are more likely to work with students who suffer with this fear but still need to build strong communication skills. Because strong communication skills are crucial to students' personal, academic, and professional success (Gunn, 2007; Morreale & Pearson, 2008; Rubin, Graham, & Mignerery, 1990), professors will need to integrate research-based strategies that can help students achieve success. Although there is a great deal of research available on the etiology of public speaking anxiety, Bodie (2010) finds that there is far less research available on interventional strategies to help these students succeed. Remarkably, Bodie's research appears to be the most recent to provide insight into this concern; therefore, it is essential to develop our understanding of CA by examining interventional strategies that may help sufferers. This study helps bridge this research gap by evaluating the effectiveness of interventional strategies embedded within a public speaking course.

Literature Review

Communication apprehension, instruction, and speech practice methods all influence students' ability to improve their public speaking skills. We will first explain CA and its impact on students in basic communication classes. Next, we will highlight attributes of effective communication instruction and its impact on students' success. Current speech practice methods and their application by instructors will be discussed. Finally, we will examine the value of speech tutoring strategies to improve students' attainment of oral communication proficiencies.

Communication Apprehension. Early on, those who were afraid of public speaking were often labeled with terms such as "stage fright." However, scholars as well as mental health professionals recognized that the apprehension and anxiety felt by sufferers extended beyond a simple case of nerves. CA is described as "an individual's level of fear or anxiety associated with either real or anticipated communication with another person or persons"

(McCroskey, 1977, p. 78). Groundbreaking avenues of understanding were opened in 1970, when McCroskey first developed the Personal Report of CA (PRCA), a 20-item scale measuring communication behaviors. The 1970 scale was revised in 1978 to a 24-point scale, the PRCA-24 (McCroskey, Beatty, Kearney, & Plax, 1985). These scales allowed users to measure the degree of apprehension that impacted “approach or avoidance behaviors across a variety of communication situations” including public speaking (Kearney & McCroskey, 1981, p. 153).

The reasons for the existence and depth of CA vary. Many scholars attribute such apprehension, at least in part, to heredity (Beatty, McCroskey, & Heise, 1998; Beatty & Valencic, 2000). Other scholars approached CA through a theoretical lens applying uncertainty reduction theory (Witt & Behnke, 2006). Uncertainty reduction theory “focuses on communicators’ level of comfort speaking in unfamiliar or unpredictable contexts” (Roby, 2009, p. 608). Regardless of the reasons for the existence of CA, communication skills are accepted as directly associated with student learning and, therefore, are critical to student success (McCroskey, Richmond, & McCroskey, 2002). Therapists have experienced some level of success with using Cognitive Behavioral Therapy in groups to treat anxiety related to public speaking (Price & Anderson, 2012), but this is not a solution widely available to college students. However, communication instructors can apply similar principles to developing their courses and assisting their students.

Communication Instruction and Student Success. The importance of strong communication skills to personal, academic, and professional success is strongly supported by research, (Gunn, 2007; Morreale & Pearson, 2008; Rubin, Graham, & Mignerery, 1990). Unfortunately, students’ academic achievement is negatively impacted by reduced opportunities to practice communication skills in the classroom (McCroskey, Richmond, & McCroskey, 2002). Cronin, Grice, and Palmerton’s (2000) study on the effectiveness of oral communication across-the-curriculum programs found that many non-speech instructors are not equipped through training or do not possess foundational knowledge in communication theory and practice, which presents obstacles to implementing adequate across-

the-curriculum programs. Even in public speaking courses intended to directly develop communication skills, professors who encourage students to practice speeches do not necessarily detail the practice strategies or indicate the effective, research-based practice methods students should employ (Smith & Frymier, 2006). Professors' hesitancy to recommend practice strategies may be due to their lack of knowledge about particular strategies that are effective, which demonstrates a critical need to identify speech practice methods that provide the best opportunities for students to develop their communication skills.

To determine whether speech practice is effective, one must evaluate the final speech presentation; however, concretely measuring traits that constitute improvement and attainment of desired communication skills is challenging (Rubin, Rubin, & Jordan, 1997). Rubin, Rubin, and Jordan note that accurate measurement of the link between success and strong communication skills is extremely challenging due to the difficulty in measuring true attainment and retention of communication skills, improvement in student confidence levels, and in measuring what ultimately contributes to the student's success due to the innumerable factors that are difficult to isolate for attribution. A common theme through the existing body of literature indicates that learning outcomes can be utilized as evidence for determining students' improvement in achievement of competencies, even though methods for finitely measuring students' achievement is difficult. Thus, creating an appropriate framework to examine learning outcomes is needed so instructors can definitively recommend the most effective speech practice methods.

Speech Practice Methods. Research on the effectiveness of different methods for practicing speech practices is difficult to ascertain (Smith & Frymier, 2006). Rubin et al. found that the use of exercises, both in and out of class, directed toward improving overall communication skills shows mixed results in terms of impact for students. However, other studies have revealed that practice does lead to improvement in students' overall speech delivery skills. Ayres, Schliesman, and Sonandre' (1998) conducted research on the effectiveness of speech practices and found significant differences between groups of students who practiced and those who did not

practice their speeches in class. In their research, students completed a series of self-report assessments regarding communication competence and apprehension, which revealed that speech practice in front of peers “is associated with reduced apprehension and a higher degree of willingness to deliver speeches” (Ayres, Schliesman, and Sonandre, 1998, p. 176). Although these results are promising indicators that affirm students’ perceptions of competence and apprehension, stronger assessments that go beyond self-assessment are necessary for understanding how to reduce student comprehension and improve speech delivery.

Several years later, Smith and Frymier (2006) developed a more robust assessment on the effectiveness of students’ speech practice methods that included an empirical measurement using students’ self-report assessments. In their study, business and communication majors completed self-assessments of their speech practices before delivering their final in-class speech. On their self-assessment, students indicated the practice technique they employed: practicing aloud in front of a mirror, silently to oneself, aloud at a quiet/private place, in a videotaped or recorded performance, before a small audience (i.e. 1--3 members), and in front of a larger audience (i.e. 4+ members). Students’ post-practice speeches were videotaped and evaluated by Smith and two research assistants who were public speaking instructors familiar with the speech assignment and evaluation criteria. Their results indicated that practicing in front of a mirror where one can view delivery performance without outside audience feedback was the most effective form of practice. Practicing in front of a larger audience was significantly more effective than practicing in front of a smaller audience, and the authors concluded that practicing before a larger audience provided a more realistic setting. However, the authors did not explore audience feedback after the speech to determine whether audience feedback from a larger group helped students make improvements. Video recorded sessions were the least effective, but only two participants practiced this method, which may not accurately represent this strategy. Finally, the number of times practiced did not positively correlate with higher evaluation scores. Smith and Frymier concluded that feedback from a listening audience needs further research, and future studies should

explore how students use and perceive audience for improving their speeches. The researchers also suggest using a large population of video recorded speeches to explore the effectiveness of this speech practice.

While studies may not clearly indicate the most effective methods of practicing speeches, they do indicate that improvements in communication skills can be linked to reductions in CA in general and toward public speaking. For instance, Hunter, Westwick, and Haleta (2014) address the ability to use public speaking courses in departmental assessment and discovered a link between students, most notably female students, who take public speaking courses and then self-report lowered CA. Yet, even though it appears that practice can make a difference in reducing CA, instructors may find it challenging to convince students to actually engage in speech practice. Simply sharing speech practice methods with students is not enough because, even though students might understand the importance of embracing these methods, they are often reluctant to do so. Students may find themselves in a quandary where they desire to do well in public speaking, but they feel quite odd and awkward watching themselves in a mirror while they practice. A venue where they feel comfortable practicing and can gain effective feedback to develop their oral communication skills is necessary. Instructors can help students build their skills by building practice activities within their course design. This is where tutoring strategies may begin to bridge the gap.

Tutoring Strategies

Tutoring is one solution to helping students improve their ability to deliver speeches. Not only can speech tutors provide support to instructors and students facing ever increasing class sizes and lack of face-to-face time, tutors can also bridge the relationship gap between faculty and students (Thompson, 2008). Students often find it easier to reach out to other students to ask for help. Moreover, building a support group in a tutoring situation may ease the discomfort of CA. Additionally, speech tutors can provide beneficial feedback that can help improve the quality of students' speeches.

Oral communication labs designed to improve public speaking often utilize one-on-one tutoring, group consultations,

and interactive workshops for large groups or classes across campus (Wilde, Cuny, and Vizzier, 2006). In the 1990s, research exploring the successes and challenges in developing and maintaining these early communication labs began to emerge (Burnett, 1997; Flores, 1997; Ganschow, 1997; Grice & Cronin, 1992; Hobgood, 1999; Sandin, 1997). Since then, the National Association of Communication Centers was created and research continues to be published in the communication discipline to help develop best practices in supporting students in communication labs (Bowdon & Carpenter, 2011; Dwyer & Davidson, 2012; Hobgood, 2014; LeFebvre & LeFebvre, 2014; McCracken, 2006; Ward & Schwartzman, 2009; Wilde, Cuny, & Vizzier, 2006). Yook and Atkins-Sayre (2012) have compiled the most extensive guide for building and directing communication labs and developing tutoring systems. Their book, *Communication Centers and Oral Communication Programs in Higher Education: Advantages, Challenges, and New Directions*, provides guidance in building an argument for the importance of communication centers to higher education, explains the effects of communication centers on retention, and gives strategies for building critical thinking in the center.

Strong communication skills are critical to students' personal, academic, and professional success (Gunn, 2007; McCroskey, Richmond, & McCroskey, 2002; Morreale & Pearson, 2008; Rubin, Graham, & Mignerery, 1990), and students' self-assessments indicate greater communication competence and reduced apprehension after practicing their speeches in class (Ayres, Schliesman, & Sonandré, 1998). However, allotting time for in-class speech practice is not always possible, leading instructors to encourage students to practice speeches outside of class. Although outside speech practice is encouraged, instructors may not specify how to practice as limited empirical evidence exists to verify the effectiveness of specific speech practice methods. As Smith and Frymier (2006) discovered, students who practiced in front of a mirror experienced the greatest benefits from practice because they saw what they needed to change, even without feedback. These researchers also found that students who practiced in front of larger audiences were more effective than students who practiced in front of a smaller audience;

however, their study did not indicate whether feedback had been offered to the speaker. Surprisingly, students who had their sessions recorded experienced a negative correlation, but since this subset was extremely small (1% of the total population), it is unclear whether these results would remain constant with a larger number of participants. Finally, Smith and Frymier's population was limited to business and communication majors, leading one to question whether results would be representative of all majors on a college campus such as those students taking a communication course to fill a general education requirement. Smith and Frymier suggest more research is needed on the impact of audience and the effectiveness of incorporating videotaping for speech practice.

If students experience benefits from watching themselves in a mirror, then video recording speeches may provide similar benefits. Additionally, video recording a speech in the presence of a larger audience (4+ members) could provide a more authentic setting for speech practice, and a trained speech tutor could provide valuable feedback to a speaker's speech. Nevertheless, this strategy has not been empirically demonstrated, so understanding how digitally-recorded speeches affects a general population, and not a subset as in Smith and Frymier's sample, could demonstrate whether these method can be applicable to a broader spectrum of students. Results of this type of investigation may provide useful information for instructors' development of course designs, helping to inform them of strategies that can improve the quality of students' speeches and reduce their CA.

Current research demonstrates the importance of teaching public speaking skills and the benefits of out-of-class practice. However, previous studies based results solely on self-report measures. While self-reports are very useful, additional measurements can help determine whether video-recording strategies augmented with speech tutoring will improve tutoring student confidence and actual speech delivery. To further understand the impact of video-recording strategies and group tutoring's impact on quality of speech and perceived apprehension, this study sought to answer three questions:

RQ 1: Is there a significant difference between students' achievement of learning outcomes before attending group tutoring sessions and after attending group tutoring sessions?

RQ 2: Is there a significant difference in the pre-tutoring and post-tutoring ratings of communication anxiety experienced by students?

RQ 3: Will students perceive improvement in their proficiency in public speaking skills after tutoring sessions are completed?

These research questions guided the study as it sought to understand the correlation between tutoring and perceived confidence and actual improvement in public speaking experiences. Through examining students' pre- and post-tutoring perceptions of their personal CA as measured by the Personal Report of CA (PRCA-24) and comparing the quality of actual pre- and post-tutoring speeches, we can begin to understand the impact that speech tutoring may have on students. After examining the results of the study, we will then discuss the findings and the implications for instructors teaching public speaking skills.

Method

Participants

Participants in the study included students enrolled in Introduction to Human Communication Studies 100 (HCS 100) at a mid-sized comprehensive university located in the Mid-Atlantic region. HCS 100 is a traditional face-to-face communication course that involves four units: communication theory, interpersonal communication, group communication, and public speaking. HCS 100 is a general education course that first-year students take in their first or second semester at the university. Subjects for this study were enrolled in their first spring semester at the university. Using two HCS 100 sections, there were a total of 56 students from two classes between the ages of 18 and 20. Of the 56 students, 51 earned passing grades, 4 earned a failing grade, and 1 withdrew from the class. At the beginning of the semester, students were divided into eight teams of seven students, which were grouped together to work throughout the semester to provide support on their speeches. Each group was also assigned a class period for speech delivery. The classes met twice a week for two 75-minute classroom sessions. Because students self-

selected the HCS 100 course, it is believed that the sample represents the overall population at the college as all entering first-year students must take this general education course in their fall or spring semester.

Students received instruction focused on developing sensitivity and understanding of the importance of adapting one's communication style to varied environments and situations. Classroom instruction provided an overview of historical aspects and current models, and students were required to work in their assigned groups to complete projects and assignments requiring small group communication skills. Students learned about interpersonal communication and public speaking strategies to equip them for individual and small group speech presentations in their classes. Application of rhetorical strategies and nonverbal communication skills were assessed during public speeches.

Speech Tutor Training

Two speech tutors were cross trained by the HCS instructor and the director of communication tutoring. The HCS instructor focused her training on reviewing the fundamentals of public speaking skills and explaining the basic requirements for students completing HCS 100. The tutoring director led trainings on incorporating group tutoring pedagogy, using technology in sessions, recording student visits, and implementing best practices in speech tutoring. Ongoing training of speech tutors was provided during monthly meetings with both the HCS instructor and the director of communication tutoring.

Before the semester began, the tutoring director and the HSC instructor met to discuss the tutoring initiative. The HCS instructor shared her syllabus, assessment rubrics, and course assignments and expectations for persuasive and informative speeches with the tutoring director and the two HCS tutors. The tutors learned the importance of their role as they would serve as an interested audience who would provide specific feedback that could help speakers improve their speeches. The researchers discussed how practicing alone is not as effective as working with a tutor because tutors provide feedback (Smith and Frymier, 2006) and how practice can help reduce students' CA (Ayers, Schliesman, & Sonandre', 1998). Finally, the speech professor met with the speech tutor and

used videos to teach concepts about characteristics of good oral communication skills and how to help students develop these skills.

Tutor training was completed in a number of steps. All speech tutors are trained in writing tutoring since the foundation of a good oral presentation is a well-written speech. Speech tutors read the book, *The Bedford Guide to Writing Tutoring*, and attended six hours of tutor training, based on the College Reading and Learning Association's guidelines, that discussed tutoring pedagogy and provided simulated tutoring experiences. The training was spread out over three afternoons, with each 90 minute session focusing on methods for working with writing and speech students. Tutors participated in collaborative sessions that helped them learn how to identify speakers' areas of weaknesses, provide targeted feedback to help speakers improve their delivery, and develop strategies to reduce speakers' CA. The two-pronged training approach that incorporated both the HCS instructor and tutoring director helped tutors understand the importance of their work with speakers and feel like a vital contributor to the dual department collaboration.

Materials and Procedures

This quantitative study with a qualitative component analyzed three types of collected data that included the following: (a) a comparison between students' achievement of learning outcomes before attending group speech tutoring sessions and after attending group speech tutoring sessions, (b) a comparison between the CA scores of students before attending group tutoring sessions in public speaking and after attending group tutoring sessions, and (c) student perceptions of the effectiveness of group tutoring and the structure of this tutoring model.

Measurement instruments. Assessment of changes in students' actual public speaking skills were evaluated with an adapted version of the Oral Communication Rubric (OCR), a measure developed by the University of Southern Mississippi's Assessment Committee as a part of the university's Quality Enhancement Plan (QEP), (The University of Southern Mississippi, 2005). Accrediting agencies such as the Southern Association of Colleges and Schools (SACS) have developed requirements such as the QEP for educational institutions to demonstrate ongoing assessment

and achievement programs. The OCR is an eight-item measure that assesses typical public speaking assessment variables on a four-step scale (see Appendix A). According to J. Howdeshell (personal communication, May 31, 2012), this rubric has been successfully implemented for previous studies on assessment of students' speeches. Researchers at the University of Southern Mississippi tested the inter-rater reliability on the OCR [as defined by a zero or one point differential on a four point scale] and calculated 91% to 98% reliability on all categories, with the majority of categories attaining 95% inter-rater agreement. This high rate of inter-rater reliability and successful implementation of this rubric by researchers at the University of Southern Mississippi led the researchers in this current study to believe that assessment of learning outcomes could be reasonably and reliably measured. Students in HCS 100 were evaluated on the first seven Learning Outcomes on the QEP rubric (see Appendix A) as their assignment did not require incorporation of an audio-visual aid.

The Personal Report of CA (PRCA-24) was employed to measure the comprehension apprehension of students before and after speech tutoring to determine if students' apprehension about public speaking would decrease as a result of tutoring. Because the content validity of the PRCA-24 has been found to be highly predictive of measures of assertiveness (McCroskey et al, 1985), the researchers determined that this instrument could accurately measure changes in students' apprehension of public speaking.

Data on students' evaluations of group tutoring was collected at the end of the semester through self-reported measures using the HCS 100 Speech Survey developed by the researchers. This 12-question survey incorporated the Survey Monkey platform for its ease in distribution and collection of responses.

Research procedures. At the beginning of the spring semester, students completed a consent form to participate in the study and were divided into eight groups for group presentations. Students met twice in their groups outside of class for hour-long tutoring sessions and attended two workshops given by one of the two speech tutors. The first workshop, "Dealing with Communication Anxiety," was presented four weeks after classes began, and the

second workshop, “Preparing and Using Effective Speech Aids,” was presented the week after the first workshop. The first hour-long group tutoring session helped students prepare for their presentations. Using the information provided by the HCS instructor, both tutors discussed assignment expectations and strategies for preparing for the written and oral portions of the assignment. After this first tutoring session, student groups, independent of their tutor, went to a multimedia production center to rehearse their presentations, which digitally recorded their sessions. Immediately following the recording of their presentations, students forwarded the electronic link to their speech tutors. The second tutoring session allowed tutors to provide feedback to speakers. When speech tutors met with students a second time, they viewed the recorded speeches and provided feedback on their presentations. Using the rubrics as a guide, both tutors discussed speakers’ individual performance in each area and strategies for improving their speech delivery and content. Group members listened to the feedback, growing in their knowledge of oral communication skills and strategies, and also gave intermittent feedback. At the conclusion of students’ second tutoring session, tutors directed students to take the online HCS 100 Speech Survey.

Evaluating the benefits of speech tutoring was difficult since the HCS professor did not have the available technology to digitally record students’ presentations during class; thus, the only other alternative was to allow students to go back to the multimedia production center to record their second speech. After students attended both tutoring sessions, individual students, independent of their small groups, returned to the multimedia production center to digitally record their presentation a second time. The second recorded speech was used only for evaluation of tutoring sessions. Students received points for recording their speeches a second time, but the second recorded speech was not followed up with any speech tutoring sessions, and the speech, which was directed solely to the professor, was recorded in an empty room. Unfortunately, only 21 out of the original 46 students returned to the multimedia center to record their presentation. Finally, students completed the PRCA-24 a second time near the end of the semester.

Analysis of data. After the final speeches had been recorded, researchers collected all three sets of data that included the digitally recorded presentations before ($N = 46$) and after ($N = 21$) tutoring sessions, pre-tutoring and post-tutoring ($N = 46$) ratings of the PRCA-24, and the HCS 100 Speech Survey ($N = 41$). A quantitative analysis using paired samples t-tests was conducted from the two sets of PRCA-24 and Oral Communication Rubric (OCR) scores. The researchers conducted a qualitative and descriptive analysis of student perceptions from the HCS 100 Speech Survey. Only students who had completed both pre-tutoring and post-tutoring recorded speeches were evaluated on the QEP. Students who had not completed consent forms and both sets of the PRCA-24 were removed from the CA sample. Finally, only students who attended both tutoring sessions were analyzed for the speech survey.

To evaluate pre- and post-speech tutoring sessions, electronic links containing recorded speeches were coded to remove identifiers and randomly placed into a spreadsheet that was distributed to the speech evaluators, who were blind as to whether a speech was pre- or post-intervention. Prior to assessing the speeches in the current study, the speech evaluators had watched a small sample of speeches to establish inter-coder reliability. Sufficient inter-coder reliability was achieved (Krippendorff's $\alpha = .82$). The evaluators then each rated a separate half of the main sample and entered the scores into a spreadsheet. After the recorded scores were entered, one researcher who had not evaluated the speeches took the coded scores and placed the results into a new spreadsheet containing pre- and post-speech tutoring scores. To determine if significant differences occurred between the pre- and post-speech tutoring sessions, descriptive statistics and paired samples t-tests were calculated by using the tabulated scores.

Pre- and post-tutoring scores from the PRCA-24 were entered into a spreadsheet and analyzed through the Statistical Package for the Social Sciences (SPSS). Descriptive statistics and paired samples t-tests were calculated to determine if significant differences in Comprehension Apprehension had occurred over the course of the semester. Results from the t-tests were compared with survey results to note common themes across both measures.

After the collection of data, the researchers examined both quantitative and qualitative measurements in the HCS 100 Speech Survey results. The researchers conducted a descriptive analysis of the quantitative questions and a qualitative analysis of students' written responses. Results from both 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

Speech Tutoring Evaluations of Recorded Speeches

The first research question sought to determine if there was a significant difference between students' achievement of learning outcomes before and after attending group tutoring sessions. Fourteen females and seven males completed the pre- and post-tutoring recordings. Table 1 presents results of the evaluators' scoring of students' speeches.

Table 1

Paired Samples Test Comparing Students QEP Pre-Tutoring and Post-Tutoring Scores

Learning Outcome	Paired Differences			<i>t</i> (20)	Sig.
	<i>M</i>	<i>SD</i>	95% CI		
Purpose and Content	0.48	0.93	[-0.90, -0.05]	2.25	0.03
Support for Reasoning	0.71	0.90	[-1.13, -0.30]	3.63	0.00
Structure	0.43	0.81	[-0.80, -0.06]	2.42	0.03
Language	0.43	0.18	[-0.80, -0.06]	2.43	0.03
Audience	0.33	0.91	[-0.75, 0.08]	1.67	0.11
Vocal Delivery	0.38	0.97	[-0.82, 0.06]	1.79	0.08
Nonverbal Delivery	0.06	0.9	[-0.52, 0.40]	-0.27	0.79

Note. *M*=Mean; *SD*=Standard Deviation; *CI*=Confidence Interval that includes the lower and upper limits; *t*(20)=paired samples *t*-test with 20 degrees of freedom; *Sig.*=Significance (two-tailed).

Results from the paired samples t-test with an alpha level set at .05 reveal significant differences between students' pre-tutoring and post-tutoring speeches in four areas: effective presentation of the central idea that is strongly supported by the content; strong evidence given for assertions; purposeful structure that aids in presenting material in an effective way; and concise language that strongly adds to understanding with few errors in vocabulary, grammar, and usage. Moderate improvement, though not a statistically significant difference, was revealed in students' ability to demonstrate a clear sense of the targeted audience and vocally deliver their speech in a way that enhances listener interest and understanding. Decreased proficiency was found in students' ability to employ eye contact, posture, gestures, movement, or facial expressions in a manner that enhances the presentation.

PRCA-24 Results

The second research question sought to determine whether speech tutoring would significantly reduce students' level of communication anxiety as measured by the PRCA-24. The research sample included 24 females and 22 males. Again, a paired samples t-test with an alpha level set at .05 was utilized to measure students' ratings of their communication anxiety before and after speech tutoring sessions. As illustrated in Table 2, the results indicate improvements in all areas, but significant differences were only discovered in the Meetings subtest and in their overall Total scores. The improved meeting score indicates students' increased proficiency and comfort level in working in small groups. It is interesting to note that students rated little change in their levels of apprehension in a group context, but significant improvement was shown in meetings. Meetings often involve more participation from selected individuals in attendance whereas group discussions require participation from all individuals in attendance. Further, group discussions are often seen as less formal speaking contexts. This may account for some degree of difference in apprehension regarding participation in meetings as opposed to group discussions. Excellent improvement was noted in Public Speaking, but it was not a significant difference. Perhaps more tutoring intervention and practice sessions are needed to reduce students' apprehension for Public Speaking. In sum,

students' overall apprehension was significantly improved between pre- and post-tutoring sessions.

Table 2

Paired Samples Test Comparing Students' PRC-A-24 Pre-Tutoring and Post-Tutoring Scores

Paired Differences

Communication Context	<i>M</i>	<i>SD</i>	95% CI	<i>t</i>(45)	Sig.
Group Discussion	0.22	3.85	[1.12, 1.17]	0.04	0.97
Meetings	2.17	3.64	[1.09, 3.25]	4.06	0.00
Interpersonal					
Conversations	0.97	3.41	[-0.06, 1.90]	1.90	0.06
Public Speaking	1.07	4.00	[-0.12, 2.25]	1.81	0.08
Total Score	4.22	10.05	[1.23, 7.20]	2.85	0.01

Note. *M* =Mean; *SD*=Standard Deviation; *CI*=Confidence Interval that includes the lower and upper limits; *t*(45)=paired samples t-test with 45 degrees of freedom; *Sig.*=Significance (two-tailed).

HCS 100 Speech Survey

The researchers sought to examine students' perceptions of the tutoring process and their perceived improvement in public speaking skills as a result of speech tutoring. Using results from the HCS 100 Survey, researchers conducted a descriptive analysis of student perceptions and a qualitative analysis from the written responses from the open-ended questions. Results from both measures were merged to determine common themes and student perceptions.

Quantitative results. Eighty-two percent of students who completed the HCS 100 Survey indicated that they had attended both tutoring sessions, but only responses of those who completed two or more sessions are included in the table below (N=41). Of the remaining sample, 78.1% attended two sessions and 21.9% attended three or more sessions. When asked what type of group setting they would prefer to work in, students were split on their responses: 43.8% indicated individual tutoring sessions; 9.4% preferred small groups of two to four students; 37.5% wanted to work with their

entire group; and 6.3% preferred not to meet with a speech tutor at all. Students' perceptions on the impact of speech tutoring on their preparation, delivery, and confidence are provided in Table 3.

Table 3
Students' Perceptions of Speech Tutoring

Speech Tutoring had a:	Sig. Neg. Impact	Slight Neg. Impact	No Impact	Slight Pos. Impact	Sig. Pos. Impact
Question 1: Rate the impact of speech tutoring on your ability to prepare a speech over the course of the semester:	3.10%	3.1%	9.4%	68.8%	15.6%
Question 2: Rate the impact of speech tutoring on your ability to deliver a speech over the course of this semester.	0.0%	3.1%	12.5%	68.8%	15.6%
Question 3: Rate the impact of speech tutoring on your confidence regarding public speaking.	3.1%	6.3%.	25.0%	53.1%	12.5%

Note. N=41

Qualitative results

After coding of open-ended responses had been conducted, several themes surfaced, most of which regarded the group meetings. The majority of comments made for improving the tutoring

sessions concerned scheduling and logistics. Because each group was comprised of seven students, scheduling a mutually convenient time for recording their speeches and meeting with a speech tutor was challenging. Students commented that it was tough to find a universally agreeable time for group meeting recordings and speech tutoring sessions. Several suggestions were voiced for addressing this difficulty: allow for individual tutoring and recording sessions instead of mandatory group sessions; schedule tutoring appointments immediately after the recording sessions; or incorporate speech tutoring during class time. The remaining comments focused on tutoring or on the tutors: have tutors attend recording sessions to provide more guidance; give more feedback or provide more time for tutoring; provide more tutors; require groups to meet with both tutors; have more time to work on speech before attending tutoring sessions, and continue to have tutors meet with students for future classes.

Discussion

This study sought to employ an empirical research design to determine whether a group model for speech tutoring sessions helps students improve their oral communication abilities and reduce their level of CA. Additionally, researchers investigated student perceptions of speech tutoring sessions to provide further understanding of the results. From these findings, a viable framework for assisting students in engaging in appropriate speech practices was created that also served to help reduce students' CA.

As stated earlier, many studies rely solely on self-reported measures to determine whether student practice and tutoring improves actual speech delivery and student confidence. In contrast to focusing only on self-reported measures, this research model provided an empirical instrument that strengthens the premise that practice and tutoring sessions can improve students' ability to deliver speeches with significant improvement in students' proficiencies to provide support for their central ideas, give strong evidence for assertions, effectively structure their content, and use concise language and correct grammar. Interestingly, in both tutoring sessions, the speech tutors provided feedback on students' written and oral speeches to support classroom instruction in

speech development and delivery, which were the greatest areas of student improvement in this study. Skills demonstrating moderate improvement, which can be described as students' ability to direct their speech to a targeted audience and enhance listener interest and understanding were not focused on quite as heavily, and since students' second speech was solely directed to the instructor, their last speech lacked an authentic, listening audience. Given the absence of a live or perceived audience, it is understandable that students did not demonstrate improvement in their ability to employ eye contact, posture, gestures, movement, or facial expressions in a manner that enhances the presentation.

The importance of a live audience for practicing and presenting speeches cannot be underestimated. A solitary figure in the multimedia room with empty desks serving as an uninterested audience does not provide an engaging environment for speech delivery, which most likely explains why learning outcomes directly related to audience did not demonstrate significant improvement. These findings support Smith and Frymier's (2006) findings that practicing in front of audiences, like participants did for the first recording for the second tutoring session, can improve the speaker's evaluation scores. Students enjoyed a built-in audience format from their groups, which most likely impacted their first speech and both tutoring sessions. The group model for tutoring sessions provides a means for improving students' communication abilities by supplying an authentic audience and more sources of feedback on students' performance. Even though students may have only received a total of 15 minutes of individually-directed tutoring time (two hour-long tutoring sessions with seven students in each group allowed students 7-8 minutes of direct tutoring for each session), the impact of the group tutoring model positively impacted students' improvement in their learning outcomes. Despite the limited amount of individualized speech tutoring, students listened to the feedback given to peers in their group, which could have also helped them become more conscious of practices that could improve their speeches.

Students' improvement in speech delivery most likely contributed to their reduction in CA, supporting previous research (Ayres, Schliesman, & Sonandré, 1998; Smith & Frymier, 2006)

that links improvements in communication skills to reductions in CA. Although students' Total CA score revealed a significant improvement, the types of improvement made in the subtest scores reveal how speech tutoring impacted students' development. In Table 2, results from Meetings and Interpersonal Communication subtests indicate that students' CA decreased in these areas. This finding might indicate that speech tutoring sessions are more effective in improving communication with smaller groups rather than with larger ones.

Students' perceptions of the mandatory tutoring sessions revealed their overall consensus that speech tutoring helped them improve their speech preparation, speech delivery, and confidence in public speaking. These perceptions were moderately favorable toward the helpfulness of the tutoring sessions, yet it is unclear as to what other factors might have contributed to students' decreased levels of CA and their improvement in speech delivery scores. Given the large improvements in students' CA scores and their ability to deliver speeches and the modest positive evaluations on the HCS 100 Survey, there may be other factors that contributed to students' improvement in addition to their participation in tutoring sessions.

Although the majority of students indicated tutors' positive impact in this tutoring model, diverse opinions were expressed about the composition of the groups and the tutoring procedures. Students were split on their preference for the size of their groups: 41% preferred individual tutoring sessions; 10.3% desired small groups of 2-4 students; and 35.8% wanted to keep the group setting. Scheduling group meetings was very challenging for students, which may be why some students preferred working with smaller groups. Others indicated a desire to have speech tutors more involved in the recording process and to have more time to meet with tutors. Overall, the notion of mandatory tutoring sessions was perceived positively by students as they expressed a desire for more interaction and time with the tutors.

These results corroborate Thompson's (2008) findings that tutors can bridge the gap between students and faculty by integrating a support system for students to access. An overwhelming majority of students positively rated their tutoring sessions as helpful in

speech preparation, speech delivery, and building confidence. Despite obvious difficulties with balancing all group members' schedules, students made significant improvement in their achievement of learning outcomes to improve their public speaking abilities and reduce their apprehension in giving speeches, even though the actual time spent with speech tutors was relatively brief. This model was more successful than methods implemented in prior semesters, when students were given an option to individually attend tutoring sessions, as few students took advantage of the speech tutoring provided by the Learning Center. The group tutoring model also dually supported students' improvement through a built-in accountability system as well as a support structure for fellow members.

Limitations

The results of this study are restricted to the population of students enrolled in the HCS 100 courses at the university at which this study was conducted. While the results of this study are useful, accurate, and important for this university, the findings may not be generalized to all university settings. Additionally, HCS 100 courses at this particular university are part of a requirement for all students within the general education curriculum. Thus, most of the students enrolled in the class are first year students who may have limited experience in delivering in-class presentations and/or working in group settings. This may suggest that they could have levels of communication anxiety that are higher than students in their junior and senior years. Despite that possibility, the results of this study may apply to institutions with similar human communication programs, learning center support, and multimedia centers that are available for student recordings of presentations. Due to the small number of students, broad generalizations to multiple settings cannot be supported.

Directions for Future Research

In order to determine if this model is a worthwhile practice for human communication instructors, replication of this practice should take place across multiple settings that incorporate student samples from a variety of colleges and universities across different

geographical regions. Considering that this student sample was primarily comprised of first year students, additional studies comparing the differences in anxiety levels between students in the early stages of their college experience with anxiety levels for their final years could help measure any long-term effects from early interventions. Additionally, after these embedded strategies are implemented, studies could also determine if differences in anxiety levels exist between students who choose to take public speaking courses and those, like ours, who are required to take a course in communication as part of the general education requirement.

Furthermore, improved understanding of the impact of this model could be better understood by using control groups to compare improvement in speech delivery and CA with speech tutoring samples. Additionally, this model could be improved by intentionally embedding the post-tutoring recording in a way that encourages all students to do a pre-and post-tutoring video. Finding viable methods for digitally recording all students' first and last speeches as the speeches are presented in front of peers would be the ideal research context. Implementation of a post-tutoring video paired with a writing assignment that prompts students to compose a reflective essay comparing the improvement from their first recording to their final recording could proactively engage students in deeper cognitive processes, helping them to evaluate their skills, determine their strengths, and identify areas that need more concerted development. If the second recording is delivered in front of an interested audience, this assignment can serve several purposes: help students project their speech to a targeted audience, enlarge samples for future research, and encourage students to purposely reflect more on strategies that can improve their public speaking abilities, thus improving students' ability to more fully achieve learning outcomes for a course.

To further understand what students perceive as contributing factors to their ability to prepare and deliver their speeches as well as improve their confidence in public speaking, more open ended questions that explore students' perceptions could be investigated. For instance, future researchers should follow up students' ratings of tutoring sessions with questions such as "What factors positively

impacted your ability to prepare and deliver speeches?” and “What factors positively contributed to your improvement in confidence to engage in public speaking?” Lastly, capping class sizes and reducing the group size to four or five students can ease students’ frustrations in scheduling meetings and provide more tutoring time for each group member.

Conclusions

Incorporating speech practice methods that allow students to work on improving communication skills can be a challenging task. This study demonstrated that mandatory tutoring sessions embedded within an instructor’s course can and does work. Of primary importance, students acknowledged improvement of their public speaking abilities and increased level of confidence, which strongly supports the empirical findings of their growth. Nonetheless, drawbacks for implementing this model can discourage practitioners from adopting this embedded design. Full execution of this model took a great deal of time and energy to manage and promote. Not only was the HCS 100 professor involved in managing the project, but the director of communication tutoring, a graduate assistant, and two speech tutors also assisted with the project. For instructors, this model needs to be embedded in the course with a requirement of attending tutoring and recording sessions because our past experience has shown that most students will not seek speech tutoring on their own. Mandatory tutoring sessions were not viewed as punitive, and students clearly admitted that they gained much from the experience. If we want students to experience success, we have to provide a clear structure and maintain our energy to drive this model. Nevertheless, these frameworks can help students achieve greater proficiency and confidence in their ability to effectively communicate ideas in front of a live audience. Ultimately, if decreased CA and group practice can help students improve public speaking skills, the lessons gleaned from this study may help students achieve the success at the heart of the academic institution.

References

- Ayres, J., Schliesman, T., & Sonandré, D. A. (1998). Practice makes perfect but does it help reduce communication apprehension? *Communication Research Reports*, 15(2), 170-179.
- Beatty, M. & Valencic, K. (2002). Context-based apprehension versus planning demands: A communibiological analysis of anticipatory public speaking anxiety. *Communication Education*, 49(1), 58-71.
- Beatty, M., McCroskey, J. C., & Heisel, A. (1998). Communication apprehension as temperamental expression: A communibiological paradigm. *Communication Monographs*, 65(3), 197-220.
- Bodie, G. D. (2010). A racing heart, rattling knees, and ruminative thoughts: Defining, explaining, and treating public speaking anxiety. *Communication Education*, 59(1), 70-105. doi:10.1080/03634520903443849
- Bowdon, M., & Carpenter, R. (Eds.). (2011). *Higher education, emerging technologies, and community partnerships: Concepts, models, and practices*. Hershey, PA: IGI Global. doi:10.4018/978-1-6-960-6237
- Burnette, A. (1997, November). *Southwest Texas State University center for communication excellence materials*. Paper presented at the meeting of the National Communication Association, Chicago, IL.
- Cronin, M. W., Grice, G. L., & Palmerton, P. R. (2000). Oral communication across the curriculum: The state of the art after twenty-five years of experience. *Journal of the Association for Communication Administration*, 29(1), 66-87. Retrieved from EBSCOhost
- Dwyer, K. K., & Davidson, M. M. (2012). Is public speaking really more feared than death? *Communication Research Reports*, 29(2), 99-107.

- Flores, N. L. (1997, November). *How Golden West College is addressing pedagogical, assessment, and accountability concerns through integrated spoken communication labs*. Paper presented at the meeting of the National Communication Association, Chicago, IL.
- Ganschow, J. (1997, November). A dialogue: Blueprints for communications labs that address pedagogical, assessment, and accountability concerns. Paper presented at the meeting of the National Communication Association, Chicago, IL.
- Grice, G. & Cronin, M. (1992, April). *The comprehensive speech communication laboratory: We have ways of making you talk*. Paper presented at the meeting of the Southern States Communication Association, San Antonio, TX.
- Gunn, A. M. (2007). Relational communication as a central focus for the “Communication Across the Curriculum” initiative. *Across the Disciplines*, 4. Retrieved June 16, 2011, from <http://wac.colostate.edu/atd/articles/gunn2007.cfm>
- Hobgood, L. (1999, November). *Establishing a communication lab or speaking center*. Paper presented at the meeting of the National Communication Association, Chicago, IL.
- Hobgood, L. (2014). Training speech center consultants: Moving forward with a backward glance. *Southern Discourse: A Journal of Multiliteracy and Innovation*, 19(1), 60-69.
- Hunter, K. M., Westwick, J. N., & Haleta, L. L. (2014). Assessing success: The impacts of a Fundamentals of Speech course on decreasing public speaking anxiety. *Communication Education*, 63(2), 124-135.
- Jordan, W. J., & Powers, W. G. (2007). Development of a measure of student apprehension toward communicating with instructors. *Human Communication*, 10(1), 20-32.

- Kearney, P., & McCroskey, J. C. (1981). Relationships among teacher communication style, trait and state communication apprehension and teacher effectiveness. *Communication Yearbook*, 4, 533-551.
- LeFebvre, L., & LeFebvre, L. E. (2014). The communication center at U.S. colleges and universities: A descriptive overview. *Basic Communication Course Annual*, 26, 143-173.
- McCracken, S. R. (2006). Listening and new approaches to the creation of communication centers. *International Journal of Listening*, 20, 60-61. doi:10.1080/10904018.2006.10499089
- McCroskey, J. C. (1977). Oral communication apprehension: A summary of recent theory and research. *Human Communication Research*, 4, 78-96.
- McCroskey, J. C., Beatty, M. J., Kearney, P. & Plax, T. G. (1985). The content validity of the PRCA-24 as a measure of communication apprehension across communication contexts. *Communication Quarterly*, 33(3), 165-173.
- McCroskey, L. L., Richmond, V. P., and McCroskey, J. C. (2002). The scholarship of teaching and learning: Contributions from the discipline of communication. *Communication Education*, 51(4), 383-391.
- Morreale, S. P., & Pearson, J. C. (2008). Why communication education is important: The centrality of the discipline in the 21st century. *Communication Education*, 57(2), 224-240. doi:10.1080/03634520701861713
- Price, M., & Anderson, P. L. (2012). Outcome expectancy as a predictor of treatment response in cognitive behavioral therapy for public speaking fears within social anxiety disorder. *Psychotherapy*, 49(2), 173-179. doi:10.1037/a0024734

- Richmond, V., & McCroskey, J. C. (1998). *Communication: Apprehension, avoidance, and effectiveness* (5th ed.). Scottsdale, AZ: Gorsuch Scarisbrick.
- Roby, D. E. (2009) Teacher leadership skills: An analysis of communication apprehension. *Education, 129*(4), 608-614.
- Rubin, R. B., Graham, E. E., & Mignerey, J.T. (1990). A longitudinal study of college students' communication competence. *Communication Education, 39*, 1-14.
- Rubin, R. B., Rubin, A. M., & Jordan, F. F. (1997). Effects of instruction on communication apprehension and communication competence. *Communication Education, 46*(2), 104-114. doi:10.1080/03634529709379080
- Ryan, L., & Zimmerelli, L. (2010). *The Bedford guide for writing tutors* (5th ed.). New York: Bedford/St. Martin's.
- Sandin, P. J. (1997, November). *Launching a speaker's lab at Butler University*. Paper presented at the meeting of the National Communication Association, Chicago, IL.
- Smith, T. E., & Frymier, A. (2006). Get 'real': Does practicing speeches before an audience improve performance? *Communication Quarterly, 54*(1), 111-125. doi:10.1080/01463370500270538
- Thompson, B. (2008). How college freshmen communicate student academic support: A grounded theory study. *Communication Education, 57*(1), 123-144. doi: 10.1080/03634520701576147
- Ward, K. & Schwartzman, R. (2009). Building interpersonal relationships as a key to effective speaking center consultations. *Journal of Instructional Psychology, 36*(4), 363-372.
- Wilde, S. M., Cuny, K. M., & Vizzier, A. L. (2006). Peer-to-peer tutoring: A model for utilizing empathic listening to build client

relationships in the communication center. *International Journal of Listening*, 20, 70-75.

Witt, P. & Behnke, R. (2006). Anticipatory speech anxiety as a function of public speaking assignment type. *Communication Education*, 55(2), 167-177.

Yook, E. L., & Atkins-Sayre, W. (Eds.). (2012). *Communication centers and oral communication programs in higher education: Advantages, challenges, and new directions*. Lanham, MD: Lexington Books.

Appendix A

The University of Southern Mississippi— Course Code: _____
 Quality Enhancement Program Presentation Code: _____
Oral Communication Assessment Rubric

Learning Outcome	1 – Unacceptable	2 – Minimally Acceptable	3 - Proficient	4 - Advanced	Score
Purpose and Content	Central idea/purpose is <u>not present</u> and/or content <u>does not support</u> purpose.	Central idea/purpose is <u>present</u> and/or content <u>minimally supports</u> purpose.	Central idea/purpose is <u>clear</u> and content <u>supports</u> purpose.	Central idea/purpose is <u>effectively presented</u> and content <u>strongly supports</u> purpose.	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
Support for Reasoning	Makes generalizations <u>without support</u> or cites irrelevant evidence.	Evidence is offered but is sometimes <u>inadequate</u> for assertions.	<u>Credible evidence is provided</u> but connection to assertion is not always made clear.	<u>Strong evidence is provided</u> for assertions.	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
Structure	<u>Little or no structure present</u> , thus making the presentation <u>confusing</u> because of lack of organization.	Structure is <u>present but inconsistently</u> executed; some material is out of place.	Structure is <u>present and consistently</u> executed.	Structure is <u>purposeful and aids</u> in presenting material in an effective way.	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>

Language	<u>Frequent problems</u> with vocabulary, grammar, and usage confuse audience and <u>detract from credibility</u> .	<u>Isolated problems</u> with vocabulary, grammar, and/or usage <u>sometimes detract from credibility</u> .	<u>Mostly free of serious</u> problems in vocabulary, grammar, and usage. Language is <u>mostly concise</u> and <u>adds to understanding</u> .	Free of problems in vocabulary, grammar, and usage (with a few exceptions). Language is concise and <u>strongly adds to understanding</u> .	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
Audience	Content and/or style of presentation are <u>inappropriate for the audience</u> .	Content and/or style of presentation are <u>occasionally inappropriate for audience</u> .	Content and/or style of presentation are <u>appropriate for audience</u> .	Content and/or style of presentation <u>reflects a clear sense of the targeted audience</u> .	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
Vocal Delivery	Vocal delivery is too soft to hear, rate is too fast to understand, tone distracts from message, and/or speech disruptions (repetitions; filled pauses, e.g., “um”) are <u>inappropriate and significantly distracting</u> .	Vocal delivery is audible. Rate, volume, tone, or speech disruptions are only <u>occasionally distracting</u> .	Vocal delivery is clear and distinct. Rate, volume, and tone <u>facilitate audience comprehension</u> . Speech disruptions are rare.	Vocal delivery is varied and dynamic. Speech rate, volume, and tone <u>significantly enhance</u> listener interest and understanding. Practically no speech disruptions.	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
Nonverbal Delivery	Eye contact, posture, attire, gestures, movement, and/or facial expressions are <u>inappropriate & significantly distracting</u> .	Eye contact, posture, attire, gestures, movement, and facial expressions are only <u>occasionally distracting</u> .	Eye contact, posture, attire, gestures, movement or facial expressions <u>facilitate audience comprehension</u> .	Eye contact, posture, attire, gestures, movement or facial expressions <u>significantly enhance</u> the presentation.	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>

Appendix B

Name _____ (results are confidential)

Personal Report of Communication Apprehension (PRCA-24)*

DIRECTIONS: This instrument is composed of twenty-four statements concerning feelings about communicating with other people. Please indicate the degree to which each statement applies to you by marking whether you (1) strongly agree, (2) agree, (3) are undecided, (4) disagree, or (5) strongly disagree. Work quickly; record your first impression.

- _____ 1. I dislike participating in group discussions.
- _____ 2. Generally, I am comfortable while participating in group discussions.
- _____ 3. I am tense and nervous while participating in group discussions.
- _____ 4. I like to get involved in group discussions.
- _____ 5. Engaging in a group discussion with new people makes me tense and nervous.
- _____ 6. I am calm and relaxed while participating in group discussions.
- _____ 7. Generally, I am nervous when I have to participate in a meeting.
- _____ 8. Usually I am calm and relaxed while participating in meetings.
- _____ 9. I am very calm and relaxed when I am called upon to express an opinion at a meeting.
- _____ 10. I am afraid to express myself at meetings.
- _____ 11. Communicating at meetings usually makes me uncomfortable.
- _____ 12. I am very relaxed when answering questions at a meeting.
- _____ 13. While participating in a conversation with a new acquaintance, I feel very nervous.
- _____ 14. I have no fear of speaking up in conversations.

- _____ 15. Ordinarily I am very tense and nervous in conversations.
- _____ 16. Ordinarily I am very calm and relaxed in conversations.
- _____ 17. While conversing with a new acquaintance, I feel very relaxed.
- _____ 18. I'm afraid to speak up in conversations.
- _____ 19. I have no fear of giving a speech.
- _____ 20. Certain parts of my body feel very tense and rigid while giving a speech.
- _____ 21. I feel relaxed while giving a speech.
- _____ 22. My thoughts become confused and jumbled when I am giving a speech.
- _____ 23. I face the prospect of giving a speech with confidence.
- _____ 24. While giving a speech, I get so nervous I forget facts I really know.

SCORING:

The PRCA permits computation of one total score and four sub scores. The sub scores are related to communication apprehension in each of four common communication contexts: group discussions, meetings, interpersonal conversations, and public speaking. To compute your scores merely add or subtract your scores for each item as indicated below.

Sub score Desired Scoring Formula

Group discussion 18 + scores for items 2, 4, and 6;
- scores for items 1, 3, and 5.

Meetings 18 + scores for items 8, 9, and 12;
- scores for items 7, 10, and 11.

Interpersonal conversations 18 + scores for items 14, 16, and 17;
- scores for items 13, 15, and 18.

Public speaking 18 + scores for items 19, 21, and 23;
- scores for items 20, 22, and 24.

To obtain your total score for the PRCA, simply add your four sub scores together. Your score should range between 24 and 120. If your score is below 24 or above 120, you have made a mistake in computing the score.

Scores on the four contexts (groups, meetings, interpersonal conversations, and public speaking) can range from a low of 6 to a high of 30. Any score above 18 indicates some degree of apprehension. If your score is above 18 for the public speaking context, you are like the overwhelming majority of Americans.

NORMS FOR PRCA 24

	MEAN	STANDARD DEVIATION
FOR TOTAL SCORE	65.6	15.3
GROUP	15.4	4.8
MEETING	16.4	4.8
DYAD	14.5	4.2
PUBLIC	19.3	5.1

Mathematics Self-Related Beliefs and Online Learning

Cherie Ichinose and Martin Bonsangue
California State University, Fullerton

Abstract

This study examined students' mathematical self-related beliefs in an online mathematics course. Mathematical self-related beliefs of a sample of high school students learning mathematics online were compared with student response data from the 2012 Programme for International Student Assessment (PISA). The treatment group reported higher levels of both mathematical anxiety and mathematical self-efficacy than did the PISA group, suggesting that online learning can be either an effective or ineffective mode for learning mathematics depending on the experience and expectations of the individual student. This information may help inform online teaching and learning in mathematics at both the secondary and post-secondary levels.

Introduction

The emergence and rapid expansion of online learning is now a reality. The International Association for K-12 Online Learning (iNACOL) reported that more than three million K-12 students were engaged in some kind of online learning for the 2012-2013 school year (Watson, Murin & Pape, 2014), the most recent year in which such data was reported (Rose, 2014). Moreover, the document states that:

Beginning in the 2013-14 school year, the Civil rights Data Collection will require all public school districts to report whether they have any students enrolled in distance learning programs. In addition, school districts may voluntarily report for 2013-14 the number of students

enrolled in distance learning programs by race, ethnicity, sex, ELL, and disability; but in the 2015-16 school year, all school districts will be required to report such information to the U.S. Department of Education's Office for Civil rights in the CrDC. (p. 14)

Both the growing number of students participating in online learning, as well as the data-reporting protocol now required by the federal government, indicate that increasingly, students and their parents/caregivers are choosing to do part or all of the students' education in an online setting.

The presence of online learning is impacting post-secondary education as well as K-12 schools. This may be especially true for local two-year and four-year colleges that have traditionally been closely associated with the high schools in their geographic area. In his book, *Management Challenges for the 21st Century*, Peter Drucker stated that, with technology, one must redefine what education means: "Long-distance [online] learning may well make obsolete within twenty-five years the freestanding undergraduate college (1999, p.101)." Drucker's now fifteen-year-old comment has a prophetic ring to it: students can now complete all degree requirements without ever setting foot on a campus. Clayton Christensen predicts that by 2019, more than 50% of the instruction will be delivered online (Christensen, Horn, & Johnson, 2011). As a result, post-secondary institutions must meet the demands of the up and coming 21st century learner.

There is a considerable amount of research connecting student self-related mathematical beliefs in traditional face-to-face learning environments. Self-related mathematical beliefs are students' beliefs in their own mathematics abilities. The three constructs, self-efficacy (the extent to which students believe in their own ability to solve mathematics problems), self-concept (students' beliefs in their own mathematics abilities) and anxiety (feelings of helplessness and stress when dealing with mathematics), have been identified as being the key predictors of mathematics achievement and behavior (Bandura, 2002; Barkatsas, Kasimatis, & Gialamas, 2009; Hoffman, 2010; OECD, 2013; Pajares & Schunk, 2001; Reed, Drijvers, & Kirschner, 2010; Wadsworth et al., 2007). The three student beliefs and attitude

constructs are interrelated. A higher level of mathematics self-efficacy has been shown to be related to mathematical performance, persistence, reduced math anxiety, and greater future interest in mathematics (Haskett, 1985; Hodges, 2008; Hoffman, 2010; Taylor & Mohr, 2001).

Most of this research is based on traditional classroom settings; there is limited research on student mathematical motivation and beliefs in an online learning environment. The study presented in this article was conducted with the purpose of extending the body of knowledge of students learning mathematics online. While the data used in this study was based upon a sample of high school aged students, there is evidence that the findings may readily apply to the college level as well, particularly in developmental mathematics courses.

Self-Related Mathematical Beliefs

With online instruction, the goal of understanding how student beliefs motivate mathematical learning is no different than with traditional face-to-face instruction; however, the modality may dictate motivation. Wadsworth et al (2007) state that the online learning environment “May support students’ motivation for learning; it also may create a situation in which motivation is ever more important to students’ success than in a traditional classroom face-to-face setting.” (p. 7) Due to the autonomous nature of online learning, there is an important link between success in an online learning environment and students’ beliefs in and motivation to achieve in online learning environment (OECD, 2013; Spence & Usher, 2007).

According to Bandura’s social cognitive theory, self-efficacy refers to beliefs in one’s capabilities to organize and execute a task, especially when facing difficult circumstances (1997). Mathematics self-efficacy is described as one’s confidence in the ability to perform mathematical tasks well and the ability to overcome difficulties (Haskett, 1985; OECD, 2013). The level of mathematics self-efficacy is dependent on a student-perceived ability to successfully complete a given, and often difficult, task. For example, students with lower mathematics self-efficacy may find solving a system of linear equations out of their grasp. They cannot visualize the solution and, believing that the task is too hard, create road-blocks to prevent them

from solving the problem. Conversely, students with higher levels of mathematics self-efficacy believe that they can solve, visualize and successfully execute the solution. Bandura celebrates the usefulness of online learning if students possess self-efficacy for regulating their own learning, and proposes that this will result in positive [mathematics] self-efficacy (Hodges, 2008). However, two studies revealed mixed findings. Spence and Usher (2007) reported that online students had significantly lower self-efficacy than their face-to-face counterparts, resulting in lower mathematics performance. Another study, focusing on a developmental mathematics course, showed no significant difference in mathematics self-efficacy between the online and face-to-face course (Wadsworth et al., 2007).

In addition to mathematics self-efficacy, student beliefs can be measured by the students' reported attitudes of their own abilities. Self-concept, according to Bandura, is essentially a view of oneself based on direct experience (Bandura, 1997). Mathematics self-concept is best described simply as students' beliefs in their own mathematical ability. Mathematics self-concept has been found to drive one's motivation to study mathematics. That is, students believe that they are "good at mathematics," this has a significant influence on what and how they study. Students with higher levels of mathematics self-concept tend to see themselves as smart and competent in mathematics, and usually believe mathematics has important implications for future study (Artino, 2010; Bong & Skaalvik, 2003). Ireson and Hallam (2009) reported that students with low mathematics self-concept did not want to pursue future mathematical studies, whereas students with more positive self-concept specified that they would like to learn more mathematics in the future. Studies have shown that mathematics self-concept is also linked to gender. In a number of studies, males showed to have a higher perception of their mathematics abilities than females in a traditional face-to-face class setting (Ireson & Hallam, 2009; OECD, 2013) and online setting (Barkatsas, Kasimatis, & Gialamas, 2009; Vale & Leder, 2004). Measurable differences between males' and females' beliefs suggest that males may be more motivated to learn because they believe that mathematics will help them in their later careers.

Mathematics can evoke a variety of emotions, both positive and negative. For some, this can be a negative emotion that has a direct impact on decision-making and learning outcomes. Students with high levels of anxiety may have adverse physiological reactions to mathematics, going to extreme lengths to avoid mathematics altogether (Reed et al., 2010). Thus, math-anxious students may deeply feel that for them, learning mathematics is not possible.

Instruction in a traditional face-to-face classroom can cause fear, anxiety, and avoidance of mathematics by some students (Tobias, 1981). Therefore, students with higher levels of mathematical anxiety may choose to learn mathematics online. At the 19th International Conference on Technology in Collegiate Mathematics, Spence (2007) reported that students chose an online course in order to avoid the physical face-to-face mathematical interactions that they find less favorable and uncomfortable. Although the sample size of Spence's study was relatively small, the implications of the results are worth noting and again suggest that future research is warranted.

Methodology

The purpose of this study was to examine students' self-related mathematics beliefs taking an online mathematics course. Comparisons were made between samples of high school students participating in traditional face-to-face and online learning environments. Two research questions were derived from a previous study (Ichinose, 2011):

RQ1. Are there differences in mathematics self-related beliefs between students in an online setting compared with students in a face-to-face setting?

RQ2. Are there differences between males' and females' mathematics self-related beliefs in either the online group or for the face-to-face group?

Sample

Participants in the study came from the larger group of 2,051 high school students taking an online mathematics course offered by California Virtual Academies (CAVA), a virtual high school in California. Each of the students was sent an online survey to assess

their experience in an online mathematics course, with 458 students responding (22.3%). This response rate was consistent with the published research of online surveys ranging from 15-29% (Comley, 2000). Of the 458 respondents, 156 (34.1%) self-reported as male, 263 (57.4%) as female, with 39 (8.5%) not answering. This sample was representative of the overall CAVA population.

To examine students' self-related mathematical beliefs, data was also obtained from the OECD 2012 database to compare the online sample with students who completed the 2012 PISA Student Questionnaire. The Programme for International Student Assessment data included 271,323 students in grades 7 through 12. Of the PISA respondents, 49.9% were male and 50.1% were female. As with the online sample, most (88.1%) of the PISA students were in 9th or 10th grade at the time of the study.

Survey Instrument

The current study included, with permission, six 4-point Likert scale mathematical beliefs related questions, from the 2012 Programme for International Student Assessment (PISA) student questionnaire, cited with high degree of validity and reliability (OECD, 2013). The 2012 theme of the student questionnaire focused on students' self-related mathematical beliefs.

Each construct (self-efficacy, self-concept and math-anxiety) consisted of three questions such that each is scored on a 4-point Likert scale. For instance, a participant answering questions pertaining to self-concept and math-anxiety will respond with the range of: Strongly Disagree (1), Disagree (2), Agree (3) or Strongly Agree (4). Questions related to self-efficacy were answered with the range of: Not Confident at all (1), Not Very Confident (2), Confident (3), and Very Confident (4).

A participant is evaluated upon his/her response to each of the questions within a given construct. For example, a participant's score associated with self-efficacy was the sum of his or her responses. Thus, a student with the scores of 4, 3, and 4 was assigned a score of 11. Since 8 was the median score of this construct, this participant's score (11) was classified as "High Self-Efficacy."

Data Analysis

To explore the mathematical beliefs of online and face-to-face learners this study used statistical analyses that included frequencies, chi-square (χ^2) test of independence, and odds ratios. Analysis of data involved the use of 2 x 2 contingency tables. One dimension reflected the two learning environments, PISA (face-to-face) and online learning, while the second dimension reflected the level of self-related mathematical beliefs: self-efficacy, self-concept, and anxiety. The χ^2 table was entered with one degree of freedom. The 0.05 level of significance was used in judging the association between the two learning environments and self-related mathematical beliefs. Odds ratios were used to determine the intensity of the occurrence of each group (online or PISA) to report higher levels of self-related mathematical beliefs.

Results

Data from both the online and PISA groups were analyzed. The results comparing the groups (online vs PISA) are reported in the sequence based on the three constructs: mathematics self-efficacy, mathematics self-concept, and mathematics anxiety. Attention was made to examine the subgroup gender within each group (online vs PISA).

Research Question 1

Recall: self-related mathematical beliefs are students' beliefs in their own mathematics abilities. Research Question 1 states, "Are there differences in mathematics self-related beliefs between students in an online setting compared with students in a face-to-face setting?" The results that follow here compares the mathematics self-efficacy, mathematics self-concept, and mathematics anxiety between the online and PISA groups.

Students were asked to what extent they believe in their own ability to handle difficult learning situations in mathematics. There were mixed findings with each question with regard to the level of confidence in solving difficult mathematics situations when comparing the online and PISA groups. The majority (92.4%) of the online group reported they were confident or extremely confident in their ability to solve a multi-step linear equation, compared with

89% of the PISA students. The online group (69.9%) reported being confident or extremely confident in their ability to solve an area problem, compared to 68.6% of the PISA students. When asked how confident students felt in calculating a 30% discount, the PISA group reported a slightly higher level of confidence (79.6%) compared to 75.9% for the online group.

Results taken from the contingency table (Table 1) indicate an association between mathematical self-efficacy and the learning modality, $\chi^2(1, N=50632) = 4.828, p = .03$. Examination of cell frequencies showed that students with higher levels of mathematics self-efficacy are more likely to be an online learner (76.0%) than the PISA group (71.1%) (odds ratio = .777, 95% CI [.621, .974]). That is, students in an online setting had statistically higher levels of mathematics self-efficacy than did their PISA counterparts.

Table 1

Mathematics Self-Efficacy Between Online and PISA (Including Expected Values)

	Lower Levels	Higher Levels
Online	100 (123.4) 24.0%	316 (292.6) 76.0%
PISA	50532 (50511.7) 28.9%	124146 (124166.3) 71.1%

Students were asked about their beliefs in their own mathematical competence. More than three-fifths (63.9%) of the online group reported they agreed or strongly agreed that “I get good grades in mathematics,” compared to the PISA (57.5%) group. The PISA group answered with higher levels of agreement (39.1%) that mathematics was their best subject as compared to the online group (34.6%).

Examination of cell frequencies (Table 2) indicates that students with higher levels of mathematics self-concept were online learners (50.6%), compared to that of the PISA group (47%). However, chi-square and odds ratio analyses revealed no association between the learning modality and mathematics self-concept, $\chi^2(1, N=173072) = .569, p = .450$ (odds ratio = .926, 95% CI [0.759, 1.130]).

Table 2

Mathematics Self-Concept Between Online and PISA (Including Expected Values)

	Lower Levels	Higher Levels
Online	151 (158.5) 35.9%	270 (262.5) 64.1%
PISA	65005 (64997.5) 37.7%	107646 (107653.5) 62.3%

Students were asked to what extent they feel helpless, tense, nervous, or under emotional stress when dealing with mathematics. Overall, students from the online group reported higher levels of anxiety. Specifically, more online students reported feeling tense when learning mathematics (46.8%) than the PISA (34.8%) sample. Further, 44.6% of the online group compared to the 33.9% of the PISA group felt nervous while doing mathematics.

Results taken from the contingency table (Table 3) indicates students with higher levels of mathematical anxiety were more likely to be an online learner (55.2%) than the PISA group (46.0%), $\chi^2(1, N=173187) = 10.169, p < 0.001$ (odds ratio = .731, 95% CI [.602, .887]). That is, students in an online setting had statistically significant higher levels of mathematical anxiety than their PISA counterparts.

Table 3

Mathematics Anxiety Between Online and PISA (Including Expected Values)

	Lower Levels	Higher Levels
Online	186 (218.4) 44.8%	229 (196.9) 55.2%
PISA	90955(90922.6) 52.6%	81814 (81849.4) 47.4%

Research Question 2

Research Question 2 states “Are there differences between males’ and females’ mathematics self-related beliefs in either the online group or the face-to-face group?” The results that follow here compares the mathematics self-efficacy, mathematics self-concept,

and mathematics anxiety between gender within each the online and PISA groups.

Table 4 shows that male students from the PISA group had higher levels of mathematics self-efficacy $\chi^2(1, N=174678) = 1436.10, p < 0.001$ and self-concept $\chi^2(1, N=172651) = 2632.68, p < 0.001$ when compared to that of female students. Conversely, female students from the PISA group reported higher levels of mathematical anxiety than did males $\chi^2(1, N=172772) = 1197.741, p < 0.001$.

Table 4

Self-Related Beliefs with Gender and PISA (Including Expected Values)

		Lower Levels	Higher Levels	χ^2
Self-Efficacy	Male	30775(35988.9) 25.4%	90567(857353.1) 74.6%	2099.32*
	Female	42902(37688.1) 33.8%	84169(89382.9) 66.2%	
Self-Concept	Male	38324(44730) 31.8%	82172(75766) 68.2%	2981.43*
	Female	53260(46854) 42.2%	72958(79364) 57.8%	
Anxiety	Male	70872(65083.4) 58.8%	49611(55399.4) 41.2%	2185.51*
	Female	62584(68372.6) 49.4%	63988(58199.4) 50.6%	

* Significant with $p < .001$

The intensity of these occurrences was confirmed by the odds ratio: self-efficacy (odds ratio = 0.669, 95% CI [.655, .683]), self-concept (odds ratio = .599, 95% CI [.587, .610]), and mathematical anxiety (odds ratio = 1.397, 95% CI [1.371, 1.424]). Thus, students in the PISA group with higher levels of mathematics self-efficacy were more likely to be male.

The same analyses (Table 5) were performed with the online group. Male students reported higher levels of self-concept $\chi^2(1, N=407) = 8.32, p < 0.001$ (odds ratio = 1.817, 95% CI [1.209, 2.730]). With mathematical anxiety, female students from the online

group reported higher levels of anxiety than did males $\chi^2 (1, N=401) = 11.96, p < 0.001$ (odds ratio = 0.487, 95% CI [0.323, 0.734]). However, chi square analysis revealed no significant association between mathematical efficacy and gender $\chi^2 (1, N=403) = 2.835, p = 0.092$. Further, males were no more likely to have higher levels of mathematical self-efficacy than females as confirmed by the odd ratio analysis, (odds ratio = 1.522, 95% CI [0.932, 2.487]).

Table 5

Self-Related Beliefs with Gender and Online Sample (Including Expected Values)

		Lower Levels	Higher Levels	χ^2
Self-Efficacy	Male	29(36)	119(112)	2.835
		19.6%	80.4%	
	Female	69(62)	186(193)	
		27.1%	72.9%	
Self-Concept	Male	62(76.1)	89(74.9)	8.322*
		41.1%	58.9%	
	Female	143(128.9)	113(127.1)	
		55.9%	44.1%	
Anxiety	Male	84(67.3)	66(82.7)	11.962**
		56%	44%	
	Female	96(112.7)	155(138.3)	
		38.2%	61.8%	

* Significant with $p < .005$

** Significant with $p < .001$

Discussion

This study revealed a relationship between learning modality (online or face-to-face) and student self-related mathematical belief of mathematics self-efficacy, mathematics self-concept and mathematical anxiety. Students in an online course reported higher levels of mathematics self-efficacy when compared to a face-to-face group. With the online group, higher levels of mathematics self-efficacy were not associated with gender. This implies that the alternative online learning modality may create a less biased learning environment between genders.

There was no significant relationship between mathematics self-concept and learning modality. Results from this study support the current mathematics education literature that in both learning environments, mathematics self-concept remained linked to gender (Barkatsas, Kasimatis, & Gialamas, 2009; Ireson & Hallam, 2009; OECD, 2013; Vale & Leder, 2004). Finally, students in an online class had higher levels of mathematical anxiety than those from PISA, perhaps indicating that online students were avoiding the more personal face-to-face mathematical environment.

As stated earlier, the three student beliefs and attitude constructs are interrelated. Traditionally a higher level of mathematics self-efficacy has been shown reduced math anxiety, and greater future interest in mathematics (Haskett, 1985; Hodges, 2008; Hoffman, 2010; Taylor & Mohr, 2001). However this study showed students in the online group with high math anxiety to also have high mathematics self-efficacy with compared to the PISA group. Future research must examine the relationship between these constructs.

Limitations

There were several limitations in this study. The sample, while reflective of the population from which it was drawn, was limited by its response rate and perhaps by some students' willingness to participate in the study. Since the study was based in part on self-reported information, the validity of some of the findings depended on the respondent's choices in representing their behaviors and opinions accurately. Also the large sample size of the PISA group resulted in comparison data that were essentially parameters rather than sample statistics.

Conclusion

The emergence and rapid expansion of online learning at both the secondary and post-secondary levels is present in virtually every such institution in the country. The flexibility and convenience of entertainment technologies can provide students live on-demand learning resources, without the restriction of time and geographical limitations.

The present study confirmed the link between success in an online learning environment and students' beliefs in and motivation to achieve in an online environment for some, but not all, students (OECD, 2013; Spence & Usher, 2007). Through instruction and content support, online teachers and instructional designers must continue to create and implement experiences that will foster student beliefs and motivation that can accommodate students' collective as well as individual experiences. With the use of 21st century learning technologies, college instructors can create settings that promote challenging mathematics in a safe online learning environment. In light of the relative newness of research on online learning, additional studies will be necessary to help further inform future educational choices.

While the current study was based on a sample of high school students' experience compared to that of an international set of data, the findings may help inform post-secondary learning environments as well. In particular, the experience reported by students in this study, and especially female students, are consonant with that reported by women enrolled in college mathematics courses, especially for non-traditional aged students (Haskett 1985; Tobias 1981). There is power in the anonymity that the online learning environment provides, thereby relieving any pressure either way to participate in a discussion based on gender. The online environment may lend itself to an equality between males and females where, historically, male students have out-performed female students in mathematics.

Since many students begin or re-start their academic trajectories at the community college, the issues that surfaced in this study may be very useful for shaping college level mathematics courses for the 21st century.

References

- Artino, A. R. (2010). Online or face-to-face learning? Exploring the personal factors that predict students' choice of instructional format. *The Internet and Higher Education*, 13(4), 272-276.

- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman and Company.
- Bandura, A. (2002). Social cognitive theory in cultural context. *Applied Psychology: An International Review*, 51(2), 269-290.
- Barkatsas, A. T., Kasimatis, K. , & Gialamas, V. (2009). Learning secondary mathematics with technology: Exploring the complex interrelationship between students' attitudes, engagement, gender and achievement. *Computers and Education*, 52, 562-570.
- Bong, M., & Skaalvik, E. (2003). Academic self-concept and self-efficacy: How different are they really?. *Educational Psychology Review*, 15(1), 1-40.
- Christensen, C., Horn, M. , & Johnson, C. (2011). *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns*. New York: McGraw-Hill.
- Comley, P. (2000): "Pop-up surveys. What works, what doesn't work and what will work in the future". Proceedings of the ESOMAR Worldwide Internet Conference Net Effects 3. April 10-12, 2000, Dublin.
- Drucker, P.F. (1999). *Management challenges for the 21st century*. New York: HarperCollins.
- Haskett, G. (1985). Role of mathematics self-efficacy in the choice of math related majors of college women and men: A path analysis. *Journal of Counseling Psychology*, 32(1), 47-56.
- Hoffman, B. (2010). I think I can, but I'm afraid to try: The role of self-efficacy beliefs and mathematics anxiety in mathematics problem-solving efficiency. *Learning and Individual Differences*, 20, 276-283.

- Hodges, C. B. (2008). Self-efficacy in the context of online learning environments: A review of the literature and directions for research. *Performance Improvement Quarterly*, 20(3/4), 7-25.
- Ichinose, C. L. (2011). Learning mathematics in the 21st century: High school students' interactions while learning mathematics online (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (3473431)
- Ireson, J., & Hallam, S. (2009). Academic self-concepts in adolescence: Relations with achievement and ability grouping in schools. *Learning and Instruction*, 2009, 201-213.
- OECD (2013), PISA 2012 Results: Ready to Learn: Students' Engagement, Drive and Self-Beliefs (Volume III), PISA, OECD Publishing. <http://dx.doi.org/10.1787/9789264201170-en>
- Organization for Economic Co-operation and Development (OECD)(2012). PISA 2012 Student Questionnaire, 32-33. http://nces.ed.gov/surveys/pisa/pdf/MS12_StQ_FormA_ENG_USA_final.pdf
- Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66(4), 543-578.
- Pajares, F., & Schunk, D. H. (2001). Self-beliefs and school success: Self-efficacy, self-concept, and school achievement. In R. Riding & S. Rayner (Eds.), *Self perception*. (pp. 239-266). London: Ablex.
- Reed, H., Drijvers, P., & Kirschner, P. (2010). Effects of attitudes and behaviours on learning mathematics with computer tools. *Computers & Education*, 55(1), 1-15.
- Rose, R. (2014). Access and equity for all learners in blended and online education. Retrieved from <http://www.inacol.org/resources/publications/inacol-reports/#8311>.

- Spence, D. J. (2007). *Traditional and online student reactions to the video tutor component of MyMathLab*. Paper presented at the 19th International Conference on Technology in Collegiate Mathematics, Boston, MA.
- Spence, D. J., & Usher, E. L. (2007). Engagement with mathematics courseware in traditional and online remedial learning environments: Relationship to self-efficacy and achievement. *Journal of Educational Computing Research*, 37(3), 267-288.
- Taylor, J., & Mohr, J. (2001). Mathematics for math anxious students studying at a distance. *Journal of Developmental Education*, 25(1), 30-41.
- Tobias, S. (1981). Stress in the math classroom. *Learning*, 9(6), 34-37.
- Vale, C., & Leder, G. (2004). Student views of computer-based mathematics in the middle years: Does gender make a difference? *Educational Studies in Mathematics*, 56(3), 287-312.
- Watson, J. F., A. Murin, and L. Pape. 2014. *Keeping pace with k-12 digital learning: Teaching Across State Lines*. Evergreen, CO: Evergreen Education Group.
- Wadsworth, L., Husman, J. , Duggan, M. , & Pennington, M. (2007). Online mathematics achievement: Effects of learning strategies and self-efficacy. *Journal of Developmental Education*, 30(3), 6-14.

Supplemental Instruction in Physical Chemistry I

Ellen Toby, Timothy P. Scott, David Migl, and Elizabeth Kolodzeji
Texas A&M University

Abstract

Physical chemistry I at Texas A&M University is an upper division course requiring mathematical and analytical skills. As such, this course poses a major problem for many Chemistry, Engineering, Biochemistry and Genetics majors. Comparisons between participants and non-participants in Supplemental Instruction for physical chemistry were made using analyses that controlled for prior mathematical ability and academic achievement. When controlling for prior mathematical ability, no statistical evidence was found that supplemental instruction attendance increased the final grade in physical chemistry I. However, when controlling for prior academic achievement, students with lower prior achievement were found to benefit from supplemental instruction while high achieving students derived no benefit.

Keywords: advanced college students, physical chemistry, supplemental instruction

Literature Review

Supplemental Instruction (SI) has long been associated with improved academic performance (Congos & Schoeps, 1993; Hays, 2010; The International Center for Supplemental Instruction, 2003; Simpson, Hynd, Nist, & Burrell, 1997; Peterfund, Rath & Xenos, 2008; Oja, 2012). The courses in these studies were freshman and sophomore level science, technology, engineering and mathematics (STEM) courses. Entering students frequently have trouble adjusting

to college and the student SI instructors not only help students with the course material, they also help students learn how to study effectively.

Many factors affect academic performance. McCarthy, Smuts and Cosser (2006) argued that many studies on the effectiveness of Supplemental Instruction failed to control for other factors which may affect academic performance. Because these studies are observational, McCarthy et al. (2006) argues that the students choosing SI may be more motivated or better prepared than those students who attended no SI session, and it is these characteristics which explain why students attending SI do better in the class. In the McCarthy et al. (2006) study, effectiveness of SI in a freshman level circuits course was assessed. The study controlled for prior academic achievement and level of preparedness upon entering university. The advantage of controlling for prior academic achievement is that there are many reasons why students are high achieving, such as being highly motivated and having excellent study and communication skills. Controlling for these factors isolates the effect of SI. The result of the multiple regression analysis done by McCarthy et al. (2006) was that the number of SI sessions attended provided no additional explanatory power in predicting a freshmen level circuits course grade. However, there was strong evidence that prior academic achievement and level of preparedness upon entering university are good predictors of circuits course grade.

Description of the Study

This study examines the effectiveness of SI in helping junior and senior students succeed in a difficult, gatekeeper undergraduate chemistry course. The students taking this course are presumed to have already learned good study habits. Consequently, the benefit derived from SI in this upper level course is limited to improving students understanding of physical chemistry. We control for two outside factors believed to impact performance in physical chemistry I, mathematical ability and prior academic achievement. We chose to use an analysis that allows for the effect SI has on the course grade to depend, in part, on either mathematical ability or prior academic achievement.

The SI sessions at Texas A&M University are conducted by trained undergraduate students, with the goals of improving course performance and retention. Table 1 shows that students who attend the SI sessions more often tend to receive better grades, on average, in physical chemistry I.

Table 1

Average Course Grade for Various SI Attendance Frequencies

Number of SI Sessions Attended	Average Course Grade	Number of Students
0	2.76	38
1-4	3.00	15
5-9	2.78	9
10 or more	3.50	2

Student participation in SI sessions is voluntary, meaning there may be many other factors associated with both SI attendance and student performance, such as gender, race, educational background, and motivation. This study considers the level of preparedness for the course as measured by overall GPA upon entering the course and average GPA in calculus I, II and III.

As attendance to SI sessions was heavily skewed to the right, attendance was transformed using an approximate natural log scale: 0 = never attended, 1 = attended 1 to 4 times, 2 = attended 5 to 9 times and 3 = attended 10 or more sessions. Figure 1 is a plot of the transformed attendance and final grade in physical chemistry I. This plot does not take into account either prior overall GPA upon entering the course or mathematical ability as measured by average calculus grade. Although there appears to be a slight increase in the course grade with increased number of SI sessions attended, there is no statistical evidence of a simple relationship between course grade and SI sessions attended.

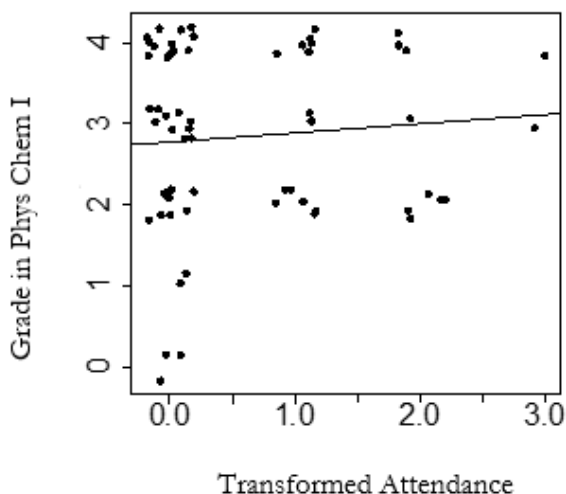


Figure 1. Relationship between course grade and SI sessions attended. Points have been jittered so that the number of individuals at each location are visible.

Controlling for Mathematical Ability

Since calculus is featured heavily in physical chemistry I, prior ability was measured using the average of past calculus grades. A multiple regression analysis (R-2.15.2©) with SI attendance and average calculus grade was used to test the effect of both predictors on the final grade in physical chemistry I. The outcome from a multiple regression analysis using the transformed attendance grades is given in Table 2.

Table 2

Regression Model Predicting Course Grade from Transformed SI attendance and Calculus Grades

	Coefficients			
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.27162	0.55325	2.298	0.0253*
SI Attendance (transformed)	0.02712	0.15471	0.175	0.8615
Calculus Average GPA	0.50815	0.17255	2.945	0.0047**

As we see from Table 2, when we compare students with the same calculus grades, SI attendance is not a significant predictor for course grade ($P = 0.8615$). An interaction term between SI attendance and calculus grade was not significant.

Results of the analysis when controlling for prior GPA

In Table 3, we find prior GPA averages are higher for students who attended SI sessions more often. Therefore, the influence of SI attendance on students' physical chemistry I grades was measured controlling for prior GPA.

Table 3

Average Prior GPA and SI Attendance Frequencies

Number of SI Sessions Attended	Average Prior GPA	Number of Students
0	3.12	38
1-4	3.14	15
5-9	2.85	9
10 or more	4.00	2

A multiple regression analysis (R-2.15.2[©]) with SI attendance and prior GPA was used to test the effect of both predictors on grade in physical chemistry I. The effect of attending the SI sessions was found to be different for students with different prior GPA's. Results from the multiple linear regression analysis can be found in Table 4. One interpretation of this model is that students who had lower prior GPA's made a lower grade in physical chemistry I on average, however, attending more SI sessions increased their GPA by around half a letter grade to one and a half letter grades (depending on the number of sessions attended). The effect was not as large for students who already had higher GPAs.

Table 4

Multiple Linear Regression Model for SI attendance controlling for Prior GPA, Using an Interaction

	Coefficients			
	Estimate	Std. Error	t value	Pr(> t)
Intercept	-2.2356	0.7103	-3.147	0.00264**
SI Attendance (transformed)	1.6936	0.5517	3.070	0.00330**
TAMU Prior GPA	1.6363	0.2232	7.330	9.85e-10***
(SI Attendance * TAMU Prior GPA)	-0.5095	0.1668	-3.055	0.00344**

Table 4 can be used to estimate the average grade of a student who attended X number of transformed SI sessions and has a TAMU Prior GPA of Y as follows:

$$\text{Estimated Average Physical Chemistry I Grade} = -2.24 + 1.69 * X + 1.64 * Y - 0.51 * X * Y$$

Using the above to compare grades of students who attended no SI sessions with those who attended 5-9 sessions, the estimated increase in the average physical chemistry I grade for students attending SI sessions is 1.35 for students with a prior GPA of 2.0 (out of 4.0) but only 0.33 for students with a prior GPA of 3.0.

Figure 2 is a plot of prior GPA by physical chemistry I grade. Non-transformed lines have been fitted separately based on the number of SI sessions attended. As can be observed in Figure 2, students with a lower prior GPA benefitted the most from attending more SI sessions. However, the final grade in physical chemistry I was not significantly different (confidence interval of 95%) for students with a prior GPA of 3.0 or above, regardless of SI sessions attended.

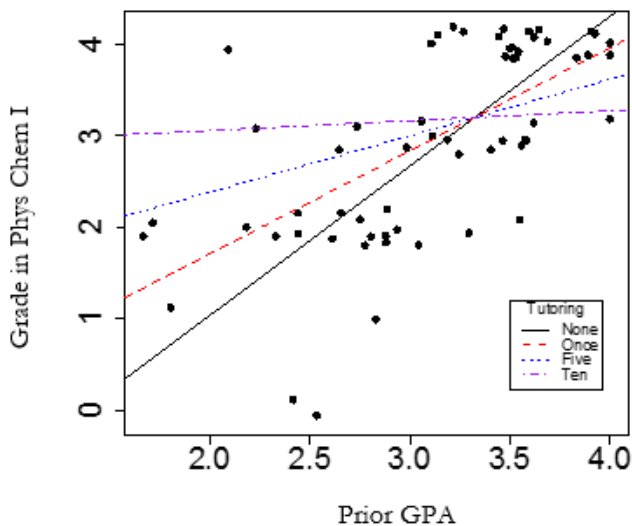


Figure 2. Plot of prior GPA by grade in Physical Chemistry I, with separate fitted lines according to number of SI sessions attended

Discussion

Previous studies have dealt only with freshman or sophomore level courses. This study examined the effect of SI attendance on the grades in an upper level gatekeeper science course: physical chemistry I. This study provides similar results to McCarthy et al. (2006) based on prior academic performance in calculus courses. However, when we controlled for prior academic achievement as measured by a student's average overall GPA at the beginning of the semester, we found statistical evidence that the number of SI sessions attended does increase average course grade, but only for students with an overall prior GPA below a 3.00. The different outcome of this study, as compared to McCarthy et al. (2006), is due in part to the assumption that the number of sessions attended and prior academic achievement act independently on course grades. McCarthy et al. (2006) assumed that the effect of attending SI sessions on the circuits course grade was the same for all students, regardless of the level of prior academic achievement, or that SI attendance was independent of prior GPA.

Conclusion

This study allows prior academic achievement to be a factor in the effect of number of SI sessions attended on course performance in physical chemistry I. There is strong statistical evidence that the number of SI sessions attended is a good predictor of the physical chemistry course grade, but the effect on the grade depends on prior academic achievement. This result indicates that students with lower GPA's (<3.00) derive more benefit (higher grades in physical chemistry I) from attending SI sessions.

References

- Congos, D.H., Schoeps, N. (1993). Does Supplemental Instruction Really Work and What is it Anyway? *Studies in Higher Education*, 18(2), 165.
- Hays, B. (2010, April 23). *How do we know if learning assistance programs work?* Retrieved from <http://www.rpggroup.org/sites/default/files/Is%20Learning%20Assistance%20Working.pdf>
- McCarthy, A., Smuts, B., Cosser, M. (2006). Assessing the Effectiveness of Supplemental Instruction: A Critique and a Case Study. *Studies in Higher Education*, 22(2), 221.
- Oja, M. (2012). Supplemental Instruction Improves Grades But Not Persistence. *College Student Journal*, 46(2), 344.
- Peterfreund, A.R., Rath, K.A., Xenos, S.P. (2008). The Impact of Supplemental Instruction on Students in STEM Courses: Results from San Francisco State University. *J. College Student Retention*, 9(4), 487.
- Simpson, M.L., Hynd, C.R., Nist, S.L., Burrell, K.I. (1997). College Academic Assistance Programs and Practices. *Educational Psychology Review*, 9(1), 39.
- The International Center for Supplemental Instruction. (2003). Supplemental Instruction

National Data Summary. Retrieved from <http://www.umkc.edu/asm/si/sidocs/National%20Supplemental%20Instruction%20Report%2098-03.pdf>

Impact of Academic Support Centers on Students with Disabilities in Postsecondary Institutions

Luann Walker
Master's Program in Developmental Education,
Texas State University

Abstract

Students with disabilities are attending institutions of higher education at an increasing rate. This trend leads to questions concerning academic success, institution responsibility, and the impact of academic support centers. Unfortunately, faculty and professional staff often do not have sufficient knowledge to address the ever-changing needs of their student population. Therefore, professional development is needed at regular intervals to work more effectively with students with learning disabilities (LD). As for academic support centers, an inclusive model was found to be more effective and accommodating. This improves the overall student accessibility and addresses student needs both inside and outside of the classroom.

Each year, students with disabilities represent progressively more of the population in institutions of higher education. Likewise, research on students with disabilities in higher education has increased considerably over the past several decades, yet even with this rise in matriculation, many students with disabilities fail to successfully complete their degrees. Institutions of higher education continue to seek high academic standards regardless of the hindrances students encounter.

Statement of Purpose

The purpose of this article is to provide insight to

professionals in the field of academic support in higher education. Two questions were identified to guide this article:

1. What responsibility does the faculty and administration hold to ensure success of disabled students?
2. In what ways are academic support centers meeting the needs of disabled students?

Previously conducted research was gathered to reveal the growing need for support to postsecondary students with learning disabilities. Academic support is often necessary for all students. However, additional inspection reveals that although students may not have formal documentation for a learning disability (LD), inclusive support from trained professionals is essential. This topic is specifically relevant as the struggles that students with LD face are substantial. By bringing awareness to more administrators, faculty and staff, supplementary aid can be made available to those students who need it.

Statement of Terminology

The following terms were identified to clarify their use in the context of this article. Postsecondary students are those who have graduated from high school and attend post-secondary institutions, regardless of course level or span of time between completing high school and entering post-secondary institutions. Learning disability is defined as any condition that makes learning difficult (e.g., Dyslexia, Autism, ADHD, and Asperger Syndrome). Academic Support refers to activities or programs offered to support students outside of traditional instruction (e.g., Tutoring, Mentoring, Supplemental Instruction, and Communication Advocates).

Review of Literature

Two distinct areas were focused on: (a) the responsibility of the faculty and administration offices of academic success for students with disabilities; and (b) the ways academic support centers satisfy the needs of students with disabilities.

Faculty and Administration Offices

High academic standards can be achieved if support is available to the diverse student populations. Couzens et al. (2015) report

the efforts of one Australian university to support students with hidden learning disabilities (LD). The university's disabilities services programs targeted LD students to (a) transition into university; (b) develop self-advocacy; (c) perfect independent time management; and (d) transition from university to employment. The case study results, based on interviews, revealed the participants found informal support networks most effective, followed by informed and caring teaching staff. Results direct universities to "build on and strengthen peer and family networks" (Couzens et al., 2015, p. 33).

In an attempt to reach students at the core of their needs, Lechtenberger, Brack, Sokolosky, and McCrary (2012) hypothesized a process that would enable more holistic support. Lechtenberger et al. developed a case study to observe one participant, a 33-year-old graduate student with cerebral palsy, David, and his path to achieve academic goals and independence in a postsecondary environment. The wraparound planning process is a program that incorporates multiple aspects of an individual's life to be present at planning meetings to achieve specified goals. The program required a series of steps: (a) create a team (i.e., case worker, faculty members); (b) understand strengths (i.e., determination, problem solving skills) and challenges (i.e., poor oral/written skills, limited funding); (d) prioritize needs/goals; and (e) gain support from collaborative partners (advocates investigated grants for off-campus housing). David and his team met multiple times over a two-week period to evaluate all phases of the planning process.

This article, like Couzens et al., emphasizes the need for support. In this instance, David's support was more structured and professional in nature because those in his support network were directly affiliated with the university. Overall, the practical significance is present for individuals or care givers to utilize when seeking to achieve large, multifaceted goals. The focus was very narrow due to the individualized needs of a person with cerebral palsy; however the premise of the wraparound system could be easily applied to other populations. In this instance, the administration's support was apparent because many of David's team members were employed by the university. Unfortunately, not all universities are able to afford to dedicate so much of their workforce to an individual student.

Therefore, it is difficult to see such a program used on a large scale. However, by utilizing a modified form of the wraparound method institutions could use small teams and evaluate the impact.

The significance of this study provides the explanation of how wraparound differs from the traditional Individual Education Plan (IEP) and how wraparound can be impactful for others outside of the intended market (i.e. children and adolescents at risk in institutional care). The researchers reported additional unintended benefits for the faculty and service professionals that facilitated the reaching of David's goals, and I believe these are key components for providing additional resources (i.e., professional development) to active faculty and service professionals. One addition, I would recommend to future researchers, would be insight into how team members are selected or to propose an alternative if a consensus is not reached. Therefore, additional research using this method would still need to be developed and explained.

Students are multifaceted, and often have many predisposed hindrances (i.e., underprepared, low socio-economic, first generation, learning disabled) present. Therefore, Lombardi, Murray, and Gerdes (2012) conducted a cross-sectional survey studying the challenges associated with having a disability and being a first-generation (first-gen) college student. The researchers analyzed 197 undergraduates who self-disclosed disabilities and qualified to receive services from the Disability Services Office (DSO).

The data were obtained by administering several measures, the College Self-Efficacy Inventory (CSEI), the Financial Burden subscale, and the College Students with Disabilities Campus Climate (CSDCC) survey. Additional demographic data were obtained from the university's system to include gender, ethnicity, disability type, and cumulative GPA. A statistically significant difference was found, the first-gen students with disabilities had lower GPAs than did continuing-generation students. First-gens also exhibited lower levels of family support and peer support, and they reported greater levels of financial stress, and greater utilization of accommodations.

Despite, the low percentage of the DSO population—not even half (38%) were used in this study (Lombardi, Murray, and Gerdes)—a noted strength was the use of a hierarchical regression analysis documented in several charts. This supports the firm

foundation that indicates additional research is needed in regards to crosssectional populations.

Woodcock and Vialle (2011) surveyed elementary Australian preservice teachers using vignettes and Likert-scale questions to ascertain their responses to students (i.e., with/without LD, effort, ability). Overall, there was statistical significance shown from the multivariate analysis of the feedback given to the students with and without LD, with greater positive feedback given to the students with LD. This indicates that preservice teachers were already aware of the needs of students with LD and addressing them. This underlines the need for continued education for professionals. By studying preservice teachers the implication is that these professionals have been (or are currently) engaged in knowledge development (e.g., graduate classes, conferences, book studies) and that more seasoned professionals might not be as current due to lack of engagement as students themselves.

Taken as a whole, the research points to both the positive impact of disability awareness among university faculty and administration, as well as the importance of making this awareness more widespread. While collaboration among knowledgeable, supportive staff has been shown to improve outcomes for students with disabilities, unfortunately, such support is not yet universal.

Academic Support Centers

Few universities offer all students—regardless of disability status—scholastic support in service centers. Recent research advocates for more inclusive learning support. For instance, Sparks and Lovett (2013) examined 336 postsecondary students in a correlational study with the purpose of determining accuracy of LD diagnostic criteria. Their objective was to determine if there was a mutually exclusive relationship between having a documented LD and needing academic support; the results indicated there was not. Based on the parameters of the data set, various diagnostic models, and prior investigation, the research design is appropriate. Sparks and Lovett (2013) used multiple instruments including: (a) Wide Range Achievement Test-Revised (WRAT); (b) IQ-Achievement Discrepancy; (c) DSM-IV, and (d) Dombrowski, Kamphaus, and Reynolds's (2004) model. The researchers provide a variety of

definitions of LD as deficit of skills, or a disorder(s) in one or more of the basic psychological processes involved with academic skills (i.e., reading, writing, and math). However, the parameters of each diagnostic model did not infer predetermined outcomes on the other models.

The pilot was conducted at a smaller college, which was the most prominent strength of the study. As a failsafe, the researchers opted to use the lowest score in each model to provide a uniform perspective of each student. Limitations of this study centers on the number of diagnostic tools, which proved to represent only a small portion of data collection methods.

The outcome of the study shows that LD diagnosed students are not distinguishable from other students. Likewise labeling students either directly or indirectly can inflict an unnecessary and often negative stigma on students (Arendale, 2007). The best way to remedy this is for more colleges to open their academic support programs to any interested students, regardless if the student has a documented disability. “Many support services (e.g., tutoring) are beneficial for nondisabled students, it is unclear why we view these as ‘disability’ services” (Sparks & Lovett, 2013, p. 239).

Despite the quantitative data presented, the researchers used only univariant statistics, providing no statistical significance. LD diagnoses range from the first to the 88th percentile for the population; this suggests that a LD diagnosis may, independently, say little about students’ college-relevant skills, thus underscoring the importance of individualized counseling and decision-making regarding accommodations and other services.

Similarly, Troiano, Liefeld, and Trachtenberg (2010) piloted a quantitative, correlational study to predict college success as a result of frequent attendance to an academic support center. This method was well-selected because a third party, the Learning Resource Center (LRC), independently collected the data. The authors hypothesized that students who regularly attended academic support center appointments would achieve higher academic success than those students who attended infrequently or not at all. Calculations were made using a discriminant function analysis to evaluate the extrapolative effect of learning support center use and gender on

college student success. Based on the results, the relationship of attendance at the Learning Center is more statically significant than the implications of gender on student success.

Unfortunately, threats are present that undercut the results of this study. The student subject group was the entire population that used the LRC. The researchers state the LRC is only available to students with diagnosed and documented LD or Attention Deficit Hyperactivity Disorder (ADHD). In addition, all participating students were eligible for educational accommodations as a result of their LD documentation. The practical significance of the study is limited due to the participants having documentation for unspecified learning disabilities or ADHD. It would be difficult to apply these findings to other LD populations as the specific disabilities were not charted. In addition, it would be difficult to infer that similar results would be valid in non-disabled populations. Additionally, an ecological generalizability threat is also present. The researchers state that 9% of college students are reported to have a disability (Troiano, Liefeld, & Trachtenberg, 2010, p.35). However, the institution participating in this study reports that 30% of its population have LD documentation. In addition, based on the numbers the entire population of a small, private, liberal arts college in the eastern US is less than 875 students. Schools of similar size are rare; therefore, these findings are arguably not likely to be generalized to larger populations.

Furthermore, this study has identified the historical understanding of relationships between students and staff, which can strengthen a student's desire to succeed. Based on the findings, recommendations specify that academic support increases college success for students with documented learning disabilities and ADHD. At present only the title indicates that the findings are directly reported on LD students. Additionally, creating a unique criteria for data collection (to include additional factors, i.e., major, specific LD, etc.) at a larger public institution would prove to have improved population and situation generalization.

McLachlan and Davis (2013) steered a phenomenological study, which developed and implemented the Enhanced Learning Support Assistant Program (ELSAP). ELSAP provides professional

development for academic support assistants to support adult students with LD in England. The design of this study is appropriate because of the nature of students with LD and the need to observe them to gain a holistic (i.e., observations, interviews, field notes, reflective diaries) understanding of their experiences. The 25 academic support assistants were invited to participate; unfortunately only nine volunteered. This poses a threat to selection data as those participants might not be a representative sample. Analytical induction was used to identify themes, which poses a possible researcher bias as a third party was not brought in to validate the findings. The strength of the research was that the inclusion of direct quotes from the students' interviews provides real accounts of experiences and perspectives.

The practical significance is apparent in the responses from the participants. The participants reported that the program increased their knowledge of support strategies, and they learned how to review their own practices. Recommendations would be to further the research by administering a longitudinal study incorporating other schools or countries into the program.

Murray, Lombardi, and Wren (2011) conducted a quasi-experimental survey study on exempt and non-exempt staff at a university. The purpose of the study was to examine the attitudes and perceptions of university staff regarding students with LD, and to explore how prior LD-training contributed to their attitudes and perceptions. The researchers evaluated the differences between the two groups on the eight attitude/perception factors (e.g., willingness to advocate, insufficient knowledge) using a Multivariate Analysis of Variance (MANOVA). The MANOVA identified several areas to be statistically significant and practically significant as those without training indicated insufficient knowledge and desire for additional training, whereas those with training indicated high general knowledge and increased sensitivity. The appropriateness of using a survey to collect this data is questionable; perhaps a focus group or an in-person interview might provide greater insight to the findings. A weakness from using a survey is the limited depth of responses. Strength of this study was the use of a previously tested survey based on identified themes in the literature.

Murray, Lombardi, and Wren stated that they hard-copy mailed all 300 staff of the university and they requested that the surveys be completed and returned; therefore, there was no oversight to prevent collaboration, or even ensure the survey was completed by the intended individual. Also, the small percentage (37%) of responses might reflect a skewed perspective of the overall climate toward students with LD.

The data points strongly to a need for learning support centers to become more inclusive. Students with a variety of disabilities, as well as students without documented disabilities, benefit similarly from learning support services. This universal benefit, coupled with the inherent inadequacies in current disability diagnostic procedures, means that colleges ought to open their learning support services to a wider population.

Statement of Conclusions

The review of literature revealed the positive impact of disability awareness among university faculty and administration, as well as the importance of making this awareness more widespread. While collaboration among knowledgeable, supportive staff has been shown to improve outcomes for students with disabilities, such support is not yet universal. Furthermore, the data point strongly to a need for learning support centers to become more inclusive. Students with a variety of disabilities, as well as students without documented disabilities, benefit similarly from learning support services. This universal benefit, coupled with the inherent inadequacies in current disability diagnostic procedures, means that colleges ought to open their learning support services to a wider population.

Statement of Recommendations for Further Research

Unfortunately, there is a lack of formidable research from and about academic support centers. Ideally, academic support centers could conduct longitudinal research depicting students with and without learning disabilities academic progress during the duration of their studies. In addition, professional development programs can collect feedback from students by way of electronic surveys or incorporating selected questions into existing course evaluations.

Encouragement for universities and institutions of higher education to offer professional development to faculty can provide additional tools and insight regarding the needs of LD students, regardless of documentation. Also, having researchers use mixed method design longitudinally would provide more concrete criteria for which to measure the approaches used and the overall outcome. This would provide additional feedback to educators, setting a benchmark for further research.

Statement of Implications

The research problem presented in this study is necessary to better understand the impact that academic support centers have on the academic success of students with learning disabilities (LD) in higher education. However, the few researchers in the field suggest that faculty and professional staff need professional development to work more effectively with students with LD, and must provide inclusive environment for students.

Professional development equips faculty and staff with the tools to more readily address the needs of their students. Specifically, it offers skills, awareness, knowledge, and strategies to better support students with LD. As a result, faculty and staff have better perceptions of students with LD and are more able to encourage them to reach their highest potential. It is important for educators to understand the impact of their actions on the academic success of students' with LD. In addition, with the proper enhancement of their existing skillset, faculty and learning support professionals are able to achieve a more integrated support structure.

As faculty and staff become more aware of the needs of students with LD, the need to offer inclusive services becomes more apparent. Limiting support to only students with LD creates the misconception of preferential treatment; and, as a result, at some institutions students without LD become disgruntled. Therefore, academic support centers should permit all interested students, regardless of LD documentation, access to learning support services (e.g., tutoring, SI, skills training). An inclusive model was found to be more efficient and accommodating than non-inclusive approaches at a variety of institutions. An inclusive and universal model improves

overall student accessibility. By addressing the needs of every student, both inside and outside of the classroom, improves their level of knowledge. That increased knowledge base will ultimately contribute to their personal and professional development in the future. An inclusive system must be supported by faculty and staff who are aware of the specific needs of students with LD, and provide the most direct aid to their students.

References

- Arendale, D. R. (2007). A Glossary of Developmental Education and Learning Assistance Terms. *Journal of College Reading & Learning*, 38(1), 10-34.
- Couzens, D., Poed, S., Kataoka, M., Brandon, A., Hartley, J., & Keen, D. (2015). Support for students with hidden disabilities in universities: A case study. *International Journal of Disability, Development and Education*, 62(1), 24-41. doi:10.1080/1034912X.2014.984592
- Dombrowski, S. C., Kamphaus, R. W., & Reynolds, C. R. (2004). After the demise of the discrepancy: Proposed learning disabilities diagnostic criteria. *Professional Psychology: Research and Practice*, 35, 364-372.
- Lechtenberger, D., Brak, L. B., Sokolosky, S., & McCrary, D. (2012). Using wraparound to support students with developmental disabilities in higher education. *College Student Journal*, 46(4), 856-866.
- Lombardi, A. R., Murray, C., & Gerdes, H. (2012). Academic performance of first-generation college students with disabilities. *Journal of College Student Development*, 53(6), 811-826.
- McLachlan, B., & Davis, G. (2013). Educating the educators: Developing those who support learning for students with additional learning needs. *Support for Learning*, 28(4), 173-180.

- Murray, C., Lombardi, A., & Wren, C. T. (2011). The effects of disability-focused training on the attitudes and perceptions of university staff. *Remedial and Special Education, 32*(4), 290-300.
- Sparks, R. L., & Lovett, B. J. (2013). Applying objective diagnostic criteria to students in a college support program for learning disabilities. *Learning Disability Quarterly, 36*(4), 231-241.
- Troiano, P. F., Liefeld, J. A., & Trachtenberg, J. V. (2010). Academic support and college success for postsecondary students with learning disabilities. *Journal of College Reading and Learning, 40*(2), 35-44.
- Woodcock, S., & Vialle, W. (2011). Are we exacerbating students' learning disabilities? An investigation of preservice teachers' attributions of the educational outcomes of students with learning disabilities. *Annals of Dyslexia, 61*(2), 223-241.

Book Review: *Teach Students How to Learn*

McGuire, S. Y., & McGuire, S. (2015). *Teach Students How to Learn*. Sterling, VA: Stylus.

Reviewed by Ashley Babcock, Editorial Board Member

In *Teach Students How to Learn*, Sandra and Stephanie McGuire provide a straightforward overview on how to give students the skills they need to learn deeply instead of studying simply to make good grades. The authors argue that by teaching students to learn, students build a toolbox of metacognitive skills, learning strategies, and study skills. This book is written for faculty and educators, such as learning center practitioners who work with students on understanding material on a deeper level. Sandra McGuire very succinctly states her purpose: “I wrote this book to let everyone in on one of the best kept secrets in education: If you teach students how to learn and give them simple, straightforward strategies to use, they can significantly increase their learning and performance” (p. xv). The authors begin with a personal story of how they began using this approach and then construct the subsequent chapters so that others can see the tools used and begin to build their own toolbox of learning strategies and study/metacognitive skills.

The authors’ viewpoint is clear: “No miracles, just strategies” (p. xv). The authors use these strategies two ways: They provide them to the readers through anecdotal and quantitative evidence as well as list them in appendices. However, they also use the learning strategies in the book as evidence that these methods work when presented effectively. *Teach Students How to Learn* employs the authors’ golden rules to show readers first-hand how some of the strategies discussed work. For example, one of the main tenets of metacognition is

knowing the goal. Therefore, the authors outline each chapter and explain the main outcomes and goal of that chapter. At the end of each chapter, the authors explain how to use this chapter on its own and how it relates to the next chapter. Readers are getting a two for one—they are learning about the authors' process but they are also seeing it at work in the setup of the book.

Saundra McGuire wrote *Teaching Students How to Learn* at the behest of many educators who have heard her speak about the process and learning strategies she has used over her prestigious career, and her personal journey becomes the book's foundation. The authors weave three types of evidence equally throughout: McGuire's personal journey of learning how to teach students to learn successfully; quantitative evidence of students learning from published and unpublished studies; and qualitative evidence of students, educators, and faculty using these strategies successfully. When introducing metacognition in chapter three, McGuire speaks about a student, Dana, who went from thinking about leaving her major in physics to graduating in 2012, "with a 3.8 GPA and a major in physics, and in the summer of 2014 she graduated with a master's degree in medical physics" (p. 19). Dana's change first occurred once she spoke with McGuire after a poor showing on her first physics exam in college.

By pairing success stories that Saundra McGuire personally witnessed with quantitative research from other faculty members' classes, the authors show that these strategies have been successful with a myriad of students, class types, and university types and is not just due to one teaching style. For example, in Cook, Kennedy and McGuire (2013), the average of students who were exposed to metacognitive skills, the study cycle, and Bloom's Taxonomy was 81.5 opposed to the 72.6 average of students who were not exposed to these strategies (as cited by McGuire and McGuire, 2015). Additionally, the inclusion of qualitative evidence from other classes, such as a biology class at UVA, helps support the authors' assertion that the 50-minute study skills intervention presented in this book might be adapted to any class or institution with successful results. Overall, between the personal, quantitative, and qualitative evidence, the message from students is clear: "This course stretched my ability

and has given me the tools to not just memorize and regurgitate facts on the tests, but rather to synthesize data and grasp a concept as a whole” (p. 151). The authors demonstrate the results of what happens when students know how to learn and can put those tools to use.

Not only do the authors provide evidence to support that students learn effectively using the strategies presented in this book, but they provide readers easily relatable examples, adaptable lessons, and slides to use with their own students. Chapters eleven and twelve instruct educators how to teach the material to groups and unprepared students. The authors outline succinctly how they will present their lesson and arm educators with a wealth of resources including, “two exemplar slide sets, a template slide set, a video of a session for groups (all at styluspub.presswarehouse.com/Tiles?TeachStudentsHowtoLearn.aspx), and a handout you can find in appendix D” (p. 123). In the instruction chapters, the authors are very cognizant of the variety of educators’ teaching styles and urge readers to, “adapt my suggestions to your own unique situation” (p. 122). Similarly, the authors are aware that both of them come from a science background (chemistry and neuroscience) and most of the examples in the text deal with science classes. Therefore, they provide three slide templates: chemistry presentation (geared toward STEM fields), general presentation (any field), and presentation template (similar to chemistry but able to be adapted to a larger audience as needed).

Overall, the authors provide a basic template for educators to adapt these skills and strategies to any discipline. However, I believe a possible collaboration for another book would be working with faculty in other disciplines who have used McGuire and McGuire’s resources effectively to develop subject-specific toolkits. For example, a book that focuses on lessons and tools to use the strategies in writing/composition or a book focusing on the social sciences. These could be smaller, “tool kits” edited by the authors that rely on faculty throughout several disciplines that have used the strategies presented in the book successfully in their respective fields. The authors could also conduct research on using these resources and have more data to prove the power of teaching students to learn.

One of the stand out features about the set-up of this book is the chapters build upon one another to develop a cohesive strategy for success. For example, one of the main premises of the book is that students need to change their behavior, understand why they need to change their behavior, and how these strategies will help them learn information on a deeper level. These ideas of *it's all in how you say it, being clear, reinforcing habits, and being specific* are reiterated in every chapter and through all of the different strategies and best practices presented. Change starts with developing the correct mindset as Sandra McGuire so concisely explains, “In fact, one major purpose of everything I have shared with you is to help students attribute their results to only their actions, to help them change their mindset” (p. 58). Therefore, while it may appear there are many strategies presented, the scrupulous reader will see the same golden rules reiterated into different concepts to give educators a clear yet adaptable approach to building their own toolkits for success.

This insightful book is the product of a forty plus year journey into teaching and learning. The authors share motivating stories of students who improved tremendously and then very succinctly explain the strategies responsible for those improvements. They make a promise at the end of the introduction that readers will understand why students do not know how to learn and that they will arm readers with the understanding of strategies to help teach students how to learn. Not only do they promise to teach these strategies, but they also promise to deliver slide sets, exercises, assessments, and study tools to share with students. They deliver on these promises. McGuire and McGuire have constructed an invaluable resource that provides educators with all the tools necessary to develop students as independent, self-efficacious learners.

Overall, this book highlights many of the strategies learning center professionals teach often in their centers and the authors put the ideas together in a concise and accessible way. However, since the personal journey is such a large part of the book, I would like to see more examples of how learning centers and faculty can work together. Some personal examples from Sandra McGuire’s experience and qualitative evidence of faculty/practitioner

interactions would be a welcome addition to chapter ten. This book presents many strategies that academics take for granted but unlocking these skills to students who do not know how to learn can be life changing! If you are looking for an engaging read that will give you a new outlook on how to teach your students, this is the book for you.

Applying Matched Sampling to Evaluate a University Tutoring Program for First-Year Students

Mark E. Walvoord¹ and Jacob D. Pleitz²
University of Oklahoma

Author's Note

¹*Now at the University of Central Oklahoma, 100 North University Drive, Box 212, Edmond, OK 73034.*

²*Now at Virginia Polytechnic Institute and State University*

Abstract

Our study used a case-control matching design to assess the influence of a voluntary tutoring program in improving first-year students' Grade Point Averages (GPA). To evaluate program effectiveness, we applied case-control matching to obtain 215 pairs of students with or without participation in tutoring, but matched on high school GPA and standardized test scores. Next, we examined differences in academic performance between the two groups. A matched pairs t-test showed that students who attended the tutoring sessions demonstrated significantly higher GPAs during their first year. We close by discussing implications and suggestions for future research.

Introduction

Cross-Level Peer Tutoring

Peer tutoring has long been used in education as an effective learning tool. With settings ranging from elementary school (Ladd & Kochenderfer, 1996) to higher education (Colvin, 2007), the practice of students helping to teach other students is often praised in the literature as a method for increasing student motivation (Miller & MacGilchrest, 1996), improving student learning (Millis & Cottell,

1998; Entwistle, 1997), and fostering greater student academic responsibility (Goodlad, 1998). Given the effectiveness of such practices, many schools are adding peer tutoring as a method of improving student performance.

Peer tutoring differs from traditional lecture methods by employing peers, rather than professional teachers, as the primary means of instruction. Although it may seem counterintuitive that a less-experienced expert may be a more effective teacher, research results present many reasons why this may be the case. We'll start by defining what exactly a peer is.

According to Falchikov (2001, p. 1), a peer is someone of “the same social standing,” and peer-level tutoring involves “helping each other to learn and learning themselves by teaching” (Topping, 1996; Falchikov, 2001, p. 3). Damon and Phelps provide a more specific definition of this process: “Peer tutoring is an approach in which one child instructs another child in material on which the first is an expert and the second is a novice” (1989, p. 11). Two important points may be derived from this definition, specifically highlighting why peer-level tutoring may be more a more effective method of learning than traditional instructor-based learning.

First, because peer tutoring involves teachers and learners of the same social standing, there may exist a unique social and intellectual reciprocity between the two. Since the teacher and learner are on the same peer level, they may be more likely to share a bond not experienced by the traditional student-professor dynamic. Given that both roles share a similar social status, they may be more likely to identify with the troubles and difficulties of the material in a unique perspective not shared by a more proficient expert. Drawing along the lines of Piaget’s learning theory, this shared bond may help the student and learner work together to develop more similar schemata, or building blocks, towards understanding concepts (Piaget & Cook, 1952).

Second, because peer-level tutoring allows students to work together in the teacher-learner dynamic, some people have proposed that a more appropriate term, mutual instruction, be used to describe the process (Swengel, 1991). This term helps emphasize the second potential advantage of peer level tutoring—that by teaching the

material to their classmates, students are able to learn and master the material from a different perspective. By both teaching and learning from one another, students are allowed to engage in a form of cooperative learning (Hermann, 2013; Machemer & Crawford, 2007), a form of learning connected with many positive outcomes, including retaining information longer (Lujan & DiCarlo, 2006) and increased academic confidence (Cherney, 2008).

There are two major characteristics that should differentiate the peer tutor from the “client” student. Tutors must have high-quality training (Sheets, 1994) and have clearly defined roles as tutors instead of course teaching assistants (Carsrud, 1979) to be most effective. Proper training gives the tutor confidence in their abilities, skills in communication, and a background in learning theory that allows them to be most effective in working with peers. Unlike teaching assistants, tutors don’t have control over students’ grades or the construction of course materials, so clients view them as a more neutral resource for discussing course challenges.

Barbara Millis, in *Cooperative Learning in Higher Education* (2010), summarizes the usefulness of cooperative learning, even apart from any peer tutoring constructs, in effectively encouraging deep learning, critical thinking, and academic skill-building. Properly structured group learning opportunities serve the purpose of increasing topical understanding and academic skills, building communities to connect students to the institution, and increasing a sense of belonging leading to increased retention (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2007).

Our Action Tutoring Program

This paper investigates a voluntary tutoring program at a large, public, mid-western university. Created in 2007, it is a campus-wide tutoring program designed to increase students’ academic achievement, critical thinking skills, and positive study habits with the ultimate goal of helping to boost retention and graduation rates. Tutoring sessions are staffed by undergraduate Peer Learning Assistants (PLAs) who have previously completed the course that they are tutoring and attend College Reading and Learning Association certified training for quality assurance (College Reading & Learning Association, 2015). Alternatively, sessions may be staffed

by course graduate teaching assistants and/or by course instructors. Called U.C. Action, to promote the idea that students must be proactive in improving their educational experience, the program was originally designed to offer assistance in introductory courses with the highest rates of D, F, or W grades. Specific opportunities offered by the U.C. Action program include group tutoring sessions to encourage peer collaboration and learning communities, faculty lead activities to give the students greater exposure to their professors, and the use of learning enhancement tools such as SmartBoards, iPads, worksheets, and visual aids to integrate active learning.

Faculty participation is encouraged through \$500 grant opportunities, increased interactions with students outside a large lecture setup, efficiency of using their office hours in this way, and the hope of increased student learning in their courses. Approximately 30 faculty, 20 GTAs, and 40 Peer Learning Assistants (PLAs) per semester work with U.C. Action to provide weekly drop-in and by-appointment assistance in over 75 courses. The majority of client visits occur at the voluntary, drop-in, group-learning sessions hosted by faculty, but additional visits occur at those hosted by PLAs and at small-group, by-appointment sessions that are available face-to-face or online. For the 2013–2014 academic year, 4,034 students visited sessions over 19,490 times, averaging 4.6 hours of assistance and 3.9 visits per student.

Recent research suggests that attending voluntary tutoring sessions may have a positive effect on student performance and retention, particularly when students perceive a benefit in doing so (Cavanaugh, 2011). In two 2010 studies, both cross-level, voluntary, one-to-one tutoring for at-risk students (Rheinheimer, Grace-Odeleye, Francois, & Kusorgbor, 2010) and drop-in, group tutoring (Cooper, 2010) correlated positively with students' retention rates and academic performance at U.S. public institutions. Additional positive effects were found by Arco, Fernandez, Espin, and Castro (2006) at a Spanish public university, suggesting that the effect may not be unique to domestic institutions. Cross-level, voluntary, group tutoring is also an effective means of increasing course grades when students used at least 9 hours per semester of tutoring according to Munley, Garvey, and McConnell (2010), and it is an effective means

to increase overall GPA and retention (Coladarci, Willett, & Allen, 2013).

Case-Control Matching

A well-known factor of proper experimental design is that the groups being compared be as close as possible on every factor other than the one of interest. Because of this, a component of true experimental design is the notion of randomization (the idea that every participant has an equal probability of being assigned to any group). Having equal probabilities of assignment will, in effect, make the groups equal on every factor other than the one being manipulated. As such, any difference in the dependent variable should be attributed to the independent variable.

The notion of case-control matching design is presented in Shadish, Cook, and Campbell (2001), who demonstrate the effectiveness of this quasi-experimental design across a number of fields, including sociology (Holland, 1986), epidemiology (Ahlbom & Norell, 1990), and psychology (Holland & Rubin, 1983). Built upon Rubin's Causal Model (Rubin, 1977), case-control design seeks to answer the question of what if an alternate event had occurred. According to Rubin, every one unit in an experiment has a potential outcome, depending on the condition to which the unit is assigned. The question then becomes, what if the person had not been assigned to this condition, but rather to another condition. All things being equal, should we observe a different outcome, then we can assume the cause of this outcome to be the different condition.

In light of this logic, sometimes called counterfactual conditioning, the current situation provides an ideal environment for case-control design. Specifically, students are presented with 1 of 2 potential realities: either attending or not attending one or more tutoring sessions. The question then becomes, what would have happened, had the attending student not attended, or what would have happened if an un-tutored student had participated. In traditional experimental design, this is created through the process of randomization (Fisher, 1935); however, because we cannot randomly assign participants to groups in the current case, we used a case-control setup.

Case-control designs create “equal groups” through matching on variables known to potentially influence the outcome. For example, college grades are often directly related to high school grades and standardized test scores (Pleitz, Terry, & Campbell, 2010). Given these pre-existing potential differences, along with the knowledge that such differences may cause a difference in the outcome that cannot be attributed directly to the variable under interest, case-control designs seek to match on these variables. They effectively wash out their influence and create equal groups. By controlling for all known confounding variables, case-control designs then allow the experimenter to answer the question of what would have happened, had an alternate reality occurred.

Purpose of the Current Study

As tutoring programs become more popular, researchers and educators are becoming more interested the effectiveness of such programs in improving students’ academic performance. However, given that attendance at many of these tutoring sessions is strictly voluntary, true experimental design is typically not possible. This current article provides an example of how case-control designs can be used to assess the influence of these programs in a more effective manner. Using case-control designs, researchers and administrators can gain a greater insight into the efficacy of such programs, and hopefully better understand how to improve student performance in higher education.

Methods

Participants

Data were collected from approximately 3,939 students at a large mid-western university (University of Oklahoma IRB approval #3563). Although exact ages of participants were not available, it is likely that they were between the ages of 18 and 20, because we restricted our study to first-year students and our campus has a fairly traditional student population. Approximately 2,135 (54%) of the sample were female. Of the sample, approximately 14% of students attended at least one U.C. Action tutoring session. Table 1 presents an overview of the sample’s descriptive statistics.

Table 1
Labels and Descriptive Statistics for Sample (N=3,939)

Variable	N	Mean	SD	Min	Max
ACT	3,939	25.97	3.90	14.00	36.00
High School GPA	3,939	3.65	0.29	2.22	4.00
Average Minutes per Visit	557	44.78	40.68	0.010	201.07
Minutes (Total)	557	82.10	42.92	0.01	240.00
First Semester GPA	3,939	2.9787	0.88	0.00	4.00

Variable	Label	Frequency	Percentage
Gender	Gender		
Male	1	1,804	45.80%
Female	2	2,315	54.20%
Action Tutoring			
Yes	1	557	14.14%
No	0	3,382	85.86%

In the current situation, the cases/controls are matched on high school GPA and standardized test scores. These variables have been shown to be highly associated with college performance in previous studies (Pleitzi et al., 2010), and explain 20% of the variance in first year GPA within the current study. Table 2 presents the means and standard deviations of high school GPA, ACT score, and first year college GPA for the two groups. The control group represents the students who did not attend the U.C. Action tutoring sessions while the study group represents the students who attended one or more sessions.

Table 2
Descriptive Statistics for Case and Control Groups

Group	High School GPA	Standardized Test Score	First Year GPA
Control	3.634 (0.3045)	26.040 (3.986)	2.925 (0.923)
Study	3.744 (0.233)	25.554 (3.318)	3.305 (0.548)

Table 2 reveals that the study group (those students who attended the tutoring sessions) entered into college with higher incoming high school GPAs but a slightly lower average standardized test score than the control group. Because of this, it may be that their higher first year GPAs are a reflection of greater academic credentials, rather than being due to attending the tutoring sessions. To account for this, we matched students between the two groups on these variables, to get a more representative picture of the influence of the U.C. Action program on first year GPA.

Results

After creating the criteria for matching (equal high school GPAs and standardized test scores), the data set contained 215 pairs of matched students. Given that the original study data set contained 557 first-year students that had visited tutoring, appropriately-matched pairs were found for 39% of those students. After matching, the mean high school GPA for the group was 3.74 and the mean standardized test (ACT) score was 26.30.

Having matched the samples on the relevant predictors, we then examined the mean differences in first year performance between the two groups. A paired sample t-test was conducted to compare the first year GPAs in the study and control conditions. Table 3 presents the results from the t-test where the mean variable represents the difference between the study group and the control group.

Table 3

Results from Case-Control Paired Samples t-test

N	Mean	Std Error	Df	t value	pr < t
215	0.2909	0.0664	213	4.37	< .0001

Results indicated that there was a significant difference between the scores for the attendees ($M=3.29$, $Sd=0.57$) and the control group ($M=2.99$, $Sd=0.92$), $t(214)=4.37$, $p < .0001$. Figure 1 presents the distribution of differences in college GPA between the two groups. The solid curve represents the data distribution using a standard normalized curve, while the dotted line represents the data distribution using a kernel density method. The box plot presents the

mean difference in college GPA between the two groups, along with a 95% confidence interval for this difference.

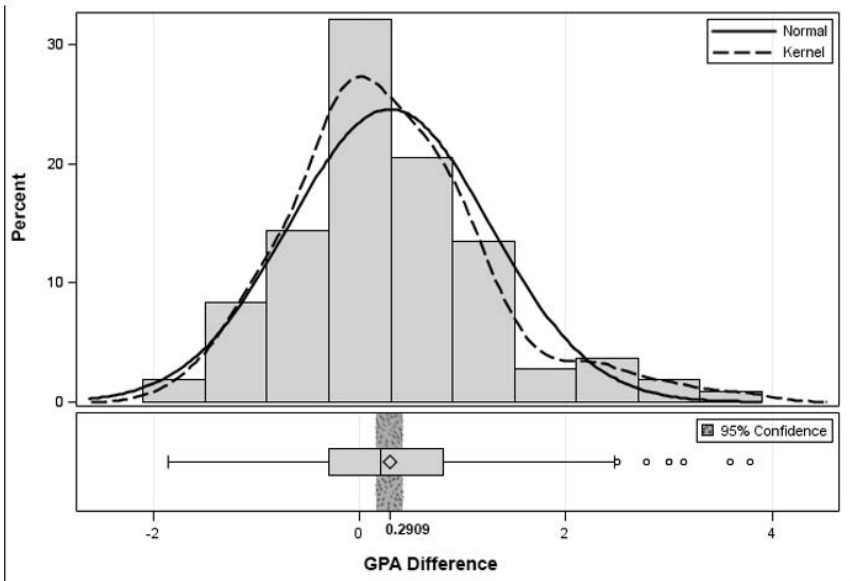


Figure 1. Distribution of differences in first year GPA between matched samples.

Discussion

The current study applied a case-control matched-pairs analysis to investigate the effectiveness of attending U.C. Action tutoring sessions on a student's first year academic performance. Students were matched on incoming high school GPAs and standardized test scores, and the differences in academic performance between the two groups were examined. Results indicated that the mean GPA for the group who attended at least one tutoring session was approximately 0.29 higher than the group who did not attend.

As we anticipated, those who attended at least one session had a higher average high school GPA than non-attendees, but we were surprised that their average standardized test scores were slightly lower. This implies that attendees are motivated to get better grades but may have some difficulty taking tests, and perhaps they attend tutoring hoping to increase test performance.

The results from the current study suggest that programs such as U.C. Action are having a positive effect on improving

students' first year GPAs. These findings continue to support the notion that implementation of peer-lead, and cross level tutoring may provide an effective method of improving student performance in higher education. Further, Given that many schools are feeling the increased pressures of budget cuts and faculty shortages, the current findings may be of particular importance within the current financial climate.

Peer tutoring can take many forms, and researchers continue to analyze the most effective methods for various educational settings. Topping (1996) summarized tutoring research in both K–12 education and higher education, showing evidence that peer tutoring is both an effective and cost-efficient means of increasing student performance, and in some cases, decreasing drop-out rates. Similarly, Falchikov (2001) gives several advantages to peer tutoring in higher education settings including decreased drop-out rates, increased study skills, and increased confidence. As the popularity of tutoring programs continues to grow, researchers have become more interested in investigating how these programs can increase retention, academic success, and graduation rates.

Along with demonstrating the effectiveness of cross-level, faculty-involved tutoring programs in improving student academic performance, the current results also present an effective way of implementing quasi-experimental design to assess cause and effect when true randomization is not a viable option. Specifically, by matching on factors known to influence the outcome of interest (student academic performance), the current article has demonstrated that the effects of random assignment may be achieved even in situations where participation in the experimental group variable is voluntary.

Shortcomings of the Current Study

Because the results presented above relied on post-hoc analysis of data observations rather than a full experimental setup, we must be careful with the interpretation of our results. It is important to point out that the students were neither randomly assigned to groups, nor randomly sampled from a general population. As such, it is not possible to directly state that participation in the tutoring program caused students to earn higher grades. Since our results were observed without any randomization or manipulation, any direct line

of causation is not possible due to potential confounds (Shadish et al., 2001).

Additionally, it is important to note that the above analysis is limited in scope due to its focus on the aggregate level of student body, rather than on the more microscopic details. That is, because students are lumped into one large sample, any nuanced behaviors are not detected. These include specific potential interactions between attendance and different majors, attendance at sessions with or without faculty present, and attendance and duration of visits. Although it appears that attending at least one session is helpful, it remains to be seen whether it is particularly more helpful for certain courses, majors, or types of students than others. These variables provide the greatest opportunity for future research.

Applications

While the present results indicate that participation in our voluntary tutoring sessions yields positive benefits for students, they also represent a pervasive problem long known to administrators and educators—that voluntary programs are only beneficial if students are willing to partake in them. Furthermore, as the above results indicate, students who are most likely to use the program are also those most likely to already have high grades to begin with. As such, it seems that those students who need academic assistance programs the most, may be the least likely to use them.

Understanding why lower achieving students are less likely to attend these effective sessions is an important first step to making such programs more attractive to target populations. Strategies we've used to make sessions more attractive and accessible to these target groups include having professors host the sessions, scheduling sessions at times and days to cater to students' needs and study habits, and offering sessions online to allow different learning preferences and flexibility of location.

Maximizing a student's academic potential is one of the most important goals for colleges and universities. This article has demonstrated how one method of instruction, a voluntary tutoring program, can be used to improve a student's first year GPA. Although there is a great deal more that needs to be studied within this area, including how to recruit low-achieving students to these services, by being able to demonstrate such programs' effectiveness,

researchers and administrators can provide students with at least one powerful reason for attendance.

References

- Arco, J. L., Fernandez, F. D., Espin, A., & Castro, M. (2006). *A cross-age peer tutoring program to prevent academic failure and drop-out among first year university students*. Proceedings from the 36th ASEE/IEEE Frontiers in Education Conference, Session M2E, October 28–31, 2006, San Diego, CA.
- Ahlbom, A., & Norell, S. (1990). *Introduction to modern epidemiology*. Chestnut Hill: MA, Epidemiology Resources.
- Carsrud, A. L. (1979). Undergraduate tutors: Are they useful? *Teaching of Psychology, 6*(1), 46–49.
- Cavanaugh, M. (2011). Students' experiences of active engagement through cooperative learning in lectures. *Active Learning in Higher Education, 12*(23), 23–33.
- Cherney, I.D. (2008). The effects of active learning on students' memories for course content. *Active Learning in Higher Education, 9*, 152–171.
- Coladarci, T., Willett, M. B., Allen, D. (2013). Tutor program participation: Effects on GPA and retention to the second year. *The Learning Assistance Review, 18*(2), 79–96.
- College Reading & Learning Association. (2015). About ITTPC. Accessed 31 October 2015 at <http://www.crla.net/index.php/certifications/ittpc-international-tutor-training-program>.
- Colvin, J. W. (2007). Peer tutoring and social dynamics in higher education. *Mentoring and Tutoring, 15*(2), 165–181.
- Cooper, E. (2010). Tutoring center effectiveness: The effect of drop-In tutoring. *Journal of College Reading and Learning, 40*(2), 21–34.

- Damon, W., & Phelps, E. (1989). Critical distinctions among three approaches. In N.M. Webb (Ed.), *Peer interaction, problem-solving and cognition: Multidisciplinary perspectives*. New York: Pergamon.
- Entwistle, N. (1997). Reconstituting approaches to learning: A response to Webb. *Higher Education*, 33(2), 213–218.
- Falchikov, N. (2001). *Learning together: Peer tutoring in higher education*. New York: Routledge Falmer.
- Fisher, R. A. (1935). *The design of experiments*. Edinburgh: Oliver and Boyd.
- Goodlad, S. (1998). Students as tutors and mentors. In S. Goodlad (Ed.), *Mentoring and tutoring by students* (pp. 1–17). London: Kogan Page.
- Hermann, K. J. (2013). The impact of cooperative learning on student engagement: Results from an intervention. *Active Learning in Higher Education*, 14(3), 175–187.
- Holland, P. W. (1986). Statistics and causal inference. *Journal of the American Statistical Association*, 81(396), 945–960.
- Holland, P. W., & Rubin, D. B. (1983). On Lord's paradox. In H. Wainer & S. Messick (Eds.), *Principals (sic) of modern psychological measurement* (pp. 3–25). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2007). Piecing together the student success puzzle: Research, propositions, and recommendations. *ASHE Higher Education Report*, 32(5), 1–182.
- Ladd, G. W., & Kochenderfer, B. J. (1996). Linkages between friendship and adjustment during early school transitions. In: W. M. Bukowski, A. F. Newcomb & W. W. Hartup (Eds.), *The*

company they keep: friendship in childhood and adolescence (pp. 322–345). Cambridge, UK: Cambridge University Press

- Lujan, H. L., & Dicarolo, S. E. (2006). Too much teaching, not enough learning: What is the solution? *Advances in Physiology Education*, *30*, 17–22.
- Machemer P.L., & Crawford, P. (2007). Student perceptions of active learning in a large cross-disciplinary classroom. *Active Learning in Higher Education*, *8*(1), 9–30.
- Miller, J. E., & MacGilchrist, L. (1996). A model for peer-led work. *Health Education*, *2*, 24–29.
- Millis, B. J. (2010). Why faculty should adopt cooperative learning approaches. In B. J. Millis (Ed.), *Cooperative Learning in Higher Education: Across the Disciplines, Across the Academy* (pp. 1–9). Sterling, VA: Stylus Publishing.
- Millis, B. J., & Cottell, P. G. (1998). *Cooperative learning for higher education faculty*. Phoenix, AZ: American Council on Education and Oryx Press.
- Munley, V. G., Garvey, E., & McConnell, M. J. (2010). The Effectiveness of peer tutoring on student achievement at the university level. *American Economic Review: Papers & Proceedings*, *100*, 277–282.
- Piaget, J. & Cook, M. (1952). *The origins of intelligence in children*. New York, NY: WW Norton & Co.
- Pleitz, J., Terry, R. and Judice Campbell, N. (2010). *What they bring with them: Incoming freshmen characteristics and probability of retention*. Poster Presented at CRSDE, November, 1–3, 2010, Mobile, AL.

- Rheinheimer, D. C., Grace-Odeleye, B., Francois, G. E., & Kusorgbor, C. (2010). Tutoring: A support strategy for at-risk students. *The Learning Assistance Review*, 15(1), 25–33.
- Rubin, D. (1977). Assignment to treatment group on the basis of a covariate. *Journal of Educational Statistics*, 2, 1–26.
- Sheets, R. A. (1994). *The effects of training and experience on adult peer tutors in community colleges*. Thesis (Ed.D.), Arizona State University.
- Shadish, W. R., Cook, D. T., & Campbell, D. T. (2001). *Experimental and quasi-experimental designs for generalized causal inference*. Stamford, CT: Cengage Learning.
- Swengel, E. M. (1991). Cutting education's Gordian knot. *Phi Delta Kappan*, 72(9), 704–710.
- Topping, K. J. (1996). The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. *Higher Education*, 32, 321–345.

Flipping College Algebra: Effects on Student Engagement and Achievement

Cherie Ichinose and Jennifer Clinkenbeard
California State University, Fullerton

Abstract

This study compared student engagement and achievement levels between students enrolled in a traditional college algebra lecture course and students enrolled in a “flipped” course. Results showed that students in the flipped class had consistently higher levels of achievement throughout the course than did students in the traditional course, despite no differences in demographics. Moreover, students in the flipped course reported greater gains in affective variables related to mathematics than did students in traditional courses. In addition, this study found evidence that the flipped course experience was especially impactful for Hispanic women.

Introduction

Colleges and universities have increasingly been concerned with “bottleneck” or “gateway” courses: that is, entry-level courses with high-level enrollment but low success. Failure of these courses to effectively serve students can have a severely detrimental effect on both the student and the institution. At the forefront of identified bottleneck courses is college algebra, a one-semester mathematics course that can either be taken for general education credit or as a prerequisite for further mathematics courses. Each year more than 1,000,000 students take college algebra or a related course (Lutzer et al, 2007). Moreover, studies have placed the non-success/withdrawal rate for these courses nationally in the 40-50% range (Herriot, 2006).

In April 2013, California State University Chancellor Timothy P. White’s budget proposal included funding to reduce the negative

impact of bottleneck courses through the use of innovative online technologies. One such type of course redesign is the initiative to “flip” the classroom. In a flipped class, students watch online video lectures before coming to class, complete a pre-assessment assignment, and then engage in a classroom discussion of the material facilitated by the instructor. This is in contrast to the traditional lecture model, where students independently take lecture notes and then attempt to complete homework problems on their own.

In this paper, we present the results of flipping a college algebra class using online technologies. Our conceptual model addresses the following two research questions:

1. How does the academic achievement of students in a flipped college algebra class compare with that of students in a traditional lecture model college algebra class?
2. What variables may serve as predictors for student achievement in a flipped college algebra class?

This paper presents a current literature review and theoretical model; the methodology used in the study with regard to questionnaire design and data collection; the data analysis; and the results and implications of this research.

Literature Review and Theoretical Model

Review of Recent Studies

The struggle that students face to pass college algebra is well documented. In 2010, a national U.S. Department of Education study found that 80 percent of high school dropouts cited their inability to pass Algebra I as the primary reason for leaving school (Schachter, 2013). Problems common to algebra students include the student’s previous knowledge of the subject, the effectiveness of the instruction, and their motivation to work hard enough to succeed (Thiel, Peterman, & Brown, 2008). Many college students, not just those in college algebra, have misconceptions about their “math ability” and have since given up on the notion that they could ever truly succeed in math (Boaler, 2013). These types of perceptions, coupled with the difficulty of the material and its reliance on prerequisite math skills from K-12 math classes, lead to many students failing college algebra, often multiple times.

Intervention strategies have been implemented to try and increase student pass rates in college algebra with varying degrees of success. Examples leveraging the use of modern technology include Carla Thompson and Patricia McCann's study to redesign college algebra to improve student retention (2010); Sherry Herron's study on the use of computer algebra systems in the classroom to improve pass rates (2012); and Neil Hatem's study on the use of graphing calculators (2010). Other types of technology used in college algebra have included online homework, online tutoring services, and multimedia technology (Kersaint, Dogbey, Barber, & Kephart, 2011). Approaches such as tutoring and supplemental instruction have also been found to be helpful for increasing both academic performance and improving attitudes towards math (Corey Legge, 2010; Ugo, 2010).

While college algebra professors share one major goal, to increase pass rates, it is also important to consider the affective component of student success. The term "affect" in mathematics, while not strictly well-defined, generally relates to a student's beliefs and attitudes towards studying math (Di Martino & Zan, 2010). Studies have shown that a college student's positive attitude towards mathematics tends to be correlated to higher achievement in a math courses (Hemmings & Kay, 2010; Hodges & Kim, 2013).

Although studies have been conducted on improving both achievement and affect in traditional college algebra settings, few explore flipped class college algebra courses. Several recent studies on general flipped-class strategies have been conducted, including Kathleen Fulton's study (2012) of flipping high school classrooms (2012); Maloy's study of flipping a college community engagement course (2014); and Demski's "expert tips" article (2013). However, few studies focus on a college mathematics courses in general, let alone for college algebra specifically (Wilson, 2013; Sparks, 2011). With this study, we hope to address a gap in the literature to examine the effects on student achievement of flipping college algebra in a university setting.

The learning process can be analyzed with Anderson and Krathwohl's revision of Bloom's Taxonomy in Figure 1 (Krathwohl & Anderson, 2010).

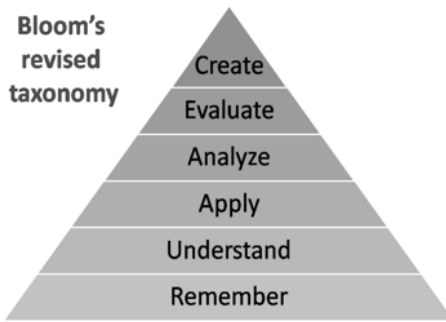


Figure 1. Revised Bloom's Taxonomy

In the traditional classroom model, the first two levels, “remember and understand,” are presented during classroom time. The student is responsible for the higher levels of comprehension on her or his own. By comparison, the flipped class is structured to allow in-class time for higher levels of comprehension. Since students watch pre-recorded lecture videos on the material before coming to class, class time can incorporate a problem-solving workshop format where students can work independently or in groups to solve more difficult problems. This allows the first two levels of Bloom's taxonomy to take place before class, and allows the instructor and students to build the upper levels of comprehension together during class time.

Flipped Class Structure

The flipped class used in this study is based on a three-step process. The student is expected to watch a 7-12 minute online module for each section of the text prior to coming to class. These modules include explanation of main ideas, examples, and embedded comprehension questions that the student answers as he or she watches and completes a pre-assessment (“Ticket in the Door”) prior to coming to class. He or she then brings the completed Ticket in the Door to class the next day; this serves as the basis for the class discussion and work. Students present their solutions to Ticket in the Door problems and then spend the rest of the class period engaged in problem solving of more difficult problems that would traditionally be assigned as homework (Figure 2).

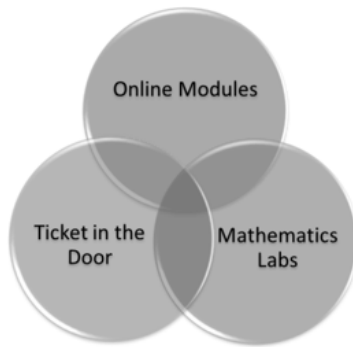


Figure 2. Three-Part Flipped Class Model

Theoretical Model

This study aims to measure differences in achievement between students in a flipped college algebra class and students in a traditional lecture class. In addition to the standard marker variables of ethnicity and gender, we consider how being in a flipped class as well as previous attempts at college algebra may predict a student's affective response to college algebra. We use this set of variables, along with the student's affective responses, to predict academic achievement in college algebra (Figure 3).

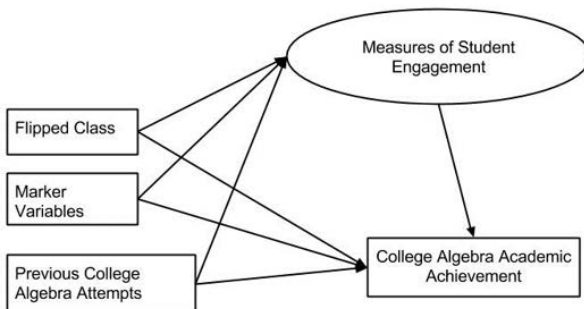


Figure 3. Theoretical Prediction Model

Method

This study was based on students at California State University Fullerton (CSUF) who completed Math 115: College Algebra, during the spring 2014 semester. CSUF is a large, urban, 4-year public university in Southern California, with approximately 38,000 students. The 669 students who completed the Math 115 course in Spring 2014

were included in this study. Information regarding ethnicity, gender, number of college algebra attempts, and grades was reported via university records for all participants.

For the population of 669 students, 40.1% of the students self-identified as male and 59.9% of the students as female.

Approximately 18.1% of students self-identified as Asian/Asian American; 19.1% as White/Caucasian; 49.9% as Hispanic/Latino/a; 3.0% as Black/African American; 6.3% as multiracial; 0.6% as “other”; and 3% as unknown/decline to state.

Since this was a spring semester, we considered the number of times the student had attempted college algebra. First-time students accounted for 49.9% of the population; students who had taken the class once previously accounted for 46.9% of the population, and students who had taken the class two or more times accounted for 3.1%. Thus, half of the students had either previously failed or withdrawn from college algebra at CSUF. Because the flipped program was a pilot, the flipped group was smaller than the traditional lecture group. There were 19 sections of college algebra, with 3 flipped sections and 16 traditional lecture sections. Of the three instructors who taught flipped classes, two of them also taught traditional lecture classes. The flipped classes accounted for 19.9% (133) of the students, while 80.1% (536) of the students were in a traditional lecture class.

Students were asked to participate in a voluntary, confidential pre- and post- survey regarding their opinions about mathematics. The same questionnaire was given for both the pre- and post- survey. Students who completed both the pre- and post- survey were awarded ten extra credit points at the end of the semester (1.0 % of the course grade). The pre-survey was available during the first two weeks of the semester, and the post-survey was available during weeks 13 and 14 of the sixteen-week semester. Of the students who responded to the survey, 310 students answered at least 70% of the questionnaire items. This resulted in a 46.3% response rate. Data considered in these analyses came from a series of Likert-scale questions taken from the PISA survey (2012) as well as several questions written by researchers.

We explored whether the variables about mathematical beliefs and in college algebra could be reduced to a smaller set of factors, or latent variables, using an exploratory factor analysis from the post-survey questionnaire (left column of Table 1). A principal components analysis with a varimax rotation was conducted in order to identify latent variables; missing data were deleted pairwise; and factor loadings below 0.300 were suppressed.

Table 1
Survey Factor Loads

	Component				
	1	2	3	4	5
I enjoy reading about mathematics.	0.668				
I look forward to my mathematics lessons.	0.577				0.364
I get very tense when I have to do mathematics homework.			0.720		
In mathematics I enjoy working with other students in groups.				0.914	
In mathematics I learn most when I work with other students in my class.				0.891	
I do mathematics because I enjoy it.	0.828				
I get good grades in mathematics.	0.633	0.307			
I get very nervous doing math problems.			0.865		
I learn mathematics quickly.	0.726				
I have always believed that math is one of my best subjects.	0.828				
I feel helpless when doing math problems.			0.814		

How confident do you feel about calculating how many square feet of tile you would need to cover a floor?		0.737			
How confident do you feel about calculating how much cheaper a TV would be after a 30% discount?		0.827			
How confident do you feel about calculating the gas mileage of a car?		0.772			
How confident do you feel solving an equation like $3x+5=17$.		0.618			
Learning mathematics is worthwhile for me because it will improve my career prospects.					0.872
Math is important to me because I need it for what I want to study later.					0.853
I would like to spend my life doing advanced mathematics.	0.737				0.300

Five principal factors were identified based on the individual variables present with the highest loadings (Table 2).

Table 2

Five Principal Factors Linked to Course Achievement

1. Math enjoyment	2. Confidence in problem-solving	3. Math anxiety	4. Peer preference	5. Perceived importance of math
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Identical course assessment/grading tools were used in the flipped and traditional classes. A course coordinator for all college algebra classes determined the textbook, course material, use of online homework, and syllabus for all college algebra courses. Most of the student's grade (about 80 %) was based on in-class real-time examinations (four exams and a final). The exams and final given

to the traditional classes were identical to those given in the flipped classes. Moreover, the conditions of the exams (calculator use, time allowed, formulas given, etc.) were identical as well. In neither type of class were students provided an exam “review sheet.”

During enrollment, when choosing a college algebra course section, there was no indicator to the student what type of class he or she was choosing. Students in the flipped classes were not aware of the different model until the semester began and they were asked to watch an introductory video explaining how their class would be different from the traditional lecture class. Although students could change course sections, fewer than 1% of those enrolled made such a change.

Results

Demographic Information

There were no statistically significant differences between the flipped group and the traditional lecture group in gender or ethnicity; there was a significant difference of the number of course attempts with more repeaters in the flipped classes ($t = 2.242$, $df = 665$, $p = .025$). In the flipped group, nearly three-fifths (59.4%) of students were repeating the course, compared with half (50.1%) of the students in the traditional group. As flipped classes were not previously available for college algebra, all of the students who were repeating the course had failed or withdrawn from a traditional lecture class.

Course Achievement

There were statistically significant differences between treatment (flipped) and control (traditional) groups on scores for exams 1, 3, 4, and the final exam, in each case favoring the treatment group (Table 1). There was also a significant difference in final percent earned in the course, with students in the flipped class earning a mean course grade 7 % higher than that in the traditional class. The passing rate in the flipped group was 66% compared with 57% in the traditional group ($t = .063$). The statistical techniques used to obtain these results accounted for the unequal sample sizes between the flipped and traditional group.

Table 3*t-tests for Equality of Means*

	<i>t</i>	<i>df</i>	Significance	Mean diff.	St. error diff.
Exam 1	5.72*	221	.001	8.79	1.54
Exam 2	0.69	214	0.49	1.15	1.61
Exam 3	4.50*	190	.001	10.2	2.27
Exam 4	2.79*	192	.006	7.08	2.53
Final Exam	2.78*	206	.006	12.9	4.66
% in Course	4.18*	230	.001	7.0	2.0
Pass Rate	1.91	209	.063	9.0	18.0

* denotes statistically significant difference

Survey Results

Survey analysis was done to explore possible interaction that affective variables may have had on academic achievement. Survey analysis was based on the sample of 310 students who completed at least 70% of both the pre- and post-survey questionnaires. In this sample there were 69 students in the flipped group (22% of the sample) and 241 in the traditional group (78%). Descriptive statistics showed that this sample was reflective of the original 669 students, with no significant differences between groups in terms of gender, ethnicity, or number of times attempting the course. Seventeen of the eighteen affective variable questionnaire items on the pre-survey showed no significant difference in responses between the flipped group and traditional group; given an alpha level of .05 with nearly 20 items, the one significant difference may have been due to chance.

Structural Equation Modeling

The theoretical model in Figure 3 was used to predict semester grade using gender, ethnicity, number of times taking the course, and type of class, together with the five factors in place of individual questionnaire items. The model implies that six regressions needed to be run. These six regressions were run using a stepwise method at an $\alpha = .05$ significance level. Missing data were handled by pairwise deletion with significant path coefficients obtained from stepwise

regressions. The revised prediction model shown in Figure 4 shows that only female Hispanic/Latino/a identification and participation in the flipped class were statistically significant predictors for course achievement.

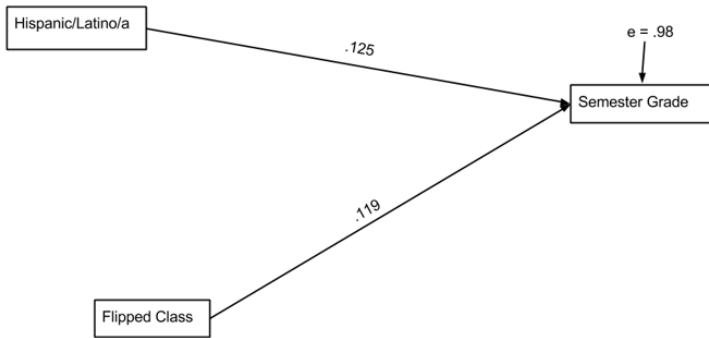


Figure 4. Revised Prediction Model

Discussion

Students in the flipped class model scored significantly higher on four of the five major assessments in the course, and on average earned a 7% higher grade in the course. Additionally, the pass rate for the flipped class was 66%, as compared with 57% in the traditional class. Moreover, all assessments were standardized and placement of students into a flipped or traditional class was random, limiting the effects due to self-selection or differences between instructors. This addresses the first research question regarding how academic achievement compared between class models.

Beliefs about math for each group were relatively static over the course of the semester. Factor analysis revealed five clusters relating to important constructs of various mathematical beliefs, the same categories considered in the PISA survey (2012). However, positive responses to these affective variables did not correlate with higher course achievement. In addition, the number of times the student had previously failed the course did not emerge as a predictor of success (or non-success).

While the original conceptual model showed various paths to higher semester grades by way of different background variables and affective factors, only female Hispanic/Latino/a identification combined with flipped class participation emerged as significant

predictors of achievement. This addresses the second research question regarding what variables may serve as predictors for student achievement. This finding is important especially at CSU Fullerton, where the largest gender/ethnic group is comprised of female Hispanic/Latino/a.

This study was designed as a pilot to evaluate the flipped class model in college algebra at CSU Fullerton. The study had several limitations, including a usable survey response rate below 50% due in part to student error on self-identification of their assigned university ID; the unequal proportion of students between the control and experimental groups; and the limited set of variables considered. Repeating the study based on fall semester results may help inform this research, especially since more of the students would be taking the course for the first time, creating a more homogenous population. Samples taken from other institutions with different assessments and implementations of the flipped classroom might also be important to investigate the impact of the flipped model, although controls would need to be carefully considered. The composition of the institution may be relevant also. For students attending a large, urban commuter campus, the flipped model may have provided a vehicle for interactions with peers and instructors that may not have otherwise been available.

The flipped math class is not limited to college algebra. Currently, several CSU Fullerton faculty members are in the process of creating (or have already implemented) flipped modules for pre-calculus, first-semester calculus, and math for liberal arts. Evaluating the differences in student engagement and achievement in different types of classes may provide evidence for applications and scalability of the flipped model.

Conclusion

Leveraging online technology to increase student success has been an important consideration over the last ten years or so, and continues to grow in popularity among educators. The initial results are promising. However, an important consideration would be the longevity of these techniques. Some educational technology, like the pocket calculator, has become a staple of today's modern

math classroom; others such as radio and TV saw an initial surge in popularity and then were mostly abandoned. In order to investigate the potential strength of the flipped classroom on a large scale, researchers must focus on data and evidence over time. In addition, it is important to remember that a strong commitment to education, high standards, and quality teaching are the most important considerations for student success. Flipping the class is potentially a way to strengthen and augment a healthy mathematics classroom, rather than a “cure-all” for poor student performance. By continuing to document evidence, we can critically evaluate the efficacy and staying power of the flipped class model.

References

- Boaler, J. (2013). Ability and Mathematics: The Mindset Revolution that Is Reshaping Education. *FORUM: For Promoting 3-19 Comprehensive Education*, 55(1), 143–152.
- Corey Legge, K. P. (2010, January 1). *Does Mandatory Supplemental Instruction Work in Developmental Math Education? A Study of Students Enrolled in Developmental Math Courses at a Suburban Community College in the Northeast*. ProQuest LLC.
- Demski, J. (2013). 6 Expert Tips for Flipping the Classroom. *Campus Technology*, 25(5), 32–37.
- Di Martino, P., & Zan, R. (2010). “Me and Maths”: Towards a Definition of Attitude Grounded on Students’ Narratives. *Journal of Mathematics Teacher Education*, 13(1), 27–48.
- Fulton, K. (2012). Upside down and inside out: Flip Your Classroom to Improve Student Learning. *Learning & Leading with Technology*, 39(8), 12–17.
- Hatem, N. (2010, January 1). *The Effect of Graphing Calculators on Student Achievement in College Algebra and Pre-Calculus Mathematics Courses*. ProQuest LLC.

- Hemmings, B., & Kay, R. (2010). Prior Achievement, Effort, and Mathematics Attitude as Predictors of Current Achievement. *Australian Educational Researcher*, 37(2), 41–58.
- Herron, S., Gandy, R., Ye, N., & Syed, N. (2012). A Comparison of Success and Failure Rates between Computer-Assisted and Traditional College Algebra Sections. *Journal of Computers in Mathematics and Science Teaching*, 31(3), 249–258.
- Herriott, S. R. (2006). Changes in college algebra. In N. Baxter Hastings, F. S. Gordon, S. P. Gordon, J. Narayan, & Mathematical Association of America (Eds.), *A fresh start for collegiate mathematics: Rethinking the courses below calculus* (pp. 90-100). Washington, DC: The Mathematical Association of America.
- Hodges, C. B., & Kim, C. (2013). Improving College Students' Attitudes toward Mathematics. *TechTrends: Linking Research and Practice to Improve Learning*, 57(4), 59–66.
- Kersaint, G., Dogbey, J., Barber, J., & Kephart, D. (2011). The Effect of Access to an Online Tutorial Service on College Algebra Student Outcomes. *Mentoring & Tutoring: Partnership in Learning*, 19(1), 25–44.
- Krathwohl, D. R., & Anderson, L. W. (2010). Merlin C. Wittrock and the Revision of Bloom's Taxonomy. *Educational Psychologist*, 45(1), 64–65.
- Lutzer, David J., Stephen B. Rodi, et al, CBMS 2005: Statistical Abstract of Undergraduate Programs in the Mathematical Sciences in the United States AMS, Providence, 2007.
- Maloy, R. W., Edwards, S. A., & Evans, A. (2014). Wikis, Workshops and Writing: Strategies for Flipping a College Community Engagement Course. *Journal of Educators Online*, 11(1).

- PISA 2012 Student Questionnaire – Form A - MS12_StQ_FormA_ENG_USA_final.pdf. (n.d.). Retrieved November 27, 2014, from http://nces.ed.gov/surveys/pisa/pdf/MS12_StQ_FormA_ENG_USA_final.pdf.
- Sparks, S. D. (2011). Schools “Flip” for Lesson Model Promoted by Khan Academy. *Education Week*, 31(5).
- Thiel, T., Peterman, S., & Brown, M. (2008). Addressing the Crisis in College Mathematics: Designing Courses for Student Success. *Change: The Magazine of Higher Learning*, 40(4), 44–49.
- Thompson, C. J., & McCann, P. (2010). Redesigning College Algebra for Student Retention: Results of a Quasi-Experimental Research Study. *MathAMATYC Educator*, 2(1), 34–38.
- Ugo, A. N. (2010). *The Relationship between Tutoring and Student Success*. ProQuest LLC.
- Wilson, S. G. (2013). The Flipped Class: A Method to Address the Challenges of an Undergraduate Statistics Course. *Teaching of Psychology*, 40(3), 193–199.

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 as defined above. We publish scholarly articles and reviews that specifically address these issues.

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Michael Frizell, MFA

Editor, TLAR

Director of Student Learning Services

Bear CLAW (Center for Learning and Writing)

Missouri State University

901 South National Avenue

Springfield, MO 65897

Phone: (417)836-5006

Direct E-Mail: MichaelFrizell@MissouriState.edu

Please send your submissions and/or questions and comments to: TLAR@MissouriState.edu

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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.

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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.

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Eric J Moschella, PhD.
Director, Student Success Center
NCLCA Membership Secretary
University of South Carolina
1322 Greene Street, Columbia, SC 29208
803-777-0684
Moschella@sc.edu



Michael Frizell

TLAR Journal Editor

Bear Claw Center for Learning and Writing

Myer Library 112

Missouri State University, 901 South National Avenue

Springfield, MO 65897
