Exhibit Materials for Taylor W. Acee:
Funded External Grant

Mireles, S., Paulson, E., & Acee, T. W. (2011-2013). *Evaluation of the Comprehensive Student Success Program* (THECB Contract No. 06726 and THECB Contract Number BMS10473). Texas Higher Education Coordinating Board, Austin, Texas, $532,304 [Taylor W. Acee is listed as a Co-Investigator on this project.]

Summary: This funded external grant is an example of my applied scholarly research that is focused on evaluating learning support interventions in postsecondary education contexts. My work on this grant is an interdisciplinary collaboration with my colleagues at Texas State University – San Marcos from the College of Education and College of Science. The funding of this grant also serves as an external recognition of my scholarly work. Currently, we have submitted an interim technical research report on this grant (Mireles, Acee, & Paulson, 2013) and I recently presented our findings to the board members Texas Higher Education Coordinating Board (Acee, Mireles, & Paulson, March 2013). See the full grant proposal below as well as the contracts for our initial funding and extension of funding.

References

Mireles, S., Acee, T. W., Paulson, E. J. (2013). *Comprehensive student success program annual report*. Report submitted to the Texas Higher Education Coordinating Board, Austin, TX.

Acee, T. W., Mireles, S. M., & Paulson, E. J. (March, 2013). *Comprehensive Student Success Program Report.* Summary report presented to the board members of the Texas Higher Education Coordinating Board, Austin, TX.

Texas State University – San Marcos

Evaluation of the Comprehensive Student Success Program

Cover Form

Applicant:	Texas State University – San Marcos
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Printed Name and Title:	W. Scott Erwin, Sr. Director, Office of Sponsored Programs
Date:	5/25/2011

Applicant Certification	
Authorized Signature:	Kay Beauchamp for
Printed Name and Title:	W. Scott Erwin, Sr. Director, Office of Sponsored Programs
Date:	5/25/2011

Table of Contents

Transmittal Letter

To: Point of Contact PAG@thecb.state.tx.us

My name is Dr. Selina Vásquez Mireles, and I am submitting an Application for the THECB EVALUATION OF THE COMPREHENSIVE STUDENT SUCCESS PROGRAM. I am committed to provide the services required by THECB, and I am in full acceptance of the terms and conditions described in this Request for Application and the Anticipated Interagency Contract. This Application is valid for ninety (90) days from the deadline for delivery of Applications to the THECB. The Application enclosed is binding and valid at the discretion of THECB.

Name of Applicant:

Texas State University-San Marcos

Name, address, telephone number, and email address of the individual authorized to negotiate and sign a Contract:

W. Scott Erwin, Sr.

Director, Office of Sponsored Programs

Texas State University-San Marcos

601 University Dr.

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Name, address, telephone number, and email address of the individual to contact regarding questions that may arise during review of the Application.

Dr. Selina Vásquez Mireles

Texas State University – San Marcos

Evaluation of the Comprehensive Student Success Program

Professor

Department of Mathematics

601 University Dr.

San Marcos, TX 78666

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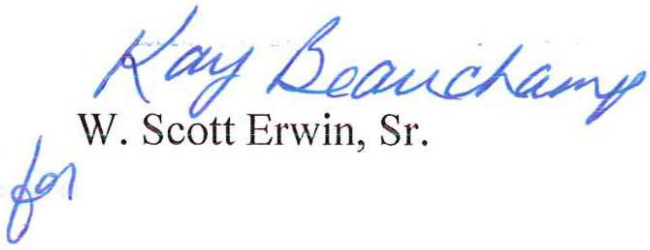
Thank you for the opportunity to submit this Application.

Sincerely,

Selina Vásquez Mireles, Ph.D.



W. Scott Erwin, Sr.

Abstract

A diverse group of expert developmental education researchers with specific expertise in mathematics, literacy, and learning support at Texas State University-San Marcos will collaborate to conduct the external evaluation of Comprehensive Student Success Programs (CSSP) in multiple institutions across the state. The evaluation team will engage the CSSPs in evaluations of both the process and product, from plan to practice, using quantitative and qualitative methodology through (a) conducting rigorous on-site evaluations that contextualize CSSP elements in institutional frameworks using site visit protocol(s) developed in collaboration with THECB evaluation staff; (b) creating and calibrating a standards- and research-based rubric to identify and guide implementation of the interventions used by the CSSPs; (c) evaluating the effectiveness of interventions through the CSSP Logic Model by collecting and verifying baseline data, guiding institutions in drawing appropriate samples, collecting and verifying outcomes data, and reporting on short-term outcomes; and, (d) writing evaluation reports and providing technical assistance, constructive feedback, and recommendations to CSSPs via written reports and presentations (both face-to-face and virtual). The expectation is that through these formative joint efforts, a community of practice will emerge and this professional community will continue to explore, identify, and evaluate effective ways to improve these initiatives.

Narrative

9.1 Qualifications of Evaluation Personnel

Each of the key personnel were chosen based on the following criteria: experience teaching 'entry-level, credit-bearing courses that have high drop or withdrawal rates and that have the highest failure rates' and/or students that are at-risk, underprepared or underserved/underrepresented; experience with the administration and/or evaluation of programs aimed at college readiness issues; experience with curriculum development and/or non-traditional instructional methods especially in general education courses; expertise in qualitative research methods, quantitative research methods, or both; active research agendas; strong working knowledge of national and state organizations and standards; and, ability to coordinate and communicate constructive feedback.

The evaluation team will consist of three Principal Investigators (Dr. Selina Vásquez Mireles, Dr. Eric Paulson, and Dr. Taylor Acee), two key personnel (Dr. Fernando Vásquez and Terri Westbrook), post-doctoral research specialist (TBN-Quantitative Methods/Program Evaluation), and two doctoral students (TBN-Mathematics Education and Developmental Education). Although the group will serve as a team, each evaluator brings a unique level of expertise to the review. Attachment B contains curriculum vitae for the evaluation team.

Dr. Selina Vásquez Mireles, professor in the Department of Mathematics, has directed the Developmental Mathematics program at Texas State since 1998. One of her primary research interests is Developmental Mathematics starting with her focus on at-risk mathematics students as a high school teacher and manifesting in a related dissertation where she first evaluated the effectiveness of an instructional method for this population. After receiving her Ph.D. from the University of Texas at Austin (UT) in Mathematics Education, she began her career at Texas

State. She was charged with re-inventing the developmental mathematics program and began by observing and then teaching these courses herself. As a second year junior faculty, she received a U.S. Department of Education Fund for the Improvement of Postsecondary Education (FIPSE) grant focusing on developmental mathematics. Through these funds, pedagogical reform began to take place. Then, in 2007 she was chosen to co-chair the vertical team that wrote the mathematics Texas College and Career Readiness Standards (TX CCRS; THECB, 2008). This insight aided in creating curricular changes in developmental mathematics and entry-level credit-bearing courses such as College Algebra at Texas State and the state in general. For instance, she is currently advocating for a new General Education Course equivalent, College Statistics and Algebra. She has served as principal investigator for several other related projects, including 2008 Summer Intensive Program, Math FOCUS: Fundamentals of Conceptual Understanding & Success. Dr. Mireles has written many scholarly articles about effective programs (Mireles, 2010; Vásquez, 2004) and has been commissioned to review programs throughout Texas including Texas A&M International University, Tarleton State University, and San Antonio College. She currently is chair of four dissertation committees that focus on college readiness issues and that employ mixed methods. As a leading expert in developmental mathematics and over ten years of experience in mixed methods research in mathematics education, Dr. Mireles is qualified to serve as principal investigator and will devote 25% of her time to this grant.

Dr. Eric Paulson is a professor in the Graduate Program in Developmental Education in the College of Education at Texas State and is the director of the proposed doctoral program in developmental education. Prior to his current position, he was associate professor in the Graduate Program in Literacy Education at the University of Cincinnati, and coordinator of the Graduate Certificate in Postsecondary Literacy Instruction. In addition, he also served as the

Director of Graduate Studies for the School of Education, overseeing several masters and doctoral degrees in a variety of areas of education. In that position, he developed program- and school-level graduate policies and implemented those as well as Graduate College policies, and administered annual graduate assistantship and graduate tuition scholarship budgets totaling $2,471,000. Prior to his work in graduate education, Dr. Paulson taught in the developmental reading programs of Pima Community College in Arizona, and the 2-year University College in Ohio. In University College he served as the program coordinator for the Reading & Critical Thinking Program.

The principal theme of Dr. Paulson's research over the last decade has been college transitional readers' experiences of texts, reading, and developmental reading instruction, and has utilized a variety of research tools applied both qualitatively and quantitatively within a social-constructivist framework. He developed an approach to examining readers' non-deliberate responses to texts, and the reading process in general, which involves a juxtaposition of eye movement analysis and miscue analysis. He described this in an early book and has used this research approach for theory building, examining developmental reading assessment claims, and evaluating hidden aspects of the ubiquitous college classroom activity of peer-reviewing. Recent moves to investigate student responses to developmental reading contexts have seen Dr. Paulson's use of metaphor analysis increase), including in contributions to methodological aspects of that research tool. Literature-based theory building has been a useful addition to these empirical research studies, including in expanding aspects of literacy theory and focusing on postsecondary literacy specifically. Dr. Paulson maintains an active research agenda and in the last ten years has published three books, numerous research articles in first-tier journals in the literacy and developmental education fields (including *Reading Research Quarterly, Research in*

the Teaching of English, Journal of Adolescent & Adult Education, Journal of Developmental Education, Journal of College Reading & Learning), and given dozens of conference presentations. Dr. Paulson is qualified to serve as co-principal investigator and will devote 25% of his time to this grant.

Dr. Taylor W. Acee has a strong background in quantitative methods, program evaluation, and experimental design as well as experience conducting research in educational settings and publishing scholarly research articles. He received his M.A. in Educational Psychology: Program Evaluation and his Ph.D. in Educational Psychology: Learning, Cognition, and Instruction from UT. As a graduate student at UT, he worked on a number of projects that involved program evaluation. In his masters and dissertation research, he developed and evaluated, using experimental research methods, motivation and self-regulation interventions aimed at helping students succeed in introductory statistics courses; a course known to be difficult for students (Acee & Weinstein, 2010). He also worked as a research assistant (RA) for the SeniorWISE study, a multimillion dollar study funded by the National Institute of Health (NIH), and helped evaluate the effectiveness of interventions designed to help train geriatric participants to improve their memory and health (McDougall, Becker, Pituch, Acee, Vaughan, & Delville, 2010). He also worked as a Graduate Student Fellow for the Research and Evaluation Team in the Planning and Accountability Division at the THECB. Currently, he is working as a program evaluator for the Fundamentals of Conceptual Understanding and Success (FOCUS) project that is funded through a Developmental Education Demonstration Project (DEDP) grant by the THECB.

In addition to Dr. Acee's experience and expertise as a researcher and program evaluator, his theoretical knowledge in the areas of learning, motivation, self-regulation and developmental

education will be useful when generating research questions and interpreting findings for this project. Dr. Acee has co-written a number of book chapters with Dr. Claire Ellen Weinstein, his mentor and author of the Learning and Study Strategies Inventory (LASSI), on learning strategies and strategic and self-regulated learning (e.g., Weinstein, Acee, & Jung, 2010). He has also published theoretical research on academic motivation (Acee, et al., 2010; Acee & Weinstein, 2010). He taught (2 years) and co-coordinated (3 years) 3-credit learning frameworks course at UT that draws on learning and motivation theory to help students become more strategic and self-regulated learners and increase their success in college. As Principal Investigator of a Research Enhancement Grant awarded from Texas State, he is currently investigating motivational influences on developmental education math student achievement and continued interest.

Dr. Acee's expertise in research and evaluation combined with his theoretical and applied knowledge in strategic learning and motivation of underprepared and at-risk students make him highly qualified to serve as co-investigator on this grant. Dr. Acee will serve as project co-investigator and will devote 25% of his time to this grant.

Dr. Fernando Vásquez received his Ph.D. in Curriculum and Instruction with an emphasis on issues related to Latino's success in postsecondary education. His five Master's degrees, education, political science, biology, business, and information systems, allow him to bring a breadth of knowledge to these issues. He has worked with special education students in diagnosing various disorders, and focusing on their weaknesses and strengths for the proper academic and social interventions needed for equitable access to the public educational system. Also, he utilized the American Disabilities Act (ADA), No Child Left Behind Act (NCLB), Individual Education Disabilities Act (IDEA), and other legal statutes for students who

had developmental delays, learning disabilities, hearing impairments, visual impairments, autism, and other disabilities as noted by IDEA. Dr. Vásquez has also worked as a special education administrator to ensure that programs were functioning according to state and federal guidelines. Also, he evaluated various programs, special and regular education, for curriculum alignment to Texas Essential Knowledge and Skills for underrepresented students. His research agenda focuses on qualitative and quantitative methods to uncover and provide a voice for students who are underserved, at-risk, and underrepresented. He has also worked in various grants at Texas State for at-risk and underrepresented students. Dr. Vásquez is currently working as a senior lecturer at Texas State in the area of English as a Second Language (ESL), and working with the ESL curriculum to better serve public education students who are underrepresented. Dr. Vásquez's vast experience with special education students, students at risk, and underrepresented/underserved students coupled with his strengths in qualitative research methods makes him a prime candidate to work on this research and evaluation project. He will devote 25% of his time to this grant.

Ms. Terri Westbrook is a mathematics education doctoral student at Texas State; she is scheduled to graduate in August 2011. Her research interests are developmental mathematics, the TX CCRS (THECB, 2008), statistics education, and the performance and achievements of developmental mathematics students in postsecondary education. Ms. Westbrook has worked continuously on curriculum development for developmental mathematics at Texas State since May 2008. This curriculum development included the integration of the TX CCRS and research-based best practices into the developmental mathematics program. Ms. Westbrook received the *Graduate Teaching Excellence Award* from the Department of Mathematics in 2009. She performed quantitative and qualitative analysis for research projects associated with technology

and culturally-relevant lesson plans for San Antonio College and Texas A&M International University. As part of her interest in the TX CCRS, Ms. Westbrook has created a TX CCRS assessment test, which was administered to all students in the second developmental mathematics course students at Texas State for the past year. As part of the instrument development, Ms. Westbrook will perform an item response analysis of the test. Furthermore, her dissertation evaluates the effectiveness of a new College Statistics and Algebra course (developed by her) that incorporates the experiential learning model and concrete-representational-abstract (CRA) instructional techniques. This course is being considered as a permanent offering at Texas State. Ms. Westbrook has worked in the community college environment where she tutored over four years in a learning lab at Austin Community College. Ms. Westbrook will devote 25% of her time to this research and evaluation project.

Post-doctoral Research Specialist

Duties and Responsibilities:

- Contribute to the conceptualization of our larger project with a focus towards research design, data collection and analysis.
- Assist institutions with data collection protocol and study design.
- Help design research protocol for site visits.
- Help conduct site visits and observations.
- Merge datasets and clean/transform data.
- Help lead RAs with data collection, entry and transformation.
- Conduct simple and sophisticated statistical analyses.
- Help produce internal and external reports of evaluation results.
- Contribute to scholarly research publications.

Qualifications:

- Ph.D. in statistics, quantitative methods, program evaluation or related field with applications to social science research, particularly education.
- Experience conducting or designing research or program evaluation studies.
- Experience conducting statistical analyses.
- Strong writing and oral presentation skills.
- Strong organizational skills.
- Ability to pay attention to detail, but also see the big picture.
- Excellent interpersonal skills.
- Experience using SPSS, SAS, and MPLUS are highly desirable.
- Experience or strong knowledge base in qualitative or mixed-methods research is preferred.

Time on project: 50%

Doctoral Research Assistants

Duties and Responsibilities:

- Contribute to the conceptualization of our larger project with a focus towards research design, data collection and analysis.
- Assist institutions with data collection protocol and study design.
- Help design research protocol for site visits.
- Help conduct site visits and observations.
- Merge datasets and clean/transform data.
- Data collection, entry and transformation.

- Conduct preliminary quantitative and qualitative data analyses.
- Help produce internal and external reports of evaluation results.
- Contribute to scholarly research publications.

Qualifications:

- Doctoral student in mathematics, mathematics education, developmental education, or related field.
- Strong writing and oral presentation skills.
- Strong organizational skills.
- Ability to pay attention to detail, but also see the big picture.
- Excellent interpersonal skills.
- Experience working with developmental education students is preferred.
- Experience conducting/designing research or program evaluation studies is preferred.
- Experience conducting quantitative and/or qualitative analyses is preferred.
- Experience using Excel and/or SPSS are preferred.

Time on project: 50%

9.2 Prior Evaluation Experience

The key personnel collectively have over 30 years of consistent experience with evaluation. In addition, with the exception of Ms. Westbrook, each key personnel holds a terminal degree, directs theses/dissertations, receives research funding, and evaluates multiple programs/interventions at higher education institutions with both quantitative and qualitative methodologies, and utilizes a wide variety of small- and large-scale data sets involving multiple outcome measures including persistence and completion.

Dr. Selina Vásquez Mireles has over 10 years of experience with evaluation and over 13 years of experience with data analyses of large scale data sets from higher education institutions. She currently supervises four dissertations, has conducted book reviews, and has served on various editorial boards including the Journal of Developmental Education. She spearheaded the National Association of Developmental Education (NADE) Certification process for the Developmental Mathematics Program at Texas State which is in its final stage of review. She has received over $2.5 million dollars in funded research initiatives. Moreover, Dr. Mireles has conducted extensive reviews of THECB-sponsored programs including Summer Bridge programs, DEDP - Community Colleges, and Intensive College Readiness Programs for Adult Education Students (IP-AES). Various colleges and universities such as Tarleton State University, San Antonio College, and Texas A&M International University/Laredo Community College, have requested that she evaluate their programs. In an effort to promote research, she created a model for training individuals on research practices, the Research Apprenticeship Model, which is currently used to facilitate research activities with pre-service and in-service mathematics teachers. Similarly, she has guided collaborative teams of high school, college, and university instructors through action research projects. Dr. Mireles is accustomed to evaluation projects that include both quantitative and qualitative data collection, data analysis, and working with large data sets.

Dr. Eric Paulson has over 10 years of experience involving aspects of evaluation and data analysis, including both quantitative and qualitative, that ranges from overseeing doctoral student research to evaluating programs, program policy changes, and implementation at a variety of higher education institutions. He has chaired and served on a large variety of dissertation committees and guided research ranging from evaluation studies to basic research to the

construction of assessment metrics. As the director of graduate studies he was responsible for the interpretation of state and university policy at the program and degree level and evaluating the efficacy of those policies. In 2008, Dr. Paulson served as the Lead Evaluator for the Quality Enhancement Plan (QEP) of Edgecombe Community College's SACS Reaffirmation, and in 2009 he served as Lead Evaluator for the Quality Enhancement Plan of Robeson Community College's SACS Reaffirmation. Both community colleges' QEPs were focused on community college reading improvement initiatives.

Dr. Taylor W. Acee has over 7 years of experience with evaluation in both higher education and geriatric health, and over 10 years of experience managing and conducting quantitative analyses (e.g., ANOVA, regression, HLM, and factor analysis) on large-scale datasets in the areas of higher education and geriatric health, plus over 6 years of experience conducting qualitative and mixed-methods research in higher education. He received his M.A. in Educational Psychology: Program Evaluation and his Ph.D. in Educational Psychology: Learning, Cognition, and Instruction from the UT. As a graduate student at UT, he worked on a number of projects that involved program evaluation. In his masters and dissertation research, he developed and evaluated (using quantitative and qualitative methods) motivation and self-regulation interventions aimed at helping students succeed in introductory statistics courses (Acee & Weinstein, 2010). He also worked as a research assistant (RA) for the SeniorWISE study, a multimillion dollar study funded by the NIH, and helped evaluate the effectiveness of interventions designed to help train geriatric participants to improve their memory and health (McDougall, Becker, Pituch, Acee, Vaughan, & Delville, 2010). He also worked as a Graduate Student Fellow for the Research and Evaluation Team in the Planning and Accountability Division at the THECB. Currently, he is working as a program evaluator for the FOCUS project

that is funded through a DEDP grant by the THECB. He also has extensive experiencing managing datasets and conducting statistical analyses. For example, he generated, managed, and conducted statistical analyses on large-scale datasets for the FOCUS project, the Community College Longitudinal Retention Study (CCLR), and the SeniorWISE study. He also has experience conducting mixed-methods research on college students' goals (Goals Study). Dr. Acee has published 13 articles in peer-reviewed research journals, 3 book chapters, and 1 monograph. He gave 37 research presentations at professional conferences, 2 of which were invited presentations. He also presented 10 workshops on strategic and self-regulated learning to academic instructors, administrators, counselors, advisors, practitioners, and students in post-secondary institutions. Dr. Acee belongs to a number of professional organizations including NADE, College Reading and Learning Association, and American Educational Research Association. He is also a member of the editorial review board for *Frontiers in Educational Psychology* and has been a reviewer for *Learning and Individual Differences*, *Journal of College Reading and Learning*, and *Journal of Educational Psychology*.

Dr. Fernando Vásquez has over 5 years of experience with evaluation in public and higher education. He also has 4 years of working with quantitative and qualitative data analyses in addition to mixed methodologies in public and higher education. He accumulated 4 years of experience with large scale data set analyses in public and higher education. He has five Master's degrees in areas that include education, biology, political science, information systems, and business administration. His Master's in Education focused in counseling, education administration, special education, and educational diagnostician (assessment and testing). He has worked with special education students in diagnosing various disorders, and focusing on their weaknesses and strengths for the proper academic and social interventions needed for equitable

access to the public educational system. He has worked closely with the ADA, NCLB, IDEA, and other legal statutes for students who had developmental delays, learning disabilities, hearing impairments, visual impairments, autism, and other disabilities as noted by IDEA. His Ph.D. focused on the cultural aspects of education and the curriculum, and underrepresented students. Dr. Vásquez has over 20 years of experience in public education. He has also worked as a special education administrator for over 10 years. Throughout his tenure in public education, he has evaluated various special and regular education programs in areas of science, math, and social studies utilizing qualitative and quantitative methodologies. Dr. Vásquez has 10 years of experience at the university level, which includes working as a professor fellow in China. He is currently working as a senior lecturer at Texas State in the area of ESL, and working with the ESL curriculum to better serve public education students who are underrepresented.

Ms. Terri Westbrook is a mathematics education doctoral student at Texas State, who plans to graduate in August 2011. She has three years of evaluation experience and three years experience with data analysis from higher education institutions with one year of experience working with large scale data sets. Ms. Westbrook has worked continuously on curriculum development for developmental mathematics at Texas State since April 2008. As part of this work, she observes instructors of developmental mathematics classes and writes up a review of their performance. She has also critiqued lesson plans created by new instructors or graduate students for developmental mathematics classes. She has worked on several grant-funded, research projects over the past three years, where she has performed quantitative and qualitative analysis. As part of her interest in the TX CCRS (THECB, 2008), Ms. Westbrook has created an assessment to measure the developmental mathematics curriculum to the new TX CCRS. This test has been administered to all students in the second developmental mathematics course at

Texas State for the past year. An item response analysis of this assessment test will be performed. As part of the THECB DEDP project at Texas State, she has created a new College Statistics and Algebra course that incorporates the experiential learning model and CRA instructional techniques. She has trained and worked with instructors at San Antonio College, Texas A&M International University, and high schools in Laredo and Uvalde on the development of lesson plans utilizing research-based best practices.

9.3 Quality of Writing Samples

In Attachment C, writing samples for all key personnel are included. Note that all the writing samples are clear and concise, have been and/or are in the process of double-blind peer reviews, and employ rigorous research methods.

Dr. Selina Vásquez Mireles' writing sample submission, an article in the *Journal of College Reading and Learning*, the most selective peer-reviewed journal in developmental education, is an example of her knowledge and skills in developmental mathematics program reconfiguration. The sample demonstrates her command of the literature and her background in conducting and writing clearly and concisely about her research efforts.

Dr. Eric Paulson's writing sample submission is a research study published in *Research in the Teaching of English*, the highest tier research journal in the field of English/writing. This article demonstrates Dr. Paulson's use of a sophisticated merging of methodologies that includes eye-movement analysis and verbal responses from participants reported through both aggregate statistical and descriptive techniques as well as a single participant's outcome. This article is a good example of Dr. Paulson's ability to pursue complex research questions through novel and mixed methodologies, with clear communication of well-supported findings.

Dr. Taylor Acee's submission, a manuscript he co-authored with Dr. Claire Ellen Weinstein that was published in the *Journal of Experimental Education,* is an excellent example of his command of the research process and his knowledge of the academic area of postsecondary student motivation. Dr. Acee, as demonstrated in this writing sample, writes skillfully for a range of readers that includes researchers and practitioners.

Dr. Fernando Vásquez' writing sample on mathematics anxiety, submitted to *School Science and Mathematics*, demonstrates his command of descriptive statistical methods design and analysis as well as his ability to identify emerging themes from qualitative data. Moreover, this topic is prevalent in the population that the CSSP serves. His sample is distinguished by his capacity to make complicated methodology clear and instructive to the practitioner.

Ms. Terri Westbrook, in her manuscript co-authored with Dr. Selina Vásquez Mireles and submitted to the *Journal of College Reading and Learning*, is an excellent example of evaluation research on the use of mathematics instructional software in developmental mathematics courses. Ms. Westbrook brings her knowledge of the instructional processes in mathematics together with her knowledge of appropriate evaluation strategies and presents her skill in writing about complex topics in comprehensible prose.

9.4 Quality of Management/Evaluation Plan

(a) Evaluation Plan

The Program Evaluation Standards as outlined by the Joint Committee on Standards for Educational Evaluation (JCSEE, 2011) and discussed in more detail by Yarbrough, Shulha, Hopson, and Caruthers (2011) will be upheld by the evaluation team. Accordingly, the evaluation team will work to (a) "…increase the extent to which program stakeholders find evaluation processes and products valuable in meeting their needs," (b) "…increase evaluation

effectiveness and efficiency," (c) "…support what is proper, fair, legal, right and just in evaluations," (d) "…increase the dependability and truthfulness of evaluation representations, propositions, and findings, especially those that support interpretations and judgments about quality," (e) "…encourage adequate documentation of evaluations and a meta-evaluative perspective focused on improvement and accountability for evaluation processes and products" (JCSEE, 2011).

The proposed project consists of an evaluation plan that measures the effectiveness of the institutional interventions after two semesters of the course offerings. There are four evaluation initiatives that the evaluation team will pursue.

Site Visits

The evaluation team asserts that at least one "site visit cycle" should occur per CSSP and believes that site visits should be designed with pre and post virtual meetings. The purpose of the pre-site visit is to gather the necessary information to make the actual site visit effective and productive. The rubric to identify interventions will be utilized and site visit expectations with agendas will be established. In addition, efforts to evaluate the effectiveness of interventions will be discussed with technical assistance. The site visit will include a presentation by the host institution of their program, observations of interventions to the extent possible; a question and answer session with the CSSP evaluators; meetings with CSSP stakeholders will occur to determine and address their questions and concerns. The post-site visit will also occur virtually and be used to convey constructive feedback, suggestions for practice, and another any other opportunity for technical assistance. See Attachment F-1.

Rubric to Identify Interventions

The rubric has two primary objectives. The first is to identify the interventions used by the CSSP institutions. The second is to guide aspects of implementation of those interventions. Those two objectives are reciprocal and recursive and the rubric will be further defined by each institution's needs and objectives. To achieve these purposes, the rubric is comprised of four main areas: (a) The CSSP Performance Measures, (b) the Goals of Program outlined in the CSSP grant RFA, (c) the Comprehensive Student Success Plan, and (d) Integration of Texas College and Career Readiness Standards (TX-CCRS). Each of those areas is outlined below.

- **Rubric Focus I. The CSSP Performance Measures.** These are the three areas of *success*, *support*, and *training* as defined in the CSSP grant RFA, in Appendix C: Performance Measures.
- **Rubric Focus II. Goals Of Program**. These are the comprehensive student success service goals as defined in the CSSP grant RFA, section 7.1.
- **Rubric Focus III. Comprehensive Student Success Plan.** This is the description of the required program components of student support services and faculty/staff training as defined in the CSSP grant RFA, section 10.1.2.
- **Rubric Focus IV. Integration of TX-CCRS**. This is the aspect of the rubric that is concerned with the identification of existing performance expectations, missing performance expectations, and potential performance expectations for courses the institution designated in their Student Success Survey. This pertains to section 10.1.3 in the CSSP grant RFA.

A draft of each of these rubrics is included in Attachment F-2.

In sum, the rubrics focus on a method to involve the institution in identifying areas of concern and methods to objectively measure outcomes of activities specific to each institution's

CSSP grant plan. This series of guiding rubrics provides consistent and transparent scaffolds while collaboratively identifying and guiding the implementation of aspects of each institution's grant activities.

Intervention effectiveness

The CSSP interventions will vary from institution to institution, but will likely overlap in terms of their foci on particular student populations (e.g., first-generation, underrepresented, and economically disadvantaged) and improving college student success in general and in high-risk courses specifically. Given the shared foci of the CSSP interventions, general outcome measures will be used across sites to evaluate the success of each CSSP intervention. These include: (a) completion rates for each high-risk course that is identified, (b) grade point average (GPA), (c) earned credit hours, (d) degree/certificate completion rates, and (e) pre/post strategic learning measures. After determining the specific foci of each CSSP intervention, additional evaluation measures will be identified and implemented based on each institution's unique program goals and strategies (e.g., if an intervention was focused on providing students with child-care services, then that institution will be guided in collecting additional data specific to the immediate goals of the child-care intervention).

The evaluation design will utilize quasi and randomized experimental groups and pre/post testing. The evaluation team will guide institutions in generating at least three groups that will later be compared for evaluation purposes: (a) Statistically-Matched Baseline Comparison Group, (b) Control Group, and (c) Intervention Group (see section 9.4.b for a more detailed description of each group).

Several analyses will be conducted to evaluate the effectiveness of the CSSP interventions for each institution: (a) compare high-risk course completion rates, GPA, earned

credit hours, and degree/certificate completion rates between students who were enrolled in the CSSP interventions and a Statistically-Matched Baseline Comparison group of students who never received the interventions because they enrolled in the targeted high-risk courses prior to program implementation; (b) compare all students in the CSSP interventions on pre, post, and where possible, 1-semester delayed post-test measures of strategic learning (these measures will be selected in conjunction with the THECB); (c) guide institutions in appropriately sampling 500 students (250 who were exposed to the intervention and 250 who were not exposed) to complete a measure of strategic learning skills and then, comparisons will be made between these groups on pre/post strategic learning data, and if applicable, course completion rates, GPA, earned credit hours, and degree/certificate completion rates; and (d) analyze additional evaluation data collected on the specific goals and strategies of each institution's CSSP interventions. After examining each institution's CSSP interventions and the data it provides, appropriate statistical methods (e.g., analysis of variance, linear regression, logistic regression, and hierarchical linear modeling) will be identified and used to conduct each analysis listed above. Table 1 outlines possible group comparisons on each outcome measure (see Attachment G).

Reports

The evaluation reports will utilize the THECB Suggested Evaluation Report Template (Attachment F-3) and adhere to the THECB Style manual. Clear and concise research questions will be posed with specific attention to independent/dependent and control variables. Moreover, when applicable, null hypotheses will be included. Supporting research will be referenced especially those noted in the CSSP RFA Appendix A "Strategies to Increase Student Success." The evaluation team will provide technical assistance with quantitative and qualitative data collection and analysis. Online materials will be available in addition to the planned site visit

cycle opportunities. See Attachments F-4, F-5, and F-6 for samples of online materials (e.g., sample institutional review board application, a guideline for using qualitative methods, and a sample advising survey). Constructive feedback and recommendations will be crafted by the evaluation team with details coming from content experts. The evaluation team will be sure to include references for professional development and exemplary models of practice. Furthermore, the evaluation team will construct a website that CSSPs can access that contains up-to-date reference materials as well as opportunities to conduct online discussions all in the spirit of building professional community.

(b) Implementation and Management of Evaluation Tasks.

Site Visits

The pre-site visit will be virtual and attended and facilitated by all key personnel. Through the pre-site visit, the evaluation team will then determine who is to conduct the site visit for that particular institution. For instance, if the majority of the course interventions tend to be mathematics, then Dr. Mireles and Ms. Westbrook will facilitate the site visit. All key personnel will attend the post-site visit; however, the actual site team will be leading the virtual meeting. See Attachment F-1.

Rubric to Identify Interventions

Based on the iterative and reflective processes implied in Stevens and Levi (2005) and Taggart (1998), our rubric involves a recursive process of construction that involves several stakeholders, including the THECB and the CSSP institutions. The framework of the rubric has been constructed to involve four foci, as described in 9.4: (1) the CSSP Program Measures, (2) the Goals of the Program, (3) the institution's Comprehensive Student Success Plan, and (4) the integration of the CCRS. This framework is found in Attachment F-2.

This process first involves working closely with the THECB to ensure that the rubric identifies and evaluates aspects of the Comprehensive Student Success Program that the THECB considers important and informative. As noted in the RFA, this will be completed by August 1, 2011.

The next phase is to work with each institution on aspects of the rubric that involve identification of characteristics of the CSSP unique to their institutions; for example, this will involve use of the CSSP surveys each institution completed in order to begin a focus on the high drop/withdrawal/failure rate courses each institution identified. Working collaboratively with each institution, this phase will be completed by September 1, 2011.

The third phase involves the use of the rubric to guide implementation of some aspects of the CSSP. This involves its use as a prompt and organizer for the institutions continuing to consider; for example, what the plan to modify existing policies and practices is, and what the timeline for that modification is (in Rubric Focus II: Goals of Program). Where appropriate, the rubric also structures reflection on, for example, what existing support services are in place for working adult students, which services are being developed, and which are being expanded (in Rubric Focus II: Comprehensive Student Success Plan). In addition, the rubric will be used as method of summarizing some of the results and communicating with each institution about areas still in need of development. The implementation-guiding aspect of the rubric has a target end date of January 31, 2012, and the evaluation/summarization portion of the rubric has a target end date of August 1, 2012.

The rubric segment of this evaluation grant will be overseen by Dr. Paulson, with each team member assigned as point person for communication with one of the CSSP institutions. Additional structuring of team member assignments will fall along content lines; for example,

where an institution focuses on a Mathematics/Science course in its Student Success Survey, Dr. Mireles will take the lead, and where an institution focuses on an English/ Literacy/ Composition/ Humanities course, Dr. Paulson will take the lead, with Dr. Acee assisting on both. This grant will help to compensate each team member for the time they spend on the rubric segment of this evaluation.

Intervention Effectiveness

In order to evaluate the effectiveness of the CSSP interventions and conduct powerful statistical analyses, the evaluation team will obtain data from each institution at the student level. The evaluation team will collect data on the following outcomes: (a) completion rates for each high-risk course that is identified, (b) GPA, (c) earned credit hours, (d) degree/certificate completion rates, (e) pre/post strategic learning measures, and (f) additional measures to be determined after reviewing each CSSP intervention.

The evaluation team will also guide institutions in creating three groups: (a) Statistically-Matched Baseline Comparison Group, (b) Control Group, and (c) Intervention Group. The Statistically Matched Baseline Comparison Group will be generated from the cohort of students who enrolled in the targeted high-risk courses prior to the initiation of the CSSP. Students will be matched on demographic (i.e., ethnicity and first generation status) and student achievement (i.e., placement scores) variables. The evaluation team will also guide institutions in appropriately sampling 500 students (250 who were exposed to the intervention and 250 who were not exposed) to complete a measure of strategic learning skills prior to and at the completion of the intervention, and if possible, again during the following semester. Sampling of these 500 students will be conducted within the target population (e.g., first-generation, under-represented, and/or economically disadvantaged students) so that the control group is comparable to the

intervention group. In addition, random sampling and random assignment to groups will be a goal as guide each institution is guided in designing their project. However, depending on the capacity of each institution and the specific interventions they decide to implement, random selection and assignment may be more or less feasible. Therefore, alternative non-random sampling methods (e.g., purposive sampling) and quasi-experimental approaches (e.g., matching) will be utilized when random sampling and random assignment are not feasible.

Once data collection is complete, the evaluation team will conduct analyses to examine pre/post differences as well as differences between groups on outcome measures (see Table 1 in Attachment G). In addition, qualitative and quantitative data collected in the four rubrics (see Attachment F-2) will be used to further evaluate the fidelity and success of each intervention. The content area leaders in mathematics, literacy, and learning support, will work collaboratively in conjunction with other CSSP project members to interpret the quantitative and qualitative results and draft a final report.

Data collection, cleaning, transformation, analysis, and interpretation will take a substantial amount of time to plan and implement. This grant will help pay for the time the Principal Investigators, Key Personnel, Post-Doctoral Research Specialist, and Doctoral Research Assistants will spend working with data from this study.

Reports

The evaluation team will collaborate to write all evaluation reports. The team will meet weekly, and through a formative process will produce monthly status reports. In addition, the team will work together to develop the preliminary report and the final report. The team has specialized content expertise that includes mathematics, literacy, learning frameworks, and developmental education, and this expertise will be aligned to the needs of the CSSPs. These

alignments will serve to yield effective technical assistance, constructive feedback, and recommendations that inform practice. Reporting will begin as early as August 1, 2011 with baseline outcome data and continue throughout the time span of this evaluation project. This grant will help pay for time spent by each member of the evaluation team on reporting.

(c) Alignment of Tasks with Evaluation Goals and Objectives

The proposed tasks are directly linked to the goals and objectives of the evaluation. The overall goal of the proposed project is for Texas State evaluation team to collaborate to conduct the external evaluation of CSSPs. The aforementioned tasks are all clear efforts to accomplish this goal. Furthermore, the evaluation tasks detailed above are each described in the context of a specific objective in mind. The evaluation task could create insight to the objectives while providing the CSSPs with activities and outcomes that expand their knowledge and skills in their fields in addition to research.

(d) Timeline

The proposed project timeline is included in Attachment A. It is complete, appropriate and reasonable for successful performance of the evaluation of the CSSPs. Specifically the timeline provides both the CSSPs and the evaluation team with flexibility with structure and options that capitalize on expertise and institutional culture. In regards to Objective 1, two site visits will occur in the fall semester and two will occur in the spring semester with the institutions that are closest to Texas State visited in months that bad weather may occur. The intervention identification rubric noted in Objective 2 will be ready by August 1, 2011. For Objective 3, the baseline data will be collected by August 1, 2011 while outcomes data will be collected in the end of the semesters. Report writing and technical assistance will be timely and adhere to the reporting requirements of THECB. The Evaluation Timeline includes scheduled

routine tasks such as weekly meetings and accounts for the time needed to accomplish tasks such as scheduling for time to write reports in addition to when reports are due.

(e) Budget

The proposed budget of $ 232,303 is appropriate and reasonable. The budget allocates 29.0% to personnel who are instrumental in the evaluative aspects of the proposed project. In addition, there are monies, 15.0%, that will be used to support student contributions including doctoral-level research perspectives. Note that the proposed budget includes monies for CSSP sites to assist in accomplishing the objectives of the proposed evaluation project. For example, *SPSS for Windows Step by Step: A Simple Guide and Reference 18.0 Update (11th Edition)* could be purchased for CSSPs to begin their professional libraries, utilize a training of trainer's model, and to conduct further research. Although not explicitly noted in the budget, there are elements of cost share as the Department of Mathematics is amicable to release time and has provided additional physical space, a high commodity, to accommodate these types of initiatives. The Department of Curriculum & Instruction and the Department of Mathematics have each agreed to supplement a student worker position (see Attachment E).

(f) Agreement Acknowledgement

The Applicant acknowledges agreement with the THECB requirement for a minimum of one status meeting monthly, by telephone or in person, with the THECB Research and Evaluation designated contact, and submission of a monthly, written progress report.

Attachments

Attachment A: Evaluation Timeline

Attachment B: Curriculum Vitae, Resumes, Job Descriptions

Attachment C: Writing Samples

Attachment D: Evaluation Budget

Attachment E: Letters of Support

Attachment F: Sample Instruments

Attachment G: Tables

Attachment H: References

Attachment A: Evaluation Timeline

Month Year	Objective 1	Objective 2	Objective 3	Objective 4	Routine
June 2011	Establish relationships with CSSPs.	Create intervention identification rubric.	Collect baseline data.	Write and submit monthly progress report.	Accomplish administrative start-up tasks such as course releases and purchasing of materials. Host evaluation team planning meeting to clarify tasks and assignments (weekly evaluation team meetings will continue for the duration of the project). Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
July 2011	Draft site visit protocol.	Calibrate intervention identification rubric.	Verify baseline data.	Write and submit monthly progress report.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
August 2011	Revise site visit protocol.	Complete rubric.	Guide institutions in drawing appropriate samples.	Write evaluation report on Objectives 1, 2, 3 Write and submit monthly progress report.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
September 2011	Host pre-site visit – North Central Texas	Collaborative work on rubric with each	Guide institutions in	Write and submit monthly progress	Host weekly evaluation team meetings.

Month Year	Objective 1	Objective 2	Objective 3	Objective 4	Routine
	College.	institution.	drawing appropriate samples.	report. Host pre-site visit – North Central Texas College.	Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
October 2011	Conduct site visit – North Central Texas College. Host pre-site visit – Austin Community College.	Use rubric to guide implementation of some aspects of the CSSP.		Write and submit monthly progress report. Conduct site visit – North Central Texas College. Host pre-site visit – Austin Community College.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
November 2011	Conduct site visit – Austin Community College. Host post-site visit – North Central Texas College.	Continue to use rubric to guide implementation of some aspects of the CSSP.	Guide institutions in drawing appropriate samples.	Write and submit monthly progress report. Conduct site visit – Austin Community College. Host post-site visit – North Central Texas College.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
December 2011	Host post-site visit – Austin Community College.	Continue to use rubric to guide implementation of some aspects of the CSSP.	Guide institutions in drawing appropriate samples.	Write preliminary report. Write and submit monthly progress report.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation

Month Year	Objective 1	Objective 2	Objective 3	Objective 4	Routine
			Collect and verify outcomes data. Report on short-term outcomes.	Write evaluation report on Objectives 1, 2, 3. Host post-site visit – Austin Community College.	staff to discuss project status.
January 2012	Host pre-site visit – Houston Community College and University of Houston – Downtown.	Evaluate use of rubric to guide implementation of some aspects of the CSSP.	Guide institutions in drawing appropriate samples.	Submit preliminary report (1/20/2012). Write and submit monthly progress report. Host pre-site visit – Houston Community College and University of Houston – Downtown.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
February 2012	Conduct site visit – Houston Community College and University of Houston – Downtown.	Continuous use of rubric to evaluate and summarize aspects of the CSSP.	Guide institutions in drawing appropriate samples.	Write and submit monthly progress report. Conduct site visit – Houston Community College and University of Houston – Downtown.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
March 2012	Host post-site visit – Houston Community College and University of	Continuous use of rubric to evaluate and summarize aspects of the CSSP.		Write and submit monthly progress report. Host post-site visit –	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget.

Texas State University – San Marcos

Evaluation of the Comprehensive Student Success Program

Month Year	**Objective 1**	**Objective 2**	**Objective 3**	**Objective 4**	**Routine**
	Houston – Downtown. Host pre-site visit – Central Texas College.			Houston Community College and University of Houston – Downtown. Host pre-site visit – Central Texas College.	Meet/call THECB evaluation staff to discuss project status.
April 2012	Conduct site visit – Central Texas College.	Continuous use of rubric to evaluate and summarize aspects of the CSSP.	Guide institutions in drawing appropriate samples.	Write and submit monthly progress report. Conduct site visit – Central Texas College.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
May 2012	Host post-site visit – Central Texas College.	Continuous use of rubric to evaluate and summarize aspects of the CSSP.	Guide institutions in drawing appropriate samples. Collect and verify outcomes data.	Write and submit monthly progress report. Write evaluation report on Objectives 1, 2, 3. Host post-site visit – Central Texas College.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
June 2012		Continuous use of rubric to evaluate and summarize aspects of the CSSP.	Report on short-term outcomes. Summarize fall 2011 and spring 2012 short-term	Write and submit monthly progress report.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation

Month Year	Objective 1	Objective 2	Objective 3	Objective 4	Routine
			outcomes.		staff to discuss project status.
July 2012				Write final report. Write and submit monthly progress report.	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.
August 2012		End use of rubric to evaluate and summarize aspects of the CSSP.		Submit final report (8/1/2012). Write and submit monthly progress report. Write evaluation report on Objectives 1, 2, 3	Host weekly evaluation team meetings. Monitor expenditures and reconcile budget. Meet/call THECB evaluation staff to discuss project status.

Attachment B: Curriculum Vitae, Resumes, Job Descriptions

Attachment B-1: Curriculum Vitae of Dr. Selina Vásquez Mireles

Attachment B-2: Curriculum Vitae of Dr. Eric J. Paulson

Attachment B-3: Curriculum Vitae of Dr. Taylor Acee

Attachment B-4: Curriculum Vitae of Dr. Fernando Vásquez

Attachment B-5: Curriculum Vitae of Ms. Terri Westbrook

Selina Vásquez Mireles, Ph.D.
Professor, Department of Mathematics, Texas State University – San Marcos

TEACHING

Dissertation Committee Chair: Thersa Westbrook; Lindsey Gerber; Debra Ward; Robert Jaster

SCHOLARLY/CREATIVE

Articles (selected)

Mireles, S. V. (2010, Spring). Developmental mathematics program: A model for change. *Journal of College Reading and Learning, 40*(2), 81-90.

Vásquez, S. (2004, Spring). A report on the effectiveness of the developmental mathematics program M.Y. Math Project – Making your mathematics: Knowing when and how to use it. *Mathematics and Computer Education, 38*(2), 190-195.

Editor

Editorial Board of the Journal of Developmental Education (Fall 2004) Volume 28 - Present

Papers Presented at Professional Meetings (selected)

"Current Learning Theories in a Developmental Mathematics Classroom." College Academic Support Programs 2010. El Paso, TX. October 12-15, 2010.

"Understanding the Texas CCRS." 6th Annual Mathematics for English Language Learners Conference. San Marcos, TX. July 9-10, 2010.

"The College Readiness Standards and Developmental Mathematics Curriculum." (Presentation and Poster Session) College Academic Support Programs 28th Annual Conference. San Antonio, TX. October 21-23, 2009.

Invited Talks, Lectures, and Presentations (selected)

"Developmental Mathematics." Texas Higher Education Coordinating Board Bridging Programs Professional Development Training. March 1, 2010.

"College and Career Readiness Standards – Next Step." College and Career Readiness Initiative Faculty Collaborative: Mathematics/Science Symposium. September 25, 2009.

Consultancies (selected)

Statewide College Readiness Initiative - Post-Secondary Mathematics Expert - Region XIII Service Center (Spring 2011)

Intensive Programs for Adult Education Students – Texas Higher Education Coordinating Board (Spring 2011)

Success Initiative in Developmental Education – Mathematics (SIDE-M) – College and Career Readiness Initiatives Faculty Collaboratives and Texas Higher Education Coordinating Board (Spring 2011)

Developmental Education Demonstration Project – Community Colleges – Texas Higher Education Coordinating Board (Spring 2011)

Grants and Contracts (selected)

Texas Higher Education Coordinating Board – Developmental Education Demonstration Project - $399,293.66. "FOCUS: Fundamentals of Conceptual Understanding & Success" (PI). Summer 2010 – Fall 2011.

The College and Career Readiness Initiative: Mathematics Faculty Collaborative – Advancement of the College and Career Readiness Standards in Teacher Preparation Programs - $10,000. "Ready, Set, Go: The Top Ten Things You Should Know About CCRS" (PI). Fall 2009 – Fall 2010

Texas Higher Education Coordinating Board – Intensive Summer Program - $98,059. "Math FOCUS: Fundamentals of Conceptual Understanding & Success" (PI and Key Personnel). Summer 2008

SERVICE

Developmental Mathematics Program – Director. Fall 1998 – Present

CASP Listserve Committee – Member. Fall 2010

TEA/THECB College Readiness Assignments Design Team: Phase 1 – Member. Spring 2009 - Fall 2009

TEA/THECB Internal Review Team – Coordinating College Readiness – Member. Spring 2009

Commission for College Ready Texas – Member. Spring 2007 – Fall 2007

College Readiness Standards – Math Vertical Team – Co-Chair. Spring 2007 – Summer 2008

One-Page Curriculum Vitae

Co-Principal Investigator: Eric J. Paulson, Professor, Graduate Program in Developmental Education

GRADUATE EDUCATION			
INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
University of Arizona, Tucson, Arizona	Ph.D.	2000	Language, Reading, & Culture
Florida State University, Tallahassee, Florida	M.S.	1993	Multilingual/Multicultural Education

A. Positions and Honors.

Professor, Texas State University-San Marcos, 2010-Present
Visiting Scholar, National Center for Developmental Education, 2010
Director of Graduate Studies for the School of Education, University of Cincinnati, 2007-2010
Coordinator, Graduate Certificate in Postsecondary Literacy Instruction, University of Cincinnati, 2006-2010
Coordinator, TESOL Endorsement, University of Cincinnati, 2006-2007
Associate Professor, University of Cincinnati, 2004-2010
Coordinator, Reading & Critical Thinking Program,University of Cincinnati, 2001-2002
Assistant Professor, University of Cincinnati, 2000-2004
Vice President, Board of Directors, Literacy Volunteers of Pima County,1998-1999
Adjunct Instructor, Developmental Reading, Pima Community College 1997-2000

Recognition for Leadership and Dedication to the Teaching Academic Survival Skills Conference, TASS, 2011
Outstanding Service to the Field of College Literacy and Learning Award, College Literacy & Learning Special Interest Group of the International Reading Association, 2010
Outstanding Article Award, *Journal of Developmental Education*, awarded by National Association for Developmental Education, 2009
Faculty Incentive Award for Research and Scholarship, University of Cincinnati, College of Ed., 2006, 2007, 2008, 2009
Academy of Fellows for Teaching and Learning, University of Cincinnati: Inducted May, 2007; Inaugural class.
Faculty Award for Professional/Scholarly Activity, Center for Access and Transition, 2006
Outstanding Dissertation Award, College Literacy and Learning Special Interest Group of the International Reading Association, 2000-2002.

Lead Evaluator, Quality Enhancement Plan, SACS Reaffirmation for Robeson Community College, North Carolina, 2009
Lead Evaluator, Quality Enhancement Plan, SACS Reaffirmation for Edgecombe Community College, North Carolina, 2008

B. Selected peer-reviewed publications (in chronological order).

Books:

Flurkey, A. D., Paulson, E. J., & Goodman, K. S. (Eds.) (2008). *Scientific Realism in Studies of Reading*. Mahwah, NJ: Erlbaum
Paulson, E. J. & Freeman, A. E. (2003). *Insight from the eyes: The science of effective reading instruction.* Portsmouth, NH: Heinemann.
Paulson, E. J., Laine, M., Biggs, S. A., & Bullock, T. B. (Eds.) (2003). *College reading research and practice*. Newark, DE: IRA

Refereed Journal Articles, Past Four Years:

Armstrong, S. L., Davis, H., & Paulson, E. J. (In Press). The subjectivity problem: Improving triangulation approaches in metaphor analysis studies. *International Journal of Qualitative Methods.*
Paulson, E. J. & Bauer, L. (In Press). Goal setting as an explicit element of metacognitive reading and study strategies for college readers. *NADE Digest*.
Paulson, E. J. & Armstrong, S. L. (2011). Mountains and pit bulls: Students' metaphors for college reading and writing. *Journal of Adolescent & Adult Literacy, 54*(7), 494-503.
Paulson, E. J. & Armstrong, S. L. (2010). Postsecondary literacy: Coherence in theory, terminology, and teacher preparation. *Journal of Developmental Education, 33*(3), 2-13.
Paulson, E. J. & Armstrong, S. L. (2010). Situating reader stance within and beyond the efferent-aesthetic continuum. *Literacy Research & Instruction*, *49*, 86-97.
Strauss, S. L., Goodman, K. S., & Paulson, E. J. (2009). Brain research and reading: How emerging concepts in neuroscience support a meaning construction view of the reading process. *Educational Research & Reviews, 4*(2), 21-33.
Sanchez, D. & Paulson, E. J. (2008). Critical language awareness and learners in college transitional English. *Teaching English in the Two-Year College, 36*(2), 164-176.
Armstrong, S. & Paulson, E. J. (2008). Whither 'peer review'?: Terminology matters. *Teaching English in the Two-Year College, 35*(4), 398-407.
Paulson, E. J. & Mason-Egan, P. (2007). Retrospective Miscue Analysis for struggling postsecondary readers. *Journal of Developmental Education, 31*(2), 2-13.
Paulson, E. J., Alexander, J., & Armstrong, S. (2007). Peer review re-viewed: Investigating the juxtaposition of composition students' eye movements and peer-review processes. *Research in the Teaching of English*, *41*(3), 304-335.

Name: Taylor W. Acee

Address: 601 University Drive
San Marcos, TX 78666

Title: Assistant Professor of Developmental Education,
Department of Curriculum and Instruction

Email: aceet@txstate.edu

Affiliation: Texas State University – San Marcos

Phone: (512) 228-6013

Educational Background

Degree	*Year*	*University*	*Major*
Ph.D.	2009	University of Texas at Austin	Educational Psychology: Learning, Cognition, and Instruction
M.A.	2007	University of Texas at Austin	Educational Psychology: Program Evaluation
B.S.	2001	University of Pittsburgh	Psychology

University and Professional Experience (selected)

Position	*Entity*	*Dates*
Assistant Professor, Department of Curriculum and Instruction	Texas State University – San Marcos	08/09-present
Program Evaluator, Fundamentals of Conceptual Understanding and Success project (FOCUS)	Texas State University – San Marcos	6/10-present
Graduate Student Fellow, Research and Evaluation Team, Planning and Accountability Division	Texas Higher Education Coordinating Board	5/08-8/08

Grants

Acee, T.W. (2010). *Motivational Influences on DE Math Student Achievement and Continued Interest in Math.* Research Enhancement Grant, Texas State University – San Marcos, San Marcos, TX. $7,946.

Scholarly Publications and Grants (selected)

Acee, T.W., & Weinstein, C.E., (2010). Effects of a value reappraisal intervention on statistics students' motivation and performance. *Journal of Experimental Education, 78,* 487-512. doi:10.1080/00220970903352753

Acee, T.W., et al. (2010). Academic boredom in under- and over-challenging situations. *Contemporary Educational Psychology, 35,* 17-27. doi:10.1016/j.cedpsych.2009.08.002

McDougall, G.J., Becker, H., Pituch, K., **Acee**, T.W., Vaughan, P., & Delville, C. (2010). The SeniorWISE study: Improving everyday memory in older adults. *Archives of Psychiatric Nursing*, *24*(5), 291-306. doi:10.1016/j.apnu.2009.11.001

Weinstein, C.E., **Acee**, T.W., & Jung, J. (2010). Learning strategies. In B. McGaw, P.L. Peterson, & E. Baker (Eds.) *International Encyclopedia of Education* (3rd ed., pp. 323-329). New York, NY: Elsevier.

Professional Service (selected)

10/10 **Member**, Review Editorial Board of *Frontiers in Educational Psychology*
8/10 **Reviewer**, *Learning and Individual Differences*
08/09 **Panel Reviewer**, Studying and Self-Regulated Learning Special Interest Group, American Educational Research Association

Fernando Vasquez, Ph.D.
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EDUCATION

Doctorate in Philosophy – Cultural & Curriculum Studies, The University of Texas at Austin
Austin, TX 2006
Doctoral Portfolio
The University of Texas at Austin, Austin, TX 2005
Masters in Information Science, The University of North Texas, Denton, TX 2000
Masters of Arts – Political Science, The University of Texas – Pan American, Edinburg, TX 1996
Bachelors in Business Administration – International Business/Economics, McCombs Business School, The University of Texas at Austin, Austin, TX 1985
Bachelors of Arts – Psychology, The University of Texas at Austin, Austin, TX 1985

PROFESSIONAL EXPERIENCE

Texas State University
Senior Lecturer 2010 to Present

- I am currently working as a senior lecturer at Texas State University. I am teaching courses for teacher candidates and for those who will become certified as educational administrators. The courses that I have taught include English as a Second Language, Educational Leadership, and Superintendency.

The University of Texas – Pan American and University of Texas-Brownsville Senior Lecturer, 2006 to 2010

- Courses taught include foundations in teaching, human development, classroom management, exceptionalities (special education), educational technology, and supervising student teachers. I am also teaching a graduate course in cross-battery assessment, which is crucial under the RtI model and NCLB.

PUBLICATIONS

- Mireles, S. V., Rahrovi, S., White, A., Vásquez, F., Walker, E., & Vásquez, P. (2010). An investigation of mathematics teachers' mathematics anxiety. *School Science and Mathematics*. Manuscript submitted for publication.
- Mireles, S. V., Rahrovi, S. R., & Vásquez, F. (2010). Culturally relevant mathematics. In S. Mayo & P. J. Larke (Eds.), *Integrating multiculturalism into the curriculum: From the liberal arts to the sciences*. Manuscript submitted for publication.
- "Masculinities at Institutions of Higher Education: Voices of South Texas Chicano Men." First International Conference on Children's Rights and Education for the 21st Century. (Peer Reviewed) http://www.21stcenturysociety.org/Fernando_Vaskuez.html (2006).

PRESENTATIONS

- "Culturally Relevant Pedagogy in STEM Fields." Texas State University. Invited Speaker. San Marcos, Texas August, 6, 2010
- Student Diversity/Student Populations." Texas State University. Invited Speaker. San Marcos, Texas November 29, 2009
- "Understanding Student Populations." Texas State University. Invited Speaker. San Marcos, Texas November 21, 2008
- "Negotiating Chicano Masculinities." Texas State University. Paper presented at the Race, Ethnicity, and Place Geography Conference. San Marcos, Texas. November 1-4, 2006.
- "The South Texas Discourse: A Cultural Understanding." Texas A&M—Corpus Christi. Paper presented at the 2nd International Conference on Children's Rights and Education for the 21st Century, Corpus Christi, Texas, May 31, 2006.

Thersa (Terri) Raye Westbrook

Educational Background

Degree	*Year*	*University*	*Major*
PhD	Aug 2007- present; in ABD status	Texas State University-San Marcos	Mathematics education
B.S.	Dec 1975	Texas State University	Computer science (mathematics minor)

Postsecondary Education Experience

Position	*College/University*	*Dates*
Doctoral Teach Asst.	Texas State University	01/2010- Current
Doctoral Instructional Asst.	Texas State University	01/2008-12/2009
Technical Assistant (Tutor)	Austin Community College	09/2003-12/2007

Teaching Honors and Awards

Department of Mathematics Graduate Teaching Excellence Award, Texas State University-San Marcos. December 2009.

Pearson Mathematics Education Graduate Student Award, Pearson Education Inc. August 2009.

Pearson Mathematics Education Graduate Student Award, Pearson Education Inc. August 2008.

Courses Prepared and Curriculum Development:

College Algebra with Statistics) - Curriculum development, course prepared.

Developmental Mathematics: Elementary Algebra/Intermediate Algebra blend course - Curriculum development, course prepared.

Developed lesson plans for Elementary Algebra.

Developed lesson plans for Intermediate Algebra.

Articles

Mireles, S., Westbrook, T., Ward, D., & Goodson, J. (2010). Effects of Algebrator software in a development mathematics classroom. *Journal of College Reading and Learning.* Manuscript submitted for publication.

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Attachment C: Writing Samples

Attachment C-1: Writing Sample of Dr. Selina Vásquez Mireles

Attachment C-2: Writing Sample of Dr. Eric J. Paulson

Attachment C-3: Writing Sample of Dr. Taylor Acee

Attachment C-4: Writing Sample of Dr. Fernando Vásquez

Attachment C-5: Writing Sample of Ms. Terri Westbrook

Selina Vásquez Mireles

Theory to Practice *Developmental Mathematics Program: A Model for Change*

The Developmental Mathematics Program (DMP) at Texas State University–San Marcos in central Texas has undergone systemic, significant changes over the past ten years. These changes primarily resulted from the alignment to the American Mathematical Association of Two-Year Colleges' (AMATYC) Crossroads in Mathematics: Standards for Introductory College Mathematics Before Calculus (Cohen, 1995) and Beyond Crossroads: Implementing Mathematics Standards in the First Two Years of College (Blair, 2006), incorporation of existing research regarding developmental education in general and developmental mathematics in particular, and infusion of best practices. This article details the impetus for change and provides a description of the current program as well as an explanation of future goals for the DMP.

AMAYTYC calls for a standards-based reform movement that parallels that of K-12 mathematics education stemming from the National Council of Teachers of Mathematics' (NCTM) *Principles and Standards for School Mathematics* (2000). *Crossroads* (1995) was the first standards document for development mathematics. It brought legitimacy and credibility to suggestions for change. For example, the use of technology in the developmental mathematics classroom was quite limited prior to *Crossroads* (1995). And, technology use in developmental mathematics classroom is recommended in

the *Crossroads* (1995) "Standard I-6: Using Technology" and "Standard P-1: Teaching with Technology." Thus, there was a need for research regarding calculator use specific to developmental mathematics students (Vásquez, 2000). This resulted in a study led by Vásquez and McCabe (2000), which found that the use of graphing calculators did not significantly impact, either positively or negatively, student academic performance. Critics of calculator use tend to claim that students will do well because they have the calculator performing the calculations. Since the results were neutral, a move to require graphing calculators for students in the program did not receive significant resistance from members of the DMP.

Research about developmental education students guided other programmatic changes for the DMP. According to Boylan (2002), the education provided to developmental students should be based on a combination of theoretical approaches drawn from cognitive and developmental psychology. Instructors should learn about these theoretical approaches and practice combining and implementing them in order to provide effective developmental education. Because they do not have such background in theory or practice, the part-time faculty and/or graduate students assigned to teach developmental mathematics students often turn to a traditional instructional method to teach basic skills. That is, teachers present fundamental skills as step-by-step procedures and reinforce by drill and practice (Krantz, 1999). Proponents of traditional instruction have purported that this approach is the most effective means of gaining fundamental skills. However, research shows that teachers with mathematics anxiety tend to favor traditional instructional techniques and that there is a high correlation between such methods and teacher ineffectiveness (Trujillo & Hadfield, 1999). Research shows a strong case for using non-traditional instructional methods based on curricular innovations such as collaborative learning, which fosters problem solving and reasoning as opposed to rote memorization (Johnson & Johnson, 1991).

Developmental mathematics students need to gain both fundamental and problem-solving skills. They need a strong mathematical foundation for obtaining their educational goals because most degree plans require at least one non-remedial mathematics course. And, in states such as Texas, students must pass state-mandated problem-solving tests in order to graduate from college. In Boylan, Bonham, and Bliss' (1994) article in *Research in Developmental Education*, "Who are the Developmental Students?", demographic data showed that a disproportionate number of minority students, namely African Americans, participated in developmental education. In an informal survey conducted by this author

of some universities in Texas, developmental mathematics students tend to outnumber developmental reading and developmental writing students. In a four-year university in Texas by the Mexican border, the ratio of developmental mathematics to developmental reading was 2:1, as was the ratio of developmental mathematics to developmental writing. In north Texas, at another four-year university, the ratio of developmental mathematics to developmental reading was 6:1, as was the ratio of developmental mathematics to developmental writing. At the institution where the DMP is housed, the ratio of developmental mathematics to developmental reading was 50:1, and the ratio of developmental mathematics to developmental writing was 26:1. Although this is not a random sample, developmental mathematics appears to be the most populated content subset of developmental education. Hence, a successful developmental mathematics program has the potential of making mathematics and, consequently, higher education more accessible for minority students.

At the Joint Meetings in Washington, DC, in January 2000, the American Mathematical Society (AMS) and the Mathematical Association of America (MAA) Committee on Teaching Assistants and Part-Time Instructors organized a special session, "Innovative Development Programs for Teaching Assistants and Part-Time Instructors." Most of the professional development available to this population was described as either informal (casual conversations amongst teaching assistants) or traditional (orientation sessions before classes start and regular meetings for a particular course). None of the twelve presentations at the conference discussed formal, concerted, programmatic efforts. Thus, there is an indication that training programs may be void of formal support (including monetary), structure (e.g., making it a requirement and committed involvement of tenured faculty), and activities (e.g., readings, structured discussions, analysis of case studies, observations and videotaping, consultations with experienced instructors, role-playing, and modeling). Moreover, the training issues discussed in this particular session were specifically for teaching assistants, not necessarily part-time faculty. Currently, there exist two programs that utilize teaching assistants and subsequently provide training related to the models, Supplemental Instruction (SI) and the Emerging Scholars Program (ESP). SI is a program developed at the University of Missouri, Kansas City, which trains supplemental instructors to foster effective study skills through content. ESP is a program based on Uri Treisman's research that shows that collaborative work on challenging problems yields increased academic performance in higher mathematics. Neither SI nor ESP specifically addresses the particular needs of part-time faculty. Hence, at

Texas State University–San Marcos, we saw a need for formal training programs for both teaching assistants and part-time faculty.

Description

The goal of the DMP at Texas State University–San Marcos is to increase developmental mathematics students' performance by improving the quality of instruction. The objectives of the program are (a) to foster fundamental and problem-solving skills in developmental mathematics students by helping them to learn when and how to create algorithms as well as when and how to use them and (b) to provide on-the-job training for all developmental mathematics instructors through an instructional framework that requires them to develop and incorporate non-traditional instructional techniques. The overall mission of the program is to provide developmental mathematics students with a positive, nurturing, learning environment, making mathematics and, thus, higher education more accessible.

The primary instructional delivery system is based upon a four-phase algorithmic instructional technique (AIT): modeling, practice, transition, and independence (Vásquez, 2003). The progression begins with teacher-directed instruction of fundamental topics and continues towards a student-directed learning environment for complex topics in a problem-solving context. The ultimate goal is to provide a student-centered learning environment where students gain an understanding of mathematical concepts by creating pertinent algorithms using problem-solving techniques that are reinforced through carefully developed problems, including those based on real-world situations. The AIT provides developmental mathematics students the nurturing environment that they need by employing non-traditional instructional techniques that yield student-authored algorithms for fundamental skills while fostering problem-solving capabilities. An example of this kind of integration is discussed in Vásquez (2003) "Utilizing an Algorithmic Instructional Technique in the Developmental Mathematics Classroom," which describes various examples including linear equations in two variables and sequences.

The program is composed of various components relevant to the developmental mathematics instructors and students. The primary instructor piece is the on-going training that each receives. Prior to each semester, the instructors participate in an intensive three-day workshop. This three-day training session includes:

1. A description of the program;
2. A review of an instructional handbook, especially an orientation to its use (the handbook is a compilation of lessons and

activities, suggesting nontraditional instructional techniques including AIT, created by the program's senior faculty and instructors, and revisions from its previous use as well as suggestions for implementation);
3. A demonstration of several activities, including at least three activities for each of the four AIT phases;
4. An opportunity to practice conducting activities that represent each of the four AIT phases;
5. A discussion on accountability and evaluation requirements such as conducting student surveys and pretests/posttests, maintaining a descriptive log of instructor developed lesson plans and activities, keeping a journal of actual classroom events and personal reflections on the day's events, and collecting samples of student work;
6. An overview, discussion, demonstration, and practice in nontraditional instructional techniques, especially collaborative learning;
7. A workshop on the use of technology in the classroom;
8. Other workshops on topics such as learning styles, professionalism, and multiculturalism that traditional training programs include; and,
9. A meeting of the advisory board charged with proposing recommendations for activity development and alignment, providing suggestions for improving the overall program and ideas for disseminating program results, and assisting other institutions with program adoption.

Other aspects of the program include a weekly seminar, mentoring, and observation/reflection opportunities. The instructors participate in a weekly seminar where they discuss day-to-day administrative issues, lessons, and pertinent literature such as AMATYC's (1995) *Crossroads*. Instructors are also each assigned a senior faculty mentor. The senior faculty mentor conducts regular observations and discusses self-reflections on videotaped classroom instruction.

The developmental mathematics students receive research-based quality instruction, academic support, and several opportunities to communicate their needs. The developmental mathematics courses are limited to approximately 25 students. Although the instructors remain the primary instructional agents, the students must also attend a one-hour lecture where a senior faculty member facilitates discussion about topics from a broad, conceptual perspective, using real-world examples and technology to tie ideas together and reinforce small-group instruction. Thus, the DMP provides students additional instructional time. Instruc-

tors must be available for appointments in addition to their required one office hour per day. Moreover, several university offices provide tutoring, including the Student Learning Assistance Center, which also offers Supplemental Instruction to students in the program. Developmental mathematics students are afforded many occasions to provide feedback about the program, including mid-semester and final course evaluations, lesson reaction polls, and results on quizzes and exams.

The most unique aspect of the program is the significance of the resources that are allocated to the DMP from the Department of Mathematics and the University. Typically, part-time/adjunct faculty teach developmental mathematics courses based on a textbook and general course outline. The DMP differs in that senior faculty members collaborate to construct an environment where instructors are carefully guided through well thought-out, research-based training that includes supporting materials and resources. This enables the part-time/adjunct faculty to become highly qualified in teaching and to address the particular needs of developmental mathematics students effectively.

The main training instrument is an instructional handbook that includes directives for teacher behavior such as what to do and how (e.g., whole-class discussion, Socratic questioning), what to stress (e.g., conceptual understanding of absolute value as it relates to the number line), and what type of activities to use (e.g., Traveling on the Number Line). Thus, it encourages inexperienced teachers to incorporate into their lessons more successful non-traditional instructional techniques. The handbook also fosters discussion among developmental mathematics instructors as they create significant contributions to the handbook based on their experiences and feedback from their coworkers. Such interchange allows experienced instructors to play out their important role in assisting with training.

The program is housed in the Department of Mathematics and is directed, coordinated, and managed by three full-time faculty members. At least 30 developmental mathematics instructors per year circulate through the system. Few, if any, of the instructors have received any teacher training. Instructors are typically full-time graduate students in mathematics, and, on average, spend at least two years as developmental mathematics instructors. Records indicate that over 80% of the instructors, after participating in the program, have received comparable positions at colleges and universities and/or are accepted to mathematics education doctoral programs with ease. In fact, the DMP contributes to the training of mathematics education doctoral students at this institution.

Consistent, on-going evaluation focusing on the students, instructors,

and the program in general occurs. The evaluation process consists of both a process and product component. The process is monitored and altered based on information from student surveys, observations by the instructor of the students, samples of student work, departmental course examinations, weekly meetings with instructors, maintenance of a descriptive log of instructor-developed lesson plans and activities, instructor participants' journals of actual classroom events, instructor participants' personal reflections on the days' events, and observations of the instructors (at times by an outside person, by a faculty mentor, or by videotape). The product is evaluated by analyzing the results on students' pretests and posttests as compared to those for a control group; their results on a state-level mathematics test, such as the Texas Higher Education Coordinating Board (THECB), as compared to their scores in previous attempts of the test; the results of their performance in their current and subsequent course, College Algebra, as compared to that for previous semesters; and the results of departmental course examinations as compared to those for a control group. Expectations for students include successful completion of the current mathematics course, passing a state-level mathematics test, and successful completion of a subsequent mathematics course. Expectations for teachers include student academic success and improved quality of teaching.

The methods of evaluation include the use of objective performance measures. The intended outcome, to increase developmental mathematics students' performance, is realized if the null hypothesis—if there is no significant difference in the adjusted means of content scores between students receiving the proposed instructional technique and students receiving the traditional instructional technique—is rejected and if there is:

1. A statistically significant increase in test scores (pretest/posttest) at the 0.05 level;
2. A significant increase (at least 10%) of students that pass developmental mathematics courses;
3. A significant increase (at least 10%) of students that pass the THEA; and,
4. A significant increase (at least 10%) of students that pass College Algebra.

Statistical analysis is conducted each semester and has consistently shown that the program is effective. As noted in Vásquez (2004), evaluation centers on general project components, instructors, and students. Insightful qualitative data reinforce these results, including anecdotal claims that the program has been successful (Vásquez, 2004).

An advisory board serves as a recommending body for activity de-

velopment and alignment. In addition to providing suggestions for improving the overall program and ideas for disseminating program results, the board also assists other institutions with program adoption. The committee members include representatives from national, state, and local organizations such as the National Center for Developmental Education (NCDE), the National Association of Developmental Education (NADE) Mathematics SPIN, the American Mathematical Society (AMS), Mathematical Association of America (MAA) Committee on Teaching Assistants and Part-Time Instructors, American Mathematical Association of Two-Year Colleges (AMATYC) Foundation/Developmental Mathematics Committee, Teachers Teaching with Technology College Short Course Program (T^3 – CSC), and the Texas Higher Education Coordinating Board (TxHECB) Center for College Readiness in the Division for Educational Partnerships.

The program includes partnerships with other colleges and universities around the nation, many of whom have sent representatives to the workshops to receive training and pilot this program at their home institutions. Furthermore, several schools contract assistance with reform efforts by revising their developmental mathematics program using the DMP as a model. Solicitations to present at conferences, assist with related projects such as the Technology in Developmental Education workshop, and host developmental education student interns are also received.

Future

Overall, the DMP maintains a productive atmosphere for all its participants. The program is continuously revised based on active, current research, successes of other programs, and revisiting of standards. For instance, a recent instructor survey indicated a strong need for efficiency in out-of-class duties such as grading. Thus, efforts are currently being made to research and, if necessary, develop new policies, procedures, and mechanisms for streamlining this process. As most publishers provide computer-based instructional products, future goals include reviewing available software packages and determining the role of a hybrid course to address the distinct needs of developmental mathematics students that need a refresher course as opposed to a remedial course (MacDonald, Vásquez, & Caverly, 2002). As recommended in *Beyond Crossroads* (2006), efforts will be made to make the developmental mathematics curriculum more career-based by including relevant, realistic applications such as those dealt with by nurses and technicians. And, efforts to align to the newly-adopted Texas College Readiness Standards are underway. In particular, both Mathematics and Cross-Discipline Stan-

dards are being addressed, and as with most standards, both process and product standards are included. In any case, the program team strives to maintain a developmental mathematics program that helps students conquer their fear of mathematics; provides teacher training; offers a framework for the development of innovative lessons including student-centered, technology-based, hands-on, real-world activities; and assists other schools, programs, and organizations with similar endeavors.

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Peer Review Re-Viewed: Investigating the Juxtaposition of Composition Students' Eye Movements and Peer-Review Processes

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While peer review is a common practice in college composition courses, there is little consistency in approach and effectiveness within the field, owing in part to the dearth of empirical research that investigates peer-review processes. This study is designed to shed light on what a peer reviewer actually reads and attends to while providing peer-review feedback. Fifteen participants peer reviewed a student's essay that had both holistic and surface-level errors. Using eye-tracking technology, we collected detailed and informative data about which parts of the text the peer reviewer looked at, how long the peer reviewer looked there, and where the peer reviewer looked next. These data were analyzed according to eye-movement research methodologies and juxtaposed with each peer reviewer's comments and suggestions about the essay being reviewed during a typical peer-review exercise. Findings include an unexpected mismatch between what peer reviewers focus on, spend time on, and examine multiple times when reading and peer reviewing an essay and what they choose to give feedback about during the peer-review session. Implications of this study include a rethinking of the composition field's widespread use of a global-to-local progression during peer-review activities.

Peer review is one of the most widely used and pedagogically vexed practices in first-year college composition courses. Many compositionists feel that it is theoretically and pedagogically sound to have students serve as reviewers and editors for each other for a number of reasons: It potentially increases student involvement in the revision and editing processes, it may alert students to the importance of considering a "real live" audience or body of readers as they compose and revise, and it should help students see in others' writing some of the common errors or patterns present in their own compositions (e.g., Berkenkotter, 1983). Numerous textbooks designed to train new writing teachers, such as *Preparing to Teach Writing: Research, Theory, and Practice* (Williams, 2003) and

The St. Martin's Guide to Teaching Writing (Glenn, Goldthwaite, & Connors, 2003), offer examples and prompts for peer-review activities, arguing that such review can serve as one of the central components of the writing process. According to Glenn et al. (2003), "peer-review groups . . . allow writers control over their work but give them the benefit of several readers' responses" (p. 63). Williams (2003) offers an entire chapter on "The Classroom as Workshop," and argues that "the process model led to an important change in the structure of writing classrooms. It transformed them into *workshops*" (p. 131). Peer review is one of the chief features of the workshop model.

However, some compositionists also argue that peer review, whether scheduled as an in-class, electronically enabled, or out-of-class activity, generally falls flat (e.g., Broman, 2005). Instructors frequently point out the tendency of many students to focus on less-than-significant aspects of their peers' papers, creating a mismatch between the instructor's intentions and student outcomes (e.g., Danis, 1988; George, 1984; Neubert & McNelis, 1990). Additionally, students may rely on patterns of evaluation and critique from earlier educational experiences—a reliance that does not suggest further development of writing skills (e.g., Schaffer, 1996).

Given the wide usage of peer review in composition classrooms, as well as the fairly mixed reviews that it receives at times from both instructors and students, it is important to understand as fully as possible what aspects of peer review are useful, how it can be structured productively for students, and why it sometimes does not seem to work very well. Unfortunately, while much anecdotal and theoretical (i.e., what *should* take place) support for peer review exists, few scholars have undertaken empirical studies to explore what actually happens during a peer-review session and how such activities contribute to the development of writing skills.

To generate data that may be useful in understanding the potential—and limitations—of peer review, we used eye-tracking technology to examine what students were attentive to during a fairly typical peer-review exercise. This technology allowed us unobtrusively to observe exactly where and for how long students were focusing on any part of a text being read, including whether they read an item once or re-examined it multiple times. In undertaking this study, we believed that, through an analysis of the kinds of items peer reviewers concentrated on during a peer-review session, we might have a better understanding of how to structure peer-review activities, both to take advantage of what students are already focusing on and to prompt students to consider other composing issues. An empirical approach to studying peer review is vital, we believe, because of the dearth of research on whether students are utilizing peer review in the ways that their instructors intend. Because eye-movement analysis provides a reliable method of inferring readers' moment-by-moment processing activities (Rayner, 1997), it

would appear to be a powerful tool in investigating whether composition students are indeed attending to the parts of the text that their instructor intended, as well as illuminating the relationship between what composition students focus on and spend time on in the text and what they choose to talk about during the peer-review process. Additionally, through analysis of the kinds of textual items peer reviewers attend to, we will be able to provide research-supported pedagogical implications for this nearly ubiquitous composition-class activity.

Our approach of examining readers' attention to aspects of the essay they are peer reviewing, as a method of informing our understanding of those readers' peer-review responses, is a departure from the norm of current approaches to composition research, which have focused primarily in the last decade on the social dimensions of language. However, we are convinced that information gathered through eye-tracking technology may greatly assist compositionists in reconsidering and developing effective peer-review pedagogies. Further, our perspective is that peer-review is *not* a behavior that can be observed outside of a pedagogical and social context. Ultimately, what we hope to model in this essay is a form of *empirical constructivism*, situating empirical data in a rich description of a common classroom practice. Indeed, given the wide usage of peer review in composition classrooms, as well as its potential to assist students in becoming more familiar with composing as a largely audience-focused process, peer review should be understood as fully as possible. In our view, this means examining as many aspects of the process as possible, in as authentic a way as possible; this study approaches such an examination from the perspective of a juxtaposition of participants' reading of an essay with their peer-review responses about that essay. We believe that such approaches can have wide-ranging ramifications if research can inform adjustments to writing pedagogies that may facilitate students' progress through the first-year writing sequence and prepare them for success as they meet writing challenges in other courses.

History and Background of Peer Review

Nearly all first-year college composition instructors employ peer review in some form as an instructional tool. Despite its widespread usage, however, in practice, much confusion exists about what it is and what it should do, as well as how it is most effectively approached and why (e.g., Holt, 1992; Topping, 1998). Most literature about peer review simply recommends it, or gives suggestions for its implementation, without providing empirical research that supports its use (e.g., Schaffer, 1996; Spigelmire, 1981; Vatalaro, 1990). Research-based approaches to peer review have explored differences between oral and written peer review (McAlexander, 2000), peer review and writing anxiety (Murau, 1993), and ESL variations on peer review (Mendonca & Johnson, 1994). The available scholarship

on peer review provides some insight into the numerous inconsistencies that have led to the existing confusion.

Peer Review Scholarship

A variety of theoretical concerns and positions permeate the scholarship in this area, which generally falls into two categories: practical and empirical.

Practical Texts

The largest category encompasses the practical texts, which are primarily how-to texts written for and by practitioners with the goal of describing and endorsing a particular method of doing peer review (Berkenkotter, 1984; Dossin, 2003; Elbow, 1973, 1981; Holt, 1992; Johnson, 2001; Kastman-Breuch, 2004; Paton, 2002; Sitko, 1992; Topping, 1998). These methods vary considerably, but most focus on making peer review less daunting for students. In order to alleviate problems arising as a result of peer pressure or intimidation, for example, several scholars have recommended anonymity in peer-review situations (Bean, 1979; Johnson, 2001). Others have noted that the evaluative comments expected of most peer reviewers are not beneficial for either writers or reviewers. Instead, these scholars have argued that students should provide objective observations (Danis, 1988), write questions instead of comments (Schaffer, 1996), or summarize and discuss their papers (George, 1984). To develop students' understanding of their audience's expectations for and reactions to their texts, Sitko (1992, 1993) has suggested that writers listen as peer readers think aloud while reading their papers. Finally, several scholars have commented on more practical aspects, such as the time involved in a peer-review session. Although most peer-review methods are described as being intended for a single class period, some have suggested that students would benefit from being in their peer-review groups longer or more frequently (Paton, 2002; Schaffer, 1996). Even though the practical scholarship amounts to the largest category on peer review, the numerous different methods, topics, and issues explored make it difficult to reach any conclusions about a "right" or "best" way to do peer review in practice.

Empirical Research

The studies in the empirical category primarily investigate the effects of a particular peer-review method, specifically effects on students' revising practices (e.g., Berkenkotter, 1983; Freedman, 1992; Harris, 1986; Karegianes, Pascarella, & Pflaum, 1980; Mendonca & Johnson, 1994; Neubert & McNelis, 1990; Newkirk, 1984; Sherrard, 1994; Thomas, 1986; Zhu, 1995). Most often, these are case studies that follow a handful of students, and frequently, the purpose of the research is either to determine whether peer-review sessions are useful for students' writing (Berkenkotter, 1983) or to investigate the effects of peer review on students' composing and revising processes (Nystrand & Brandt, 1989). Others have

focused on student preferences, that is, whether peer review was preferred over self-evaluation (Harris, 1986) or instructor evaluation (Karegianes et al., 1980). Another strand investigated students' verbal interaction during peer-review sessions (Freedman, 1992; Thomas, 1986). The last significant strand of empirical research on peer review examined its benefits for ESL students (Mendonca & Johnson, 1994; Zhu, 1995). As is the case with the practical scholarship, the literature in the empirical category is widely divergent, and we found no studies that actually investigate *what* students do during peer review.

Peer Review Themes in the Literature

We found two dominant themes running throughout this body of research that reflect two different theoretical orientations in the field of composition: the ongoing prevalence of social-epistemic approaches and a growing call for empirical studies.

Emphasis on Social Constructionism

First, many scholars recognize Vygotsky's (1978) theories of development by emphasizing the socially constructed aspects of peer review; often such activities involve a mixture of written and verbal peer-review methods (e.g., Danis, 1982; Gere & Stevens, 1985; Hewett, 2000; Thomas, 1986; Wixon & Stone, 1977). Instead of limiting a peer-review session to a questionnaire-style worksheet, these scholars encourage more discussion-based sessions. In their study of student discussion in writing groups, for example, Gere and Stevens (1985) suggested that the benefit of oral response in peer-review sessions is its simplicity; because written comments are more structured, time-consuming, and elaborate, oral response tends to encourage more specific responses. Across the scholarship, in theoretical texts (e.g., Gere, 1990), empirical studies (e.g., Hewett, 2000), and practical texts (e.g., Wixon & Stone, 1977), another often-noted benefit to using discussion in peer-review groups is that it allows students to socially construct a much-needed language for talking about writing and a shared understanding of what that means (see Bakhtin, 1981).

Other scholars see additional pedagogical benefits ensuing from peer-review activities. In addition to helping students develop metadiscourses about writing, peer review might also assist students in taking ownership of their learning and becoming more effective agents in their own and others' learning (e.g., Brooke, 1991; Wallace & Ewald, 2000). For instance, Wallace and Ewald (2000) argue for redesigning composition classrooms so that both teachers and students share power and input and students can find more rhetorically effective and empowering ways of voicing their concerns, issues, and ideas. One particular venue that Wallace and Ewald examine briefly is peer review, in which students have the opportunity to practice articulating their own thoughts and critiques. The authors assert that peer review can become more effective if it is part of a classroom architecture that

already favors "student input" and thus makes room for "student agency" (p. 84). Conversely, Tobin (1993) asserts that peer reviewers may hold back on their comments because they don't want to hurt their classmates' feelings and because they want to protect their own interests.

Call for Research

The other common theme is a nearly universal call for further research on peer review. Most scholars have recognized that, although the body of literature on this topic is immense, very few aspects of peer review have been investigated empirically. Topping (1998), for instance, has commented that more research is needed "with improved methodological quality and fuller and more detailed reporting of studies" (p. 269). Likewise, DiPardo and Freedman (1988) have noted the absence of any research on *what* students do during peer review and have suggested investigations of the social dynamics at work within peer-review groups and how these dynamics affect the learning situation:

> Although practitioner endorsements commonly share the assumption that the writing process is somehow supported by having students gather together for the purposes of providing one another with feedback on writing, response groups have been seldom studied to illuminate just what processes are thereby supported, or how. Thus, although writing groups have assumed an important place in educational practice, teachers are left to reflect upon them mostly in light of their own experiences or those of colleagues. (pp. 119-120)

Beyond these two commonalities, however, there is very little consistency or agreement in the available literature on peer review. In fact, even the terminology used to describe peer-review activities is widely divergent. At least five different terms can be found in the scholarship to describe the act of having students examine each other's writing: peer review, peer response, peer editing, peer critiquing, and peer evaluation (e.g., Harris, 1986; Holt, 1992; Karegianes et al., 1980; Neubert & McNelis, 1990; Rubin, 2002). Because these terms are neither defined nor distinguished from one another in the literature, it appears that they are randomly assigned and considered synonymous. This lack of consistency in terminology is reflected in the widespread variation in philosophies, strategies, theoretical frames, and research methods. As one scholar mentions, "The literature on peer assessment between students in higher education is at an early stage of development, very variable in type and quality, and scattered and fragmentary in nature" (Topping, 1998, p. 267).

With respect to research on peer-review activities, Smit (2004) asserts that "there is not a great deal of research being published on composing processes, and the reason may very well be that researchers do not know where to go from here" (p. 75). If peer review is an integral part of the composing process, then it deserves

our scholarly and critical attention—particularly given its widespread use in composition classrooms and the call for further research into it. Until relatively recently, we have been limited to research practices and methods that have focused on direct observation, studies in context, and case studies, the practices that Smit (2004) points out. By utilizing eye-tracking technology, however, we can be more attentive to what students are actually examining when they undertake peer-review activities.

The Possibilities of Eye-Movement Research: Some History and Background

For more than a century, the recording and analysis of readers' eye movements have been a powerful research tool in literacy and reading studies that has revealed enormous amounts of information about, and insight into, the reading process (e.g., Huey, 1908/1968; Rayner, 1998). One reason eye-movement research has been such a fruitful line of inquiry revolves around its ecological validity; recording and analyzing a reader's eye movements demands no extra task to be undertaken by the reader. Other common reading-research techniques, like think-alouds, response-time tasks, cloze activities, or comprehension tests, all add an additional non-reading element to the reading process in order to provide data about the reading process. In contrast to these somewhat artificial additions to the process, an eye-tracking apparatus collects data about reading while the participant is doing nothing but reading.

How Eye Movements Reveal Reading Processes

Eye-movement research is an ecologically valid research tool, but importantly, it also reliably yields valid information about reading processes. The following section outlines the type of information eye-movement research provides.

Physiological Limitations

Understanding what the eyes can reveal about reading processes requires first understanding the physiological limitations of the eyes as an information source. Although we may have the perception that our eyes smoothly glide across the page as we read, our eyes actually make a series of very short pauses, called *fixations*, throughout the reading process. This phenomenon was first observed by Emile Javal in 1879 (reported in Huey, 1908/1968), and further research would demonstrate that the purpose of a fixation is to provide the reader with in-focus graphic information.

What is physiologically in focus during a fixation is much smaller than what might be expected. Of the three regions of viewing information to which the eye has access during a fixation—the foveal, parafoveal, and peripheral regions—in-focus information is limited to the foveal region. This small area of vision subsumes 1-2 degrees of visual angle, or about 3-6 letter spaces around the point of

fixation. The parafoveal region extends about 24-30 letters around the point of fixation, and the peripheral region includes everything in the visual field beyond the parafoveal region (Just & Carpenter, 1987). The fovea is concerned with processing detail, and the farther away from the fovea an object is viewed, the more difficult it is to identify it.

In terms of reading, when letters are viewed within the fovea, they are distinguishable. When a random string of letters is viewed outside of the fovea but within the parafovea, it is much more difficult to distinguish letter information. In other words, what is physiologically in focus during a fixation is for the most part the word that is being fixated. Note that this is a *physiological* limitation, not a perceptual one. When letters in the parafoveal field are presented in context, as they are in a normal reading situation, they can be distinguished sufficiently to be useful under certain conditions. Nevertheless, it is because the in-focus viewing area is so small that one important function of eye movements during reading is to move words into this viewing area where they can be clearly seen by the reader.

In addition to a small in-focus viewing area, the eye is also limited as an information source by the fact that during reading it must be stationary to deliver usable data to the brain. Following each fixation, there is a *saccade*, or movement, that is extremely short and so fast that it allows no useful information to be gained from it (Just & Carpenter, 1987). That is why readers' eyes make fixations instead of simply gliding over the text—no usable information is gained during the movement of the eyes, an early finding in the eye-movement field that has been replicated many times since (e.g., Dodge, 1900; Rayner, 1997; Wolverton & Zola, 1983). The combination of the eye having a small in-focus viewing area with the fact that the eye must fixate in order to retrieve usable information means that, physiologically, in order to "see" a word, it is usually necessary to pause and look right at it. However, strong syntactic and semantic contexts allow readers to perceive words that are in the parafovea, so that a portion of the words in the text, especially function words, do not need to be directly fixated. For this reason, readers typically fixate between two-thirds and three-quarters of the words in a text (Fisher & Shebilske, 1985; Just & Carpenter, 1987; Paulson, 2002; Rayner, 1997). During normal reading, the combination of reader expectation and prediction, and the context implicit in the text they are reading, allows readers to visually skip words but still feel as though they have seen and read every word (Ehrlich & Rayner, 1981). In terms of the present study, an important finding about word fixations from eye-movement research is that readers fixate problem areas of the text—ambiguous words, misspelled words, and so on—more frequently and for a longer duration than other areas of the text (Ehrlich & Rayner, 1981; Frazier & Rayner, 1982; Zola, 1984).

Readers make rapid decisions about where to move their eyes next and how long to keep them there, based on moment-by-moment attention allocation and

information processing. That is, where a reader fixates during reading is a reflection of the part of the text to which the reader is attending (Just & Carpenter, 1987; Morrison, 1984), and eye-movement data reflect "moment-to-moment processing activities of readers" (Rayner, 1997). So while eye movements cannot perfectly reveal whether a reader has comprehended a given word, "the time a reader spends on a word or a phrase can indicate when a process occurs and how its duration is influenced by characteristics of the text, the reader, and the task" (Just & Carpenter, 1987, p. 5). There is a strong link between where a reader fixates and moment-by-moment attention (Chaffin, Morris, & Seely, 2001), although this should not be interpreted as revealing what the reader is thinking. However, in terms of reading processes, "by examining where a reader pauses, it is possible to learn about the comprehension processes themselves" (Just & Carpenter, 1980, p. 329).

Readers Look Longer at Difficult Words

As mentioned previously, eye-movement research has found that readers skip a portion of the words in a text. However, that does not mean that readers simply skip every second, third, or *n*th word; on the contrary, the words that are actually looked at by a reader show a focus on gaining information from the most useful parts of a text. For example, content words, which carry much of the semantic meaning of the sentence, are looked at more often than function words, which have a more syntactic, grammatical role. The difference can be great: Carpenter and Just (1983) found that participants fixated 83% of the content words and 38% of the function words in their study. In short, readers tend to fixate words that provide the most information and are of the most use to them while reading. In general, readers' fixations last around a quarter of a second, or approximately 200-250 milliseconds (msec) (Rayner, 1998).

Class of word (e.g., content vs. function) is not the only variable in determining whether a word gets fixated by a reader. An important aspect of reading processes that eye-movement analysis can reveal is that of *difficulty*. That is, eye movements are very good indicators of whether a reader found a word (or phrase, or sentence, etc.) difficult to process. A widely reported finding in eye-movement research is that low-frequency words receive longer fixations than high-frequency words (Rayner & Pollatsek, 1989), which simply means that the more unfamiliar a word is, the longer a reader has to look at it in order to process its meaning. The same thing happens when a reader reaches an ambiguous word in a sentence (Frazier & Rayner, 1982). Importantly, for the purposes of this project, eye-movement research has shown that readers look longer, and more often, at misspelled words (Ehrlich & Rayner, 1981; Zola, 1984). Note that this does not mean that a researcher can know for certain whether a given word was difficult for a reader to process. In general, however, eye-movement research has shown that anomalous,

ambiguous, or misspelled words receive more and longer eye fixations because of the heavier processing load associated with making sense of that portion of the text—in short, anything a reader notices as being difficult or wrong is apt to receive longer and more frequent eye fixations.

Because we are interested in what the peer reviewers actually pay attention to while reading, eye movements provide an important source of data. By examining our participants' eye movements on the student essay they were peer reviewing, we were able to understand what parts of the essay they focused on and examined; whether the surface errors that are in the essay received more attention than other, non-error parts of the essay; and how their reading processes paralleled, detracted from, or otherwise reflected their peer-review processes.

Methods

Apparatus

Eye-movement data were collected with an Applied Science Laboratories Model 504 eye tracker that sits in front of a typical computer work station. The 504 uses a remote pan-tilt camera, which negates the need for a chin rest or bite bar, though a forehead rest was used to insure accurate data recording. This unit is unobtrusive to the degree that if readers were not told that they were being eye tracked, they would not be aware of the process. The eye tracker records eye movements by tracking a reader's pupil and corneal reflections with an infrared reflection source and is accurate to within .5 degrees of visual angle. Spatial and temporal aspects of readers' eye movements were analyzed using Fixplot and Eyenal software supplied by Applied Science Laboratories. In addition to having access to the data in statistical form, fixations and saccades are plotted directly on digital reproductions of the text and include fixation duration, fixation number, fixation location, saccade direction, and saccade length.

Texts

All texts that students read were displayed on a 19-inch, flat-screen monitor with normal text size and ratio. Participants sat in front of the computer screen and keyboard as they would when normally reading from a computer monitor in a computerized classroom. We chose the student text and peer-review assignment texts so that they would resemble as closely as possible the kinds of texts that students in first-year composition courses would encounter at our university.

To develop a typical peer-review assignment prompt, we surveyed approximately 20 in-print, first-year composition textbooks, paying particular attention to the peer-review activities described in each. In almost all cases, students are encouraged to first read their colleague's work globally, commenting on major issues of content and organization. Texts that prepare new instructors to teach

writing recommend much the same approach. For instance, Glenn et al. (2003) offer new composition instructors a list of 14 types of questions that can be used to structure peer-review sessions. The list begins with questions focusing attention on how well a draft meets the aims of the assignment, how evident its thesis and main purpose are, and how clearly it is organized. At the end of the list, questions about sentences, words, and tone ask students to pay attention to surface-level errors and comparable issues. Interestingly, based on our conversations with instructors both at our home institution and at a national writing conference, such a movement—from global to local or surface-level issues—often parallels many instructors' grading priorities, with more weight often given to content as opposed to mechanical issues. With such an emphasis in mind, we ultimately decided to draw our peer-review activity from our university's English Composition Program's self-published Student Guide, which itself has a very similar approach—prompting students to focus first on global issues before moving to mechanical and grammatical issues. Based on such directions, we devised the following peer-review questions to ask our participants:

1. What advice would you give the author to help him or her improve the introduction?
2. Does the introduction seem to meet the requirements of the assignment?
3. Does the writer clearly express how or why this experience was significant?
4. Are there any problems with this paper that you would want to point out to the author?

Before beginning the peer-review session, these questions were introduced to the participants so they would have an idea of the focus of the peer review. During the peer-review session, these questions were then asked directly of the participants in addition to any other participant-generated questions or feedback that arose.

The essay text, which was the focus of the peer-review session, is the introductory section of a larger essay (hence the use of the word "introduction" in the first peer-review question, above). This introductory section is comprised of two paragraphs and is 366 words in length (see Appendix). Using the two-paragraph introduction as the text the participants peer reviewed allowed us to focus on both surface-level issues as well as holistic issues (holistic mismatches between the prompt and the essay being more pronounced in the introduction than in the body of the essay, for example). The essay is an actual student's essay that we solicited from an experienced composition instructor with the student's permission; in addition to the introductory paragraphs, we provided an essay assignment prompt, set off in italics at the top of the text to be peer reviewed. The assignment prompt read as follows:

> Write a narrative essay about a single experience or event that has had a significant impact on you. Be sure to focus on just one moment or occasion; don't try to recall a series of events in an essay of this length.

The essay itself was left unaltered and included a holistic mismatch between the prompt and the essay, as explained in detail in the Data Analysis section. Essentially, the assignment prompt we provided called for a narration of a single experience; the essay, however, did not quite follow that prompt and instead related numerous experiences. In addition, there were 10 surface-level errors in the essay, including errors of capitalization, spelling, and incorrect word forms. For example, in the following sentence from the essay, the author wrote the word "were" instead of "where": "My days and nights at the Quarry are some of the best memories, and it is the place were we all watched each other grow up and this summer we watched everyone move away from the small town."

Participants

Seventeen students (eleven females and four males) from a first-year composition course at a Midwestern university volunteered for this project and were paid an honorarium of a $25 gift card to the university bookstore. All participants had prior experience with college-level peer review and had successfully completed other composition courses at the college level. These students were all native English speakers and were traditional college-age students. Two participants were unable to be eye tracked with sufficient accuracy and were not included in the pool of participants; a total of 15 students were thus eye tracked and analyzed. Peer-review sessions were done individually and lasted less than one hour.

Procedure

When participants arrived for their session, the project was explained to them, including a familiarization with the four broad peer-review questions (above). The eye tracker was introduced and then calibrated to their eyes, a process that insures reliable and accurate data collection. Participants then read two practice texts while being eye tracked in order to make them comfortable with the set-up. After the practice texts, the student essay that participants were to peer review was put on the computer screen, and participants were encouraged to read the essay one time through before beginning the peer-review session.

When participants were ready to begin the verbal peer-review session, this article's third author and an experienced composition instructor, asked them the open-ended questions described above, in addition to follow-up questions and anything else the participants wanted to talk about regarding the essay. The text remained on the screen, and participants' eye movements were tracked during this portion of the peer-review session; participants were encouraged to refer to the essay throughout. This portion of the peer-review session was designed to

parallel an in-class verbal peer-review session, where the peer reviewer reads the student's essay and then has a discussion with that student about the essay. This was an organic discussion that followed up paths of inquiry suggested by the peer reviewer, using the four questions as guides. In addition, each participant had an opportunity to add additional comments or to converse in general about peer review at the conclusion of the session. While this project took place outside of the classroom environment, every effort was made to replicate an actual peer-review activity and to make the experience as authentic as possible for the participants.

Data Analysis and Results

This section combines information about data analysis with the results of that analysis. Aggregate eye-movement and peer-response data are presented first with an emphasis on places where the two types of data intersect. Following this overview of all the participants' data, we provide an in-depth analysis of one of the participants, using thick description and qualitative analysis as means of presenting the data and findings.

Aggregate Data

As noted earlier, participants responded to four basic peer-review questions verbally during the peer-review session. Before they began reading the essay, participants had the questions read to them; they then responded to these same questions during the peer-review session itself. The questions asked of these peer reviewers lent themselves to two overall types of feedback: feedback that focused on holistic issues and feedback that focused on surface-level or mechanical issues. Because participants were providing peer-review feedback verbally in a discussion-type environment with the interlocutor, questions were also followed up with more questions and requests for more feedback as the peer-review session progressed. That is, while the participants had access to broad, guiding questions before and during the peer-review session, the peer-review session was also organic in that all participants' questions and comments were part of a larger dialogue with the interlocutor.

The text to be reviewed contained 10 specific surface-level problems ranging from capitalization errors to misspellings, as well as two holistic issues stemming from the mismatch between the assignment prompt and the essay. The first holistic issue revolved around the question of whether or not the writer focused "on just one moment or occasion." The other issue was a question of whether or not the writer "clearly expresses how or why this event was significant."

Because we were interested in collecting and analyzing eye-movement data during the entire verbal peer-review process, the eye-movement record of each reader spans not only the initial reading of the essay—each reader read the essay

once through before beginning to give peer-review feedback—but also what parts of the essay the participant examined while giving feedback about the essay. While the totality of each reader's eye-movement record was considered for most aspects of the analysis, some parts of each eye-movement record were separated out for additional analysis where doing so would illuminate aspects of the participants' peer-review feedback.

Eye Movements during the Initial Reading

The participants in this study were asked to read the essay one time through before beginning peer review, and this initial reading is analyzed here in order to provide information about the participants' reading processes. The average percentage of words all readers fixated in the initial reading of the essay was 62.09% (SD 9.21%), and the average duration of all readers' fixations on the initial reading of the essay was 209 milliseconds (msec) (SD 18 msec). Both of these figures are well within the normal fixation percentages found in existing eye-movement literature, as described previously. Based on eye-movement measures, the initial reading of this essay appears to have been read normally—that is, reading the essay for the purposes of subsequent peer review did not appear to alter or disrupt what are usually considered to be normal reading processes.

Eye Movements during the Peer-Review Process

In "normal" reading, readers fixate about two-thirds of the words throughout a given text, and this is approximately the number of words participants fixated when they read the essay one time through (as described in the previous section). During the subsequent verbal peer-review process, however, a completely different reading process was observed, as participants examined the essay, searched for problems, thought about what advice to give the reader, and so on. During this aspect of the peer-review process, participants fixated many words multiple times in an atypical eye-movement pattern. The fixations were short—averaging 177 msec (SD 13 msec)—and instead of a fairly regular spacing of fixations across the text, participants would look at a given word or phrase several times, and then skip to another word or phrase in a different area of the text that would then again be fixated multiple times, and so on. This is a different eye-movement pattern overall than the *initial* reading of the essay—and what we usually think of as "normal" reading—but it is reasonable to expect this type of pattern of eye movements since participants were reading the text multiple times while examining it for items on which to provide peer-review advice.

Below, we begin to weave in our participants' peer-review feedback to the data presentation. Although our inclination is to begin our presentation of participants' peer-review feedback with holistic issues and move from there to more surface-level issues, we instead follow our participants' overwhelming predilection for foregrounding surface-level issues. As will become evident, our partici-

pants were more likely to center their comments around word-level errors in the text as opposed to overarching mismatches between the prompt and the essay.

Surface-Level Issues

According to eye-movement research, anomalies or misspellings in text should result in more fixations and longer durations on those misspelled words relative to other words in the text (Ehrlich & Rayner, 1981; Zola, 1984). Indeed, in this study, the average number of fixations readers made on error words was significantly higher than the average number of fixations readers made on all other words in the text (paired *t* test, (14) p=.0124). Likewise, comparing readers' fixation *durations* on error words versus all other words in the text demonstrated that fixations on error words were significantly longer (paired *t* test, (14) p=.0005). In other words, participants made more and longer fixations on words in the text that were misspelled or otherwise not used correctly than they did on all the other words in the text, as the eye-movement literature would predict. However, while the study participants visually examined the errors in the text thoroughly and repeatedly, their peer-review feedback did not reflect this level of attention. Typically, despite the majority of participants beginning the peer-review session by commenting in general on surface-level errors, only one or two participants would comment on a given error, even when prompted for specifics.

This is not to say that participants ignored surface-level errors; in fact, they foregrounded them. However, they tended to talk about surface-level issues in broad terms rather than by identifying specific errors, even when directly prompted. In fact, more than half of these peer reviewers began the verbal portion of the peer review by commenting on general mechanical concerns without specifically naming any errors. Nine of the 15 participants responded to the first question, "What advice would you give to help the writer improve the introduction?," by offering suggestions on such general surface-level concerns as grammar, punctuation, spelling, and mechanics. A representative response by one of our participants to that first question is, "I'd tell them to look at their spelling and punctuation."

However, even when they initially suggested revision to "spelling and punctuation," as the above participant did, they chose to point out a capitalization error instead: either the lowercased "the" at the beginning of a sentence, or the all-capitalized "LOVE" in the last sentence.[1] This focus on capitalization errors was typical of all the peer reviewers during the verbal portion. Of the 10 surface-level errors, the two most commonly identified were these same two capitalization "errors." Spelling, punctuation, and grammar—the most frequently named general problems—were rarely, if ever, identified as specific examples of surface-level errors. Even though these peer reviewers were commenting on the general "spelling and punctuation" concerns, they were mostly limiting themselves to feedback about capitalization errors when they were asked to identify specific errors.

Because of the mismatch between what participants paid attention to in the text, as reviewed by eye-movement analysis, and what they articulated during the verbal peer review, we added another level of analysis to the initial eye-movement analysis of the error words. In addition to the above contrast of error words to the other words in the text, we also chose a "comparison" word for each error word that was similar to the error word in order to examine whether there was some aspect of the word itself (or its features) that was attracting attention by the participants but not being viewed as an error. For example, the comparison word for the error word "play" is another instance of the word "play" in the essay, but where it is used correctly:

> Error word "play": *We grew up outside* play *sports, games, swimming, and just sitting outside and talking.*
>
> Comparison word "play": *the sand pit is close to the house and is soft beneath our feet when we* play *late night games of vollyball.*

This gave us another dimension of comparison for each error word where we were able to directly compare how participants responded to an error word by examining it in contrast to a similar, "control" word that is used correctly in the essay. In comparing how each reader viewed the "error" words and the "comparison" words, we found that the *number* of fixations on error words was significantly higher than the number of fixations on comparison words (paired *t* test (14) p=.0020). Similarly, the *duration* of fixations on error words was significantly higher than the duration of fixations on comparison words (paired *t* test (14) p=.0029). Therefore, as a whole, readers spent more time and attention on errors than they did on comparable, non-error parts of the text. This further supports the eye-movement supposition that mistakes will garner more and longer fixations than other parts of the text, as well as our original analysis that readers were responding to the error words as errors. The amount of time and attention participants gave the errors in the essay while reading is reflected in their foregrounding surface-level issues in their peer-review responses; they did not, however, articulate many specific errors. That participants were spending so much time attending to these errors during their reading, then voicing general concerns about errors in the text, but were not able, or willing, to discuss specific errors may be an indication of a lack of ownership in the peer-review process or uncertainty about their abilities to respond in general. This issue is revisited in subsequent sections.

Holistic Issues

While several participants responded generally about the writer's description of the setting, less than one third of the participants began the peer-review session by

suggesting holistic revisions; that is, identifying their concerns with how the writer handled the assignment prompt. As described above, the assignment prompt appeared in italics directly above the body of the essay so that participants could refer to the prompt during the entire peer-review session. This was particularly important because there is a holistic mismatch between the prompt, which the researchers provided, and the essay in that the prompt calls for a single experience and the essay relates numerous experiences and memories. Only two of the participants immediately identified a mismatch between the assignment prompt and the essay. However, even when participants didn't begin their peer-review discussion by identifying such holistic concerns, these concerns did eventually come up during the course of the peer-review session, usually in response to the peer-review questions that directly addressed holistic issues: "Does the introduction seem to meet the requirements of the assignment?" and "Does the writer clearly express how or why this event was significant?"

Only four of the 15 participants initiated some sort of discussion of the assignment prompt and text mismatch, while six other participants were able to identify the mismatch between the prompt and the essay when directly asked. Five participants neither initiated a response nor offered a supported response to the holistic questions. With two-thirds of the participants noticing the problem, it is interesting that they chose not to pursue the topic in their discussion unless directly prompted for that information.

One possibility for this lack of discussion may be that these peer reviewers were simply unsure about how to revise such a global problem, so they opted not to discuss it in any kind of depth. Indeed, these global concerns triggered uncertainty for the participants. Nearly half of the participants changed their minds when asked the two questions that dealt with adherence to the assignment prompt; for example, the peer reviewers would respond to the first question with a yes-or-no response, but would later change that response, either after being prompted to explain their responses or after being asked the second question. One participant, when asked "Do you think this introduction meets the requirements of the assignment?" exemplified this trend by responding, "for the most part." She then continued by commenting on the writer's focus on more than one situation or occasion in the essay: "She's [the writer] combining on the times they went there, so it's not really just one moment or occasion, it's kind of many." While it would appear that she was still a bit unsure of her response at that point—especially with her use of phrases like "not really" and "kind of"—in the next sentence, she commented more confidently that the writer instead focused on "a series of events in the sense that she used all the different times that correlate all these memories." At that point, it appears that this participant had convinced herself of the problem, and she therefore changed her initial response to the question about the essay meeting the requirements of the assignment: "So, I guess not." A similar approach

to the holistic-mismatch questions was identified in other participants as well; five others had similar patterns in which their initial responses were amended as they talked through their reasoning. Indeed, it should be noted that these students, based on previous experiences with peer review in the classroom, *may* have felt that the original prompt for the peer-review exercises was not particularly important—hence their seeming lack of attention to it initially. That is, they may have felt that their advice as readers was more significant than adhering to a particular prompt—a point that should be kept in mind by instructors when developing peer-review exercises with particular rhetorical or content issues in mind.

The participants' eye-movement patterns lend some explanation to the participants' tendency to avoid initiating discussion of the assignment prompt/essay mismatch. In contrast to the *essay* itself, in which participants fixated an average of 62.09% of the words, only 35.4% (SD 22.38) of the words in the *prompt* were fixated during the initial reading, a significant difference (paired t test, (14) p=.0002). Interestingly, the fixation percentages of the prompt ranged from zero to 71%, with 11 participants fixating less than 50% of the words in the prompt and three of those fixating less than 1%. This type of eye-movement pattern is generally not found during normal reading and is more indicative of a skimming or scanning approach overall. In short, participants did not read the prompt in the same way they read the essay during the initial reading of both.

After the initial reading, during the verbal peer-review part of the session, there was a marked rise in interest in the prompt. Throughout the peer-review process, participants fixated aspects of the prompt an average of 69.07 times (SD 53.55). In addition, they "entered" the prompt—made a fixation on one of the words in the prompt from a location elsewhere in the body of the essay—an average of 30.07 (SD 13.27) different times. This indicates that an average of 30 different times during the peer-review process, participants decided to get information from the prompt, presumably to assist in evaluating holistic aspects of the essay. That this amount of activity in the prompt during the peer-review process was so markedly different than the amount of activity in the prompt during the initial reading suggests that peer reviewers may approach a peer-review situation from a perspective that does not foreground holistic issues, as we take up in the Discussion section, below.

Issues of Ownership

Nearly all of the participants in the study expressed uncertainty about their peer-reviewing abilities on both surface and holistic levels of feedback. For example, three participants mentioned that they had concerns about punctuation, but were unsure what the problem was. In fact, not only were participants uncertain about how to correctly identify specific examples of a broad problem they had identified—"punctuation," for example—but they also seemed reluctant to take

ownership for their recommendations. Few peer reviewers used directive, unapologetic comments like "this writer needs to . . . ." Even though the actual writer was not present during this session, these participants' responses were cautious and reflected a consideration of the effects on the writer's ego. For example, a few participants carefully phrased their responses to focus on what "I would do" instead of what "the writer should do." This strategy could be a way for peer reviewers to make clear that they are not providing "the answers," but only advice. In that way, these participants may have been enacting a form of the tacit cooperation that allows for both saving one's own face and protecting the face of others (Goffman, 1967). Along those same lines, many participants chose to talk mostly about right-or-wrong issues such as the emphasis on capitalization errors discussed previously. While a third of the participants used "right-or-wrong language" when they discussed spelling concerns, other participants used this language when moving beyond spelling errors to imply that there is a right way and wrong way to write; in the section that follows the summary, below, we focus on a participant who exemplifies these trends and provides examples of these issues.

Summary of Eye-Movement and Peer-Feedback Data

When participants read this essay one time through, before beginning to give peer-review feedback, the process was typical by eye-movement standards for reading at the college level. That is, participants fixated on just under two-thirds of the words in the text for an average of a little under one-quarter of a second per fixation—typical eye-movement measures for reading. When they read the text during the peer-review part of the session, however, participants examined the text extremely thoroughly, looking at the vast majority of words multiple times. As eye-movement analysis would predict, participants looked at the errors in the essay far more often, and for far longer, than any other words in the essay. This level of scrutiny reflects the participants' focus on surface-level errors in the text. However, although these peer reviewers foregrounded surface-level errors in their feedback, and spent large amounts of time and attention on the errors compared to other words in the text, they were still reluctant or unable to draw out specific errors. While they typically only glanced at the assignment prompt before beginning to read the text (looked at one-third or fewer of the words), while offering peer-review advice, they tended to look at the assignment prompt an average of 30 different times. That is, they would read part of the essay, look at the prompt, look back at the essay, re-read the prompt, and so on. In most cases, participants did not pay attention to the prompt, or discuss holistic issues, until well into the peer-review session when they began the essay-prompt-essay pattern of eye movements; this aligns with the participants' peer-review feedback regarding holistic issues and reflects the participants' approach as one that does not foreground holistic issues. These findings are discussed in the focus on one of the participants, below, as well as the Discussion section that follows the case study.

Carla's Peer-Review Approach

In this section, we focus on one of the participants, Carla,[2] whose peer-review processes exemplify the strategies, approaches, and struggles typical of most participants in this study, and, perhaps, most students in peer-review situations.

First, Carla provides a good example of a student who may not have a clear understanding of the goals of peer review. Her comments during the peer-review session implied a belief that peer review should focus primarily on surface-level concerns and right-and-wrong notions of writing. Also, perhaps because she was unclear about the goals, the uncertainty she demonstrated about her peer-reviewing (and writing) abilities—an uncertainty that was noticeable in nearly all of the peer reviewers studied—was even more pronounced.

Carla began the peer-review discussion by asking for clarification on what kind of advice to offer, though her question clearly limited the possibilities to two equally surface-level options: "Like grammatically, or like punctuation and stuff?" Without waiting for the clarification, though, she quickly moved on by identifying some specific examples. In this regard, Carla's peer-review response was unique: Of the 15 participants, Carla was the only one who responded to the first question by identifying a specific surface-level error, while others began by talking in generalities about surface-level errors. Even so, Carla's emphasis on surface-level issues exemplifies the trend noted in most other participants.

Surface-Level Issues

First, Carla said that she "noticed" a capitalization problem: the "the" capitalization error, a word she fixated 14 times for 3,225 msec, which is more than six times the average duration for all non-error words. In contrast, Carla fixated another "the" in the text (one that was correctly capitalized) near her average fixation duration. These data indicate that Carla did more than merely *notice* this error. In fact, not only was her attention drawn to that error for a much longer time than it was with other words, but it was also drawn there much more frequently. Carla only fixated twice on the comparison word, but fixated the error word 14 times, a clear indication of continued cognitive attention. Carla's increased attention to the "the" error is not unusual, however, and is, in fact, predicted by eye-movement research as outlined previously and as observed in the other participants.

Carla's eye-movement pattern with the "the" error was not an anomaly; in fact, she had very similar patterns on half of the other errors. For example, she fixated the misspelled word "vollyball" 10 times for a total of 2,624 msec, which is far longer than other, non-error words in the text. Like the "the" error, she spent a significantly longer time attending to this word, including returning to the word from other parts of the text multiple times, which indicates that it bothered her at least enough to distract her when she tried to move on to other parts of the text. However, unlike the "the" error, she chose not to say anything about the "vollyball" error. While multiple re-examinations for long periods of time did not necessarily

mean that Carla had identified the item as an "error," the peer-review discussion was designed to allow participants the opportunity to talk about any and all questionable areas they found. Carla understood this, as her verbal feedback about the "the" error indicates. However, even when directly asked, she expressed her belief that there were no more problem areas to discuss, which reflected the approach taken by most of the other participants as well.

Like the "the" and "vollyball" errors, Carla re-examined other error words multiple times for long durations as well. Table 1, below, depicts the number of fixations and amount of time Carla spent on five of the errors in the text, compared with the number of fixations and amount of time she spent on the error comparison words (the words used for intratextual comparisons of eye-movement measures during analysis).

TABLE 1: **Carla's Examination of Error Words Versus Comparison Words**

Error	Number of Fixations		Length of Fixation Duration (msec)	
	FIXATIONS ON ERROR	FIXATIONS ON COMPARISON	DURATION ON ERROR	DURATION ON COMPARISON
play	8	1	1,703	251
were	5	2	710	271
the (cap.)	14	2	3,225	572
vollyball	10	1	2,624	80
the (that)	4	2	971	572

Table 1 illustrates Carla's much longer durations and more frequent rate of examination on the error words as compared to the non-error comparison words. Clearly, Carla found the error words problematic, yet did not mention any of these errors beyond the capitalization of "the," even when directly asked if there were any more errors to discuss.

Carla also identified a punctuation concern, but she expressed some difficulty when explaining it: "There's a lot of semicolons, but I don't know if that's supposed to be there." It appears that she was struggling with the language of writing critique at that point; in fact, she identified it as the language of "other" when she confirmed her response: "A lot of semicolons, or commas; however *they* call them, the period and the comma" (emphasis added). In this way, Carla seemed to be distancing herself from the more specific language likely to be used by composition instructors, who are, presumably, the "they" she mentions. Perhaps this distancing was simply a result of her uncertainty or lack of knowledge about the specific grammatical rules involved in semicolon usage. Alternatively, perhaps Carla was attempting to adopt the persona of teacher—or at least what she perceived as

that persona based on her prior experiences—a possibility that we raise again in the Discussion section of this article.

Additionally, Carla's attention to the semicolons in the text made it clear, too, that, like most of the other participants, she was focused on surface-level, right/wrong issues: "I noticed that there were a lot of them. I mean, maybe they're not *incorrect* but . . ." (emphasis added). She revisited this point later when she added, "Also, there is a significant number of semicolons and although they may be correct they are something that catches the reader's attention." Interestingly enough, there were only two semicolons in the peer-reviewed text. This fact offers a strong indication that Carla was indeed being a careful peer reviewer in the sense that she was not merely glossing over the text looking for blatant misspellings or other surface-level errors, a complaint frequently reported by the participants of this study about their own experiences with classmates peer reviewing their papers; rather, she was considering the kinds of surface-level errors that the writer may have missed and that the teacher would likely acknowledge.

Holistic Issues

Carla also exemplified a trend noticed in many of the participants for offering quick and possibly ill-considered responses to the closed question, "Does this introduction seem to meet the requirements of the assignment?," by responding "Yeah." Not until she was further prompted to explain, "In what way?" did she continue to explain, and, in the process, change her initial response. She added, "It talks about it. Well, no I guess it really doesn't. It says a single experience or event, but it's not really talking about a single one. It's talking about all the times that they went to the quarry and how it impacted them all the time that they went." Of course, it's possible that she simply needed more time to respond, or that she only came to understand the mismatch by talking herself through it. In any case, just as the capitalization error she introduced at the beginning of the peer-review session, this holistic mismatch prompted considerable attention. For example, during the course of the session, Carla looked back and forth between the essay and the prompt 40 times, above the average number of entrances made by the other participants (30.07). Her continued attention to the assignment prompt indicates that she was actively and deliberately seeking out and comparing the information in the prompt with the text throughout the peer-review session, as was the norm with this group of participants.

Safety Language

Although she never offered any overly critical or harsh comments, when the discussion started to wind down, she returned to a more emotion-driven approach, making it seem as though she were trying to soften the blow for the writer's ego. When asked, "Would you say anything else to this writer?" she commented, "I liked it. I thought it was good." Carla's affirmation was not unusual;

in fact, several participants made such approving comments. There seems to be both a sort of safety net as well as a built-in disclaimer in these kinds of responses. For Carla, this comment seemed to be positioned as a way to conclude the peer-review discussion. In that way, "I liked it" seemed to be a safety net or a way to maintain a friendly relationship despite the "criticism." Carla may have felt that writing is such a personal act that any criticism of it, however constructive or warranted, may be taken personally, and her comment seems strategically placed toward the final words of the discussion in order to "apologize" for any hurt feelings.

These "like" comments also seem to have a built-in disclaimer. In short, this appears to be code for dismissing the language of the "other" (the teacher-language). "I liked it" might mean, simply, "I'm only criticizing because I have to, but if it were up to me, I would keep your writing the way it is," which could be a direct example of the kind of tacit cooperation in face-saving that Goffman (1967) discusses. When Carla said she liked it, she also added, "I thought it was good." When prompted to explain further—"What's good about it?"—Carla explained, "It's very descriptive. It makes you see things, surrounded by a small forest and large rocky walls rise from the surface. It gives you a picture. I like that." This may be more instances of safety language, or possibly that she is actively searching for something positive to say about the writing.

What is most interesting about Carla's comments is that despite her hesitancy to claim ownership over her suggestions, many of her comments suggest that she was offering sound advice. For example, when asked what other advice she might give the writer, she began, "I don't know." She continued by evaluating the effectiveness of the introduction as an attention-getter, though, which indicates that she understood the purpose of an introduction: "Nothing really like makes me want to care; most introductions start with something that grabs somebody." Immediately following this point, though, she seemed to lose confidence again, and returned to her self-questioning comment, "I don't know. Something that would make them—the readers—want to keep reading." Even though she was making an insightful observation about the purpose of introductions that most composition instructors would encourage, she was still hesitant to own her comment. This may reflect more "safety language" intended to protect the feelings of the writer, or it may offer further evidence that Carla was struggling to adopt the kind of persona needed to be a successful peer reviewer.

Discussion

Our findings suggest that students are tentative about offering commentary, frequently doubting their ability to provide feedback about the essay despite the fact that eye-movement analysis demonstrates that students clearly identified areas of the text rich with feedback opportunities where the surface-level errors

were. These participants' hesitancy, coupled with what eye-movement analysis revealed as marked attention to both surface-level errors and the assignment prompt *during* (though not necessarily before) the peer-review situation, suggest some general ways in which we can understand how students might approach a peer-review activity. Interestingly, it was the analysis of eye-movement data that revealed students' multiple examinations of and attention to both the surface errors and the prompt. And while eye-movement analysis cannot provide evidence of comprehension for any specific word, it does provide striking data about the number of examinations and re-examinations of the error words in the essay, as well as the length of time participants chose to scrutinize those errors.

A Rethinking of Global-to-Local Progression

In general, our findings lead us to question the fairly typical peer-review protocol of having students attend *first* to global issues and *then* move steadily to more specific—for example, surface-level—issues. As noted earlier, students spent a lot more time paying attention to the essay assignment prompt *during* the peer-review process than *before* it, which suggests that these students might have approached the peer-review situation from a perspective that did not foreground holistic issues. Indeed, even during the follow-up discussion with students, few participants initiated a discussion of the assignment prompt and text mismatch. As Tobin (1993) and others suggest, students might feel uncertain about their abilities to peer review successfully or appropriately.

There seemed to be genuine concern on these students' part about their ability to correctly identify assignment/text mismatches, and thus offer the kind of peer-review critique that many typical peer-review activities call for. Remember that identifying such mismatches is often one of the *first* items in a peer-review checklist (see Glenn et al., 2003). Is such concern with identifying mismatches representative of true inability or lack of confidence? It may be the case that students need to develop and adopt particular personae as readers—readers who put on a "teacherly hat" to approach a piece of student writing. Certainly this would require some explicit discussion in the classroom, not only to help students recognize the kinds of issues they are being asked to identify, but also to enable students to realize the perspective they are being asked to adopt while peer reviewing. We also believe that students should be encouraged to admit hesitancies if they are unsure of how to respond, either to content or a mechanical issue. Particularly in terms of content issues, hesitancies can mark passages in student texts that are troubling because of lack of clarity, lack of audience consideration, or lack of development. Encouraging students to be aware of when they are hesitating to offer advice and then to *voice* those hesitancies may further enrich students' experience of peer review and boost their confidence levels. If anything, students need to know that encountering and expressing their own hesitancies is *not* necessarily an indication of lack of knowledge, skill, or insight. Rather, such hesitancies are a

natural part of the reading and meaning-making process that *all* readers encounter. Voicing them may be useful for those whose work we are peer-reviewing; as such, the "teacherly hat" we may ask students to adopt should not be understood as asking students to adopt an "all-knowing" role—or to pretend to such. Further, we should keep in mind that students in a regular classroom situation might adopt such personae more readily than in the research situation in which these students participated. It is difficult to tell at this point in our research, and we suggest further inquiry into this specific aspect of the peer-review process, particularly with first-year students. At the very least, our findings suggest that students *do* indeed find an initial holistic approach difficult at best.

How then are we to understand students' much greater attention, in terms of the sheer number and duration of fixations, to surface-level errors? Such attention and multiple examinations might corroborate our sense that first-year students are not particularly expert—or do not *feel* themselves to be particularly expert—at holistic peer-review approaches; they focus instead on the kinds of errors that they can readily and easily identify. In a way, particularly for first-year writing instructors, it may be gratifying that a group of fairly typical first-year students *can* in fact note surface-level problems. However, though they comment freely in a general sense about such surface-level errors, they are not as adept at articulating what the errors are, even though analysis of their eye-movement patterns indicates that they re-examine and attend to such errors to a much greater degree than nearly anything else in the essay. But even if such students cannot actually articulate what is specifically wrong about the error, they notice that something is happening—and they notice enough that their reading is interrupted.

Again, such scrutiny of surface-level errors prompts us to question the protocol of *beginning* peer-review activities with global and holistic issues and *ending* them with editing and surface-level scrutiny. It may be more beneficial to have students articulate first their understanding of what is happening to the student text at the level of editing and then move on to more holistic issues. Doing so would accomplish a number of things. First, it would offer the students the opportunity to talk about "errors" that they are clearly able to identify—or, at least, parts of the texts under review that the eye-movement data show they are stumbling over during their initial readings. Allowing students to work first with what they are able to identify as "wrong" should help them build confidence in their ability to offer constructive and important feedback. Second, it may be vital as part of the reading process to have such errors corrected first, *before* asking students to move on to more holistic critiques. Shaughnessy (1977), in her classic study of basic writing students, argues that "Errors . . . are unintentional and unprofitable intrusions upon the consciousness of the reader" and that "even slight departures from a code cost the writer something, in whatever system he [sic] happens to be communicating, and given the hard bargain he must drive with his

reader, he usually cannot afford many of them" (pp. 12-13). Our data suggest that Shaughnessy is absolutely right; if students' reading is constantly interrupted by surface-level errors, then their ability to comprehend the text more globally and holistically may be compromised. This may be particularly true for more basic writers. In this regard, attending to such errors first may be crucial in enabling students to become adept at identifying more global issues, such as prompt/text mismatches. Our findings may corroborate Williams' (1981) assertion that addressing errors of grammar and usage entails a shift from the objective "correctness" of an item on a page to a consideration of the transaction between writer and reader.

Interestingly, the peer-review protocols that we have found to be most typically used—moving from global issues to editing tasks—seem to mimic, broadly, the "steps" in a traditionally accepted writing process, which begins first with global invention and moves steadily through revision to final editing. However, it is useful to remember that composing processes do not necessarily follow such a linear path. For instance, Smit (2004) notes the potential fallacy of adhering doggedly and without reflection to a straightforward, linear writing "process"—a process that might not meet the needs of student writers. If the composing process is potentially so circuitous, then perhaps the peer-review process should be, if not circuitous, then a little less linear. Revising the peer-review process to foreground mechanical issues might, as we have suggested, both take advantage of student strengths in offering feedback and provide them with opportunities to build confidence as peer reviewers.

We offer such advice with some hesitancy, for we believe that writing *is* a process, a complex, multifaceted and densely social act, and we do not want to value product over process. As such, we do not offer our findings as corroboration of current-traditionalist approaches to the teaching of writing. Rather, our findings suggest much more clearly and accurately exactly what first-year students are attentive to in peer-review activities and where their hesitancies and difficulties lie. Such information can be used, we believe, to help redesign peer-review protocols and activities to ensure that students are learning how to become effective peer reviewers. In other words, our data suggest that students can learn to identify global issues and holistic mismatches—but such ability must be learned and should not be assumed as part of the "toolkit" that first-year students bring to the writing class. Remember, for instance, that Carla, the student whom we used as a case study above, was very hesitant about offering holistic advice; at the same time, she looked back and forth between the essay and the prompt 40 different times during the peer-review process. We believe that such activity means she was actively and deliberately seeking out and comparing the information in the prompt with the text—attempting, perhaps, to offer holistic feedback.

Furthermore, it might be useful *not* to separate out the "stages" of writing into distinct "tasks," such as editing or focusing on organization. For instance,

students could be instructed to think about the relationship among editing, style, and rhetorical issues. Consider how several of the participants fixated the all-capitalized word LOVE multiple times, with some commenting that it is clearly an "error." Technically, such capitalization is not necessarily erroneous, but, rather, reflects a stylistic choice most likely designed for a particular rhetorical effect. Being attentive to such "errors" in the early stages of peer review need not mean that students are focusing first on simple proofreading; in this case, as an example, a useful discussion of the connection between stylistic choice and rhetorical effect can open up students' thinking to the possibilities of textual communication and the relationship between grammar and rhetoric (see Micciche, 2004).

The participants in this study scrutinized the surface-level errors in the essay to a high degree, but other first-year writers may, of course, not examine such errors to the same degree; eye-tracking research with a variety of writers needs to be undertaken so we can better understand the kinds of textual cues and reading processes that are used to navigate texts. Again, as we have suggested here, such information may be crucial in redesigning pedagogical activities and reading and writing assignments. In general, we need to be more attentive to the kinds of tasks we are asking students to perform, particularly if, as Wallace and Ewald (2000), among others, contend, we wish to engender more mutuality in the classroom so students can effectively voice their interests and build from their strengths. While composition instructors may be able to quickly and effectively read and peer review an essay, many of our students will not be as proficient at that task.

One caveat concerning the implications and suggestions that are based on this study is that they stem from, for the most part, this single study. While our research raises these issues and supports our pedagogical suggestions, we see a strong need for more research of a similar nature. The greater the variety in such research (of classroom contexts, genre responded to, peer-review purposes identified, types of essay prompts used, types of peer-review questions asked of the participants, and more), the richer our understanding of these issues will become.

In terms of other research avenues, we should be increasingly attentive to the ways in which students read *on the screen* as opposed to in print. All of the student participants in this exercise read from a computer screen. More and more instructors are putting material for students to review online or sharing such materials, including student work, electronically, and it may be useful to note how reading on screen and reading in print prompt differing reading processes. Indeed, textbook companies are increasingly putting online instruction materials accompanying print publications. For example, Alexander and Barber's (2005) textbook, *Argument Now*, has readings and discussion questions online, and students are prompted to submit answers electronically; again, noting how students read (e.g., what they look at, and pay attention to) might aid tremendously in the future design and pedagogical use of such venues. Other examples include Kemp's (see

Foreman, 2000) TOPIC at Texas Tech University, and Schunn's (Cho & Schunn, in press) SWoRD at the University of Pittsburgh. While such online systems provide innovative ways for students to submit work and receive feedback, we believe that only more specific analyses, such as those offered through methods like eye tracking, can alert us to how students are actually using such forums—and the texts they are manipulating through them.

Ultimately, we feel that research at this level—exploring specifically the reading and composing processes of our students—can be most beneficial in helping us reconsider and redesign key elements of writing instruction pedagogies. They can also attune us to what our students are actually doing with the texts that we give them and that they generate. Such attention may be particularly useful in peer-review activities and other group work, where we attempt to cultivate and nurture student voices and agency. Paying attention to students' abilities and working from them is a powerful way to honor students and their voices. In part, this means that we must continue to actively investigate their abilities with peer review (and beyond) by employing cross-disciplinary research methods and approaches—like the juxtaposition of eye tracking and peer review reported here.

Finally, honoring our students means making a commitment to furthering our understanding of such typical composition practices as peer review. Because peer review is so widely used, it is essential that we continue to consider its impact on our students and their writing development. That means reconsidering its theoretical foundations and goals, as well as its structure and organization, in practice.

AUTHORS' NOTE

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NOTES

1. The "all caps" version of "love" is technically not an error; however, so many participants labeled it as an error that we decided to include it with the other, more traditional errors in the essay.
2. A pseudonym.

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APPENDIX

The student essay text that student participants in our study peer reviewed follows:

> Write a narrative essay about a single experience or event that has had a significant impact on you. Be sure to focus on just one moment or occasion; don't try to recall a series of events in an essay of this length.

The Quarry

Memories of my life flood my mind, all the days my friends and I spent together growing up and learning about life. We were never apart and spent our summer days outside in nature. Mother Nature surrounded us; we could see trees and rolling farmland for miles. We grew up outside play sports, games, swimming, and just sitting outside and talking. Of all the great places we loved the one spot that stands out to me most is the Quarry, and all of my summer memories there could fill up the enormous hole. My days and nights at the Quarry are some of the best memories, and it is the place were we all watched each other grow up and this summer we watched everyone move away from the small town. At the Quarry we remembered our pasts, lived for the moment, and developed a hunger from the future.

The Quarry to some may be just an old hole in the Earth now filled with water due to the carelessness of the workers who hit a water vein and filled the hole with water. To the workers it was a big mistake but to us it was the best accident because the Quarry is a special place to my friends and I. It sits off the road surrounded by a small forest and its large rocky walls rise from the surface of the still water. An old dock and diving board are close to shore, right in front of the shabby beach house. the sand pit is close to the house and is soft beneath our feet when we play late night games of vollyball; only the moon shines down on our figures as we laught and play in the soft light. The shore is full of small pebbles and yellow sand; it is also very small and is near the only shallow water. The old basketball hoop lies just beyond the shore. The net is now gone and all the remains is the rusty poll and wooden backboard, but it is the perfect place to compete in half court games. I LOVE and miss the Quarry as I think of this wonderful place.

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Effects of a Value-Reappraisal Intervention on Statistics Students' Motivation and Performance

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The authors investigated the effects of an exploratory value-reappraisal intervention on students' motivation and performance in an undergraduate introductory statistics course. They sampled 82 students from 2 instructors' sections during both the fall and spring semesters. Students were randomly assigned within each section to either the Value-Reappraisal (VR) or Control condition (C). VR presented messages about the importance of statistics and guided students in exploring potential values of learning statistics. Results showed positive effects of VR on task value, endogenous instrumentality, and a choice-behavior measure of interest. The authors found VR to affect exam performance, but only for students who had a particular instructor. This research helps broaden literature on self-regulation and expectancy-value models of motivation by focusing on the regulation of value perceptions.

Keywords: achievement, attitude, expectancy value, interest, intervention research, math and science education, motivation, self-regulation

MANY STUDENTS HAVE TROUBLE learning math and science, and they also find it difficult to understand why learning these subjects is important for them on an individual level. Furthermore, there are growing economic and social needs to increase students' achievement and continued interest in math and science education (National Science Foundation, 2006; U.S. Department of Education, 2006). Research in the areas of achievement motivation and self-regulated learning has identified important predictors of students' academic achievement and continued

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interest as well as factors that could potentially be targeted in interventions to increase these outcomes.

Expectancy-value theory posits that students' achievement and continued interest in a particular subject area can, in part, be explained by their expectations about successfully performing academic tasks and the degree to which they value those tasks (Eccles et al., 1983; Wigfield & Eccles, 2002). Students are thought to choose and be motivated toward academic tasks and courses that they expect they can successfully complete and perceive as valuable (Atkinson, 1964; Eccles & Wigfield, 2002). Although both expectation beliefs and value perceptions have been found to be positively related to motivation and achievement (e.g., Simpkins, Davis-Kean, & Eccles, 2006; Wigfield & Eccles, 1992, 2000), expectation beliefs have been found to be stronger predictors of achievement, and value perceptions have been found to be stronger predictors of continued interest in a particular subject area (e.g., enrollment in and intentions to take math courses; Meece, Wigfield, & Eccles, 1990; Wigfield & Eccles, 1992, 2000). For example, in a study of 250 seventh- through ninth-grade students, Meece et al. found that expectation beliefs directly predicted subsequent math grades and value perceptions directly predicted intentions to enroll in future math courses. Furthermore, this pattern of results held for both boys and girls. On the basis of these findings, helping students to increase their expectation beliefs might lead to stronger gains in achievement, and helping students increase their value perceptions might lead to stronger gains on measures of continued interest and, perhaps, further study in a particular content area.

Theory and research on self-regulation has suggested that students can actively modify their academic values, beliefs, and goals through the use of self-regulatory strategies (Boekaerts, Renninger, Sigel, Damon, & Lerner, 2006; Corno & Kanfer, 1993; Pintrich, 2000, 2004; Pintrich & DeGroot, 1990; Wolters, 1998, 2003; Zimmerman, 1989, 2000). Central to models of self-regulation are processes involved in setting, pursuing, and evaluating learning and achievement goals. According to Zimmerman's (2000) model, self-regulation involves three cyclical phases: forethought (setting goals and planning how to reach those goals strategically), performance/volitional control (implementing plans and metacognitively monitoring implementation efforts), and self-reflection (evaluating goal progress and reacting to and reflecting on successes and failures). A large body of research on strategic and self-regulated learning has suggested that students can increase their expectation beliefs for success and achievement through the use of self-regulatory strategies (Bandura, 1997; Bandura & Cervone, 1983; Bandura & Schunk, 1981; Cleary & Zimmerman, 2001; DeCorte, Verschaffel, & Masui, 2004; Fuchs et al., 2003; Glaser & Brunstein, 2007; Kitsantas, Reiser, & Doster, 2004; Kramarski & Gutman, 2006; Lynch, 2006; Metallidou & Vlachou, 2007; Pintrich & DeGroot; Schunk, 1996; Schunk & Ertmer, 1999, 2000; Torrance, Fidalgo, & Garcia, 2007; Zimmerman, 2000; Zimmerman, Bandura, & Martinez-Pons, 1992).

However, there is a dearth of theory and research focused on helping students to place value on and develop a continued interest in a particular subject area. Both motivation and self-regulation researchers have highlighted a need for more work in this area (Brophy, 1999; Pintrich, 2000, 2004; Wolters, 1998, 2003). For instance, Brophy (1999) argued that " . . . the value (as opposed to the expectancy) aspects of human motivation, particularly motivation to engage in domain-specific learning tasks" need to be further developed and emphasized in theoretical and empirical work (p. 75). Brophy addressed concepts and principles such as building learning communities that help students to adopt learning goals, providing students with optimally challenging tasks, and choosing tasks that have a potential to be perceived as important, given the learners' past knowledge and experiences. However, Brophy (1999) did not focus on self-regulatory processes and strategies that students could use to regulate their value perceptions and interest. In Pintrich's (2000, 2004) theoretical model of four self-regulatory phases (forethought, planning, and activation; monitoring; control; and reaction and reflection) and four areas that can be regulated during each phase (cognition, motivation/affect, behavior, and context), he emphasized that one way students can actively increase their motivation is by activating and regulating their value perceptions. Wolters's (1998) research provided support for this idea because it showed that students reported using strategies to both increase their interest in a task (e.g., by making studying into a game) and increase the relevance of a task (e.g., by thinking how learning course content could be useful in one's career). However, more theoretical, empirical, and intervention research is needed to investigate strategies that can help students to increase the value they place on their coursework and generate a continued interest in different content areas, particularly in the areas of math and science.

The purpose of this study, on the basis of an integration and organization of disparate research conducted by educational and social psychologists that is relevant to the self-regulation of students' value perceptions, was to explore the effect of an exploratory value-reappraisal intervention on motivational variables and achievement in a college statistics course.

A GENERAL FRAMEWORK FOR VALUE REAPPRAISAL

Rooted in information processing theory, models of persuasion (e.g., Chaiken, 1987; Petty & Cacioppo, 1986) and conceptual change (e.g., Dole & Sinatra, 1998) share a basic framework that is useful for understanding the modification of students' value perceptions about academic tasks and courses. This framework suggests that the processing or elaboration of a message increases the potential for attitude, or conceptual, change (Murphy, 2001; Murphy, Holleran, Long, & Zeruth, 2005; Woods & Murphy, 2001). Processing a message favorably increases the potential for attitude change in the direction advocated in the message; processing

a message unfavorably increases the potential for attitude change in the opposite direction from what was advocated in the message (Bohner & Schwarz, 2001; Greenwald, 1968; Pettty, Ostrom, & Brock, 1981). The effect of a persuasive message on a students' attitude is, therefore, believed to be mediated by the students' cognitive responses to the message. This indicates that presenting students with messages about why a task may be valuable and then guiding them in processing these messages favorably could help them to positively reappraise the value of the task. However, very few studies have been conducted on strategies to help guide students in processing persuasive messages. Research on persuasion and conceptual change has primarily focused on the persuasive aspects of the message (e.g., credibility of the author, strength of arguments, ease of understanding text, balanced arguments, emotion provoking, interesting text) and personal characteristics of the participants (e.g., preexisting beliefs and values, level of prior knowledge about the message topic, and motivation to process the message) and how these variables interact to predict students' cognitive responses to a message and hence their change in attitudes or beliefs (Bohner & Schwarz, 2001; Murphy, 2001).

Persuasion and conceptual change researchers also acknowledge that there are two routes that students can use to process a message (Woods & Murphy, 2001). The central route refers to "... effortful scrutiny of message arguments and other relevant information" (Bohner & Schwarz, 2001, p. 419) and involves linking "... any incoming arguments to issue-relevant information previously encoded within a recipients' memory" (Woods & Murphy, 2001, p. 644). Conversely, the peripheral route refers to less effortful and more superficial processing of a message, such as by using heuristic rules (e.g., "experts make valid arguments," "longer arguments are more persuasive than shorter arguments") to decide on the persuasiveness of a message (Bohner & Schwarz, 2001; Wood & Murphy, 2001). Whereas the peripheral route has been found to promote temporary attitude change, the central route has been associated with lasting attitude change (Stiff, 1994).

The extent to which students elaborate on a message through the central route has been found to depend on their motivation and ability to process the message (Petty & Cacioppo, 1986). Low levels of student motivation and ability to process a message can thus pose a problem when researchers and/or educators wish for students to actively process messages. One possible solution to this problem is for students to complete activities that guide them in actively processing the messages. However, there is a lack of research focused on interventions that both present students with messages and guide them in using strategies to explore issues related to those messages.

Persuasive Messages

Providing students with messages about the different reasons that an academic task might be valuable has been suggested as one approach that could help

students to positively reappraise the value of a task (Brophy, 1999; Hofer, 2002). For example, Dholakia and Bagozzi (2003) found that students had stronger commitments and were more likely to access extra not-for-credit reading assignments when they received a message about the importance of the reading compared with those students who received no such message. Similarly, providing a rationale when assigning a task has been found to lead to relatively higher motivation and performance in work/occupational settings (Latham, Erez, & Locke, 1988). However, what content should the message convey to students to convince them that an academic task is important? Current conceptualizations of task value put forth by Eccles and Wigfield (see Eccles et al., 1983; Eccles & Wigfield, 2002) postulated that students might value a task for different reasons, and this framework could be used to help explain to students the potential value of a task. For example, students may value a task because it is generally important to them and in line with their self-concept (attainment value), useful for achieving their future goals (utility value), or enjoyable in and of itself (intrinsic value; Eccles, 2005; Eccles et al., 1983; Wigfield & Eccles, 1992, 2000). In addition, the cost of task engagement (e.g., time, effort, negative emotions) is another type of value perception that could be addressed (Eccles et al., 1983). Although providing students with messages about why a task may be important could be instrumental in helping students positively reappraise the value of a task, reappraising a task's value may also involve the active use of strategies, and interventions could guide students in using such strategies.

Value-Reappraisal Strategies

Wolters (1998) found that students reported using strategies to enhance their valuation for academic tasks in order to increase their motivation, especially in situations in which they initially appraised the material as irrelevant. Students reported strategies such as trying to make the task personally relevant, finding ways that the task could be useful in future situations, and trying to make the task more enjoyable. Helping students actively brainstorm different reasons and generate rationales for course engagement might help students to modify their course-related value perceptions and continued interest in a subject area.

Using imagination and mental simulation (Markus & Nurius, 1986; Pham & Taylor, 1999; Singer, 1975) to explore the value of learning (e.g., imagining experiencing positive incentives associated with task success) might also be an important strategy involved in generating value perceptions. Singer showed that most humans daydream and use imaginative processes to elaborate thoughts and ideas and that these processes are instrumental in linking cognition, emotion, and motivation. Furthermore, Markus and Nurius suggested that imaginative processes are involved in the elaboration of future possible selves, which are schemata that serve to motivate people toward the futures that they envision for themselves.

In addition, contrasting future benefits of learning with costs of task engagement (Oettingen, Pak, & Schnetter, 2001) has been found to help students increase their commitments to learning course material. Oettingen et al. conducted a series of studies across various domains (e.g., academic, interpersonal) and found that contrasting future benefits with realistic costs of a task resulted in higher task commitment and performance compared with when they were asked to imagine only future benefits or only realistic costs. On the basis of disparate theory and research, value-reappraisal strategies might include brainstorming, generating rationales, imagining, and contrasting pros and cons about the importance of academic tasks, courses, and subject areas. Such strategies could potentially be used by students to self-regulate their value perceptions.

METHOD

Overview of the Study

The major purpose of this study was to design a value-reappraisal intervention and investigate its effects on self-report measures of task value (perceived value of course tasks), endogenous instrumentality (perceived usefulness of developing knowledge and skills related to a course for the attainment of future goals), and self-efficacy (confidence in one's capabilities to succeed at the work in a course); a choice-behavior measure of interest in statistics (whether students accessed extra not-for-credit Web sites related to statistics); and postintervention exam performance.

The VR intervention was designed to help students positively reappraise the value they placed on developing statistical knowledge and skills. Students were presented with messages about the importance of becoming an intelligent consumer of statistics in everyday life (attainment value), academic and professional uses of statistics (utility value), and the intrinsic enjoyment of learning statistics (intrinsic value). Students were also guided in actively processing the content of these messages through the central route by brainstorming, generating rationales, imagining, and contrasting pros and cons related to the importance of learning statistics. A no-treatment control condition (C) was also included and students were randomly assigned to either VR or C.

Since VR was focused on increasing students' value perceptions, it was hypothesized that students in the VR group would evidence stronger gains on measures of task value and endogenous instrumentality over time (pretest, immediate posttest, 2-week delayed posttest) compared to students in the control group. Furthermore, it was hypothesized that the VR group would be more likely to access extra not-for-credit statistics websites (the choice-behavior measure of interest) than the control group. Because VR was focused on modifying students' value perceptions, not

their expectation beliefs; and, because research on expectancy-value theory has suggested that value perceptions are stronger predictors of continued interest and expectation beliefs are stronger predictors of achievement (Meece et al., 1990; Wigfield & Eccles, 1992, 2000), it was questionable whether VR would affect students' ratings of self-efficacy and their postintervention exam performance. Therefore, we made no specific hypotheses about these two outcome variables.

The domain of statistics was chosen for these studies because students often express negative attitudes and beliefs toward statistics (Fullerton & Umphrey, 2001; Gal & Ginsburg, 1994; Gal, Ginsburgh, & Schau, 1997; Garfield, Hogg, Schau, & Whittinghill, 2002; Mills, 2004), and given the common usage of statistics in the media and across various occupations, there might be valid reasons for students to increase the value they place on learning statistics. In addition, the introductory statistics course in which this research was conducted included a research participation requirement. This made it convenient to recruit participants and conduct experimental intervention research.

Participants

A total of 82 college students from an introduction to statistics course offered through the educational psychology department of a large public university in the South Central United States were recruited through the department's human subject pool. Students received research participation credit for completing this study. Students were sampled from four sections of the course over two consecutive semesters: Fall Section 1 ($n = 21$) and Section 2 ($n = 19$); Spring Section 3 ($n = 23$) and Section 4 ($n = 19$). There were two instructors: Instructor A taught Sections 1 and 3, and Instructor B taught Sections 2 and 4. There were 68 women and 14 men, which is representative of those who enroll in introductory statistics courses through this department but not of the university at large, which enrolls 51% female students. The ethnic composition of the sample was as follows: African American ($n = 2$), Asian ($n = 16$), Caucasian ($n = 49$), Hispanic ($n = 12$) and 3 did not specify an ethnicity. Students tended to be in upper division: first year students ($n = 1$), sophomores ($n = 15$), juniors ($n = 33$), seniors ($n = 27$), and graduate students ($n = 6$). Students were enrolled in various colleges and programs across campus and intended to seek degrees in the following areas: advertising ($n = 9$), anthropology ($n = 1$), applied learning and development ($n = 1$), athletic training ($n = 1$), biology ($n = 2$), chemistry ($n = 1$), communication sciences and disorders ($n = 8$), communications ($n = 1$), educational psychology ($n = 1$), exercise physiology ($n = 2$), human development and family sciences ($n = 14$), human ecology ($n = 1$), kinesiology ($n = 7$), music ($n = 2$), nursing ($n = 16$), nutrition ($n = 6$), pharmacy ($n = 2$), physical therapy ($n = 2$), public relations ($n = 1$), textiles and apparel ($n = 3$), and urban studies ($n = 1$). Furthermore, most students had already declared a

major ($n = 78$). For many students, completing the introductory statistics course fulfilled a degree requirement even though taking this particular course may not have been required. The average age was 21.43 years ($SD = 3.21$).

Design

Potentially confounding variables were partially controlled for within the experimental design by using stratified random assignment. Students were stratified on instructor, gender, and year in school and then randomly assigned to one of two groups: VR group ($n = 41$) or the control group ($n = 41$). The repeated measures design used in this study included a pretest (immediately before the intervention), an immediate posttest (immediately after the intervention), and a 2-week delayed posttest.

Procedures

Table 1 provides an overview of the study procedures. Students in this study came to two sessions. Session 1 (approximately 100 min) was held in a computer lab with enough computers for 20 people. Sessions were held on weekdays, typically between 5:00 p.m. to 7:30 p.m., for approximately 3 weeks. On average, 10 students came to each session. Students were greeted and asked to sit at one of the computer stations. After signing the consent form, students completed the pretest measures (task value, endogenous instrumentality, and self-efficacy). Then,

TABLE 1
Overview of Study Procedures

Stage of Project	*Timing*	*Activity*
Preintervention Course Exam	Approximately 3 weeks into the semester	• Students took preintervention course exam
Session 1	Approximately 6 weeks into the semester	• Students took pretest measures • Students completed intervention/control condition • Students took immediate posttest measures
Session 2	Approximately 8 weeks into the semester	• Students took 2-week delayed posttest measures • Students took demographic survey
Choice-Behavior Measure	Approximately 10 weeks into the semester	• Statistics websites were posted for students to access
Postintervention Course Exam	Approximately 12 weeks into the semester	• Students took postintervention course exam

students were told how to sign on to the computers and download the relevant intervention (randomly assigned). The researcher was available to students to help with logistical questions. After the students completed the intervention, they took the immediate posttest measures (same as the pretest measures), signed up for Session 2, and left.

Session 2 (approximately 30 min) took place approximately 2 weeks after the students' first session in a classroom large enough to seat 50 people. On average, 20 students came to any one session (held weekdays at 4:00 p.m. or 5:00 p.m.). Students completed the 2-week delayed posttest measures (same as the pretest measures), and completed the demographic survey. Last, students were thanked and debriefed via e-mail once the study was completed. Students completed the pretest, immediate posttest, 2-week delayed posttest, and demographic measures by reading the items in a questionnaire booklet and bubbling in their responses on a Scantron sheet. The intervention and control conditions were delivered in the form of Microsoft Word 2000 files, and students typed their responses to the activities directly into these files.

Dependent Variables

Self-report measures of task value, endogenous instrumentality, and self-efficacy were administered at all three time points. All self-report measures used a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), and referenced students' statistics course.

Task value. We used the Task Value Scale from the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991) to measure task value generally (overall importance a student places on course-related tasks). The Task Value Scale has two items for attainment (e.g., "It is important for me to learn the course material in this course"), utility (e.g., "I think I will be able to use what I learn in this course in other courses"), and intrinsic value (e.g., "I am very interested in the content area of this course") resulting in a total of six items. The items are averaged together to compute an overall task value score. This scale has been used in numerous studies and strong reliability evidence has been established ($\alpha = .9$; Duncan & McKeachie, 2005). We included this measure because it has been successfully used as a general measure of task value with college populations.

Endogenous instrumentality. We used three items to measure endogenous instrumentality (the perceived usefulness of developing knowledge and skills related to a task for the attainment of future goals; e.g., "What I learn in this course will be useful for my future occupation"). Items were taken from an unpublished

revision of Husman, Derryberry, Crowson, and Lomax's (2004) four-item measure of endogenous instrumentality (J. Husman, personal communication, July 17, 2005). Endogenous instrumentality differs from task value because the Task Value Scale is a general measure that includes items related to attainment, utility, and intrinsic value. At a conceptual level, endogenous instrumentality is similar to utility value; however, one difference is that endogenous instrumentality is specifically focused on the utility of learning course material, as opposed to, for example, the usefulness of passing a class. Another difference is that each item from the endogenous instrumentality scale makes an explicit reference to the future, whereas, the items from the Task Value Scale do not reference the future explicitly. We included endogenous instrumentality as an outcome in this study because a major focus of the VR intervention was to help students discover the relevance of developing knowledge and skills in statistics. Empirical evidence suggested that the original 4-item measure of endogenous instrumentality had good reliability ($\alpha =$ .86; Husman et al.). In addition, on the basis of results from structural equation modeling, Husman et al. found that their endogenous instrumentality measure, the MSLQ Task Value Scale (two of the six items were removed because of poor reliability), and the MSLQ measure of intrinsic motivation, were measuring unique constructs. Also, endogenous instrumentality and task value were found to be positively related, but the relation reported was fairly weak.

Self-efficacy. The Perceived Academic Competence Scale was developed by Kaplan and Midgley (1997) by selecting seven items from the Academic Self-Beliefs Scale of Midgley, Maehr, and Urdan's (1993) Patterns of Adaptive Learning Survey. This scale was used to measure self-efficacy for completing course-related tasks (e.g., "I can do almost all the work in this course if I don't give up"). Items loaded as expected in a factor analysis that also included learning and performance goal orientation items and allowed factors to correlate (Kaplan & Midgley). In addition, good reliability data ($\alpha = .83$ to .85) were reported (Kaplan & Midgley). For the purposes of the present study, the items were adapted to refer to students' statistics course instead of English or math classes.

Preintervention exam performance. We used the first course exam, which was given approximately 3 weeks before the administration of the intervention, as a baseline measure of students' course achievement and treated it as a covariate in analyses examining intervention effects on postintervention exam performance. Because instructors did not use the same exam, we standardized the preintervention exam scores within each section by dividing the standardized residual by an estimate of its standard deviation, which yielded a mean of 0 and a standard deviation of 1 for each section. Instructor A's exam covered the following topics: introduction to statistics, frequency distributions, central tendency, variability, *z*

scores, and probability. Instructor B's exam covered the same topics as Instructor A's exam but also covered introduction to hypothesis testing and introduction to the *t* statistics.

Postintervention exam performance. The third course exam, which was given approximately 1 month after the administration of the intervention, was used as a dependent variable. We also standardized postintervention exam scores using the same procedures as described in the previous paragraph. Instructor A's exam covered the following topics: related samples *t* test, independent samples *t* test, correlation, simple linear regression, and chi-square test of association. Instructor B's exam covered the same topics as did Instructor A's exam, with one exception: Instructor B's exam covered statistical techniques for ordinal data, whereas Instructor A's exam covered *t* tests.

Choice-behavior measure of interest in statistics. Approximately 3 weeks after the intervention, two Web sites (one that was related to statistics concepts and procedures and the other that was related to how statistics is used in different careers) were posted on the course Web site. Then, an e-mail was sent out to students by their instructor with the following message:

> Hi, Class,
> A graduate student of mine found two really good Internet sites related to statistics. One site has definitions and explanations for statistical terminology and the other has information about why statistics is important and how people use statistics in various occupations. If you have some free time, please check them out. They are interesting.

Students could then go to the course Web site and access either or both of the statistics Web sites that were posted. Accessing the Web sites was not a requirement, and students could not earn points by accessing them. When an assignment is not required and points cannot be earned, accessing it could potentially be used as an indicator of interest in that subject area. A feature on the course Web site was enabled that tracked which students clicked on the statistics Web sites. Unfortunately, the statistical tracking mechanism was not available for us to use during the fall semester, so this measure was only included during the spring semester of the study ($n = 42$). A dichotomous variable indicating whether students accessed the Web site was of interest, as opposed to the frequency of times a student accessed the Web site. This was because once a student accessed one of the statistics Web sites, he or she could then save that Web site to his or her own computer and access it later, barring our statistical tracking mechanism from tracking that student's access to that Web site.

Description of the Value-Reappraisal Intervention and Control Conditions

We administered the experimental conditions using computers in a campus computer lab. The materials were in the form of Microsoft Word 2000 files downloaded from a designated Web site. For each condition, students read a series of reading passages and completed associated activities. Students typed their responses to the activities directly into the file. The number of passages, activities, and approximate time it took to complete each condition are as follows: control (four passages, four activities, 75 min) and value reappraisal (six passages, eight activities, 75 min).

Value-Reappraisal Intervention (VR). VR was designed to help students reappraise their values related to their introductory statistics course. Students were presented with messages and strategies to explore the value of learning statistics. Particular emphasis was given to helping students consider the importance of developing statistical knowledge and skills.

Passage 1 (639 words) explained what attitudes are and why it is important for students to construct a positive attitude toward their coursework. Activity 1 asked students to describe one positive and one negative attitude students generally might have toward college courses.

Passage 2 (453 words) explained that one possible route to developing a more positive attitude toward a course is to understand why learning the content and mastering the skills related to that course may be personally important. Activity 2 asked students to create a list of knowledge and skills that could be developed from learning the content presented in their statistics course. In addition, students were asked to first create a list of incentives for developing that knowledge and skill; and second, to generate mental simulations of them realizing these incentives in the future. We used Oettingen et al.'s (2001, p. 740) instructions for generating mental simulations.

Passage 3 (482 words) discussed how developing statistical knowledge and skill could help students become more intelligent consumers of statistical information. Activity 3 asked students to describe past and future situations in which they used or would use statistically based information. They were also asked to generate a rationale for why learning the material in their statistics course could help them become more intelligent consumers of statistical information.

Passage 4 (70 words) briefly discussed how developing statistical knowledge and skills could help students become better prepared for future courses. Activity 4 asked students to brainstorm a list of upcoming courses in which having statistical knowledge and skills might be useful and to generate a rational for why learning the material in their statistics course could help them in a future course.

Passage 5 (136 words) briefly discussed how developing statistical knowledge and skills could be instrumental in becoming better prepared in a future career

and provided examples of how statistics are used in various careers. In Activity 5, students were asked to create a list of potential careers for them and then to chose one and describe the ways in which they saw statistical knowledge and skills being used in that career. They were also asked to generate a rationale for why learning statistics could help prepare them for that career.

Passage 6 (244 words) briefly discussed how statistics could be challenging, interesting, and enjoyable. It also discussed how negative thoughts related to learning statistics can make it less enjoyable. Activity 6 asked students to identify two negative thoughts that they had related to their introductory statistics course and to replace each thought with a positive thought. We adapted this particular activity from Weinstein, Woodruff, and Awalt's (2002) "Becoming a Strategic Learner: Attitude Module."

The last part of VR was designed to help students examine the costs and benefits related to learning statistics. This part did not have any reading passages, only activities. Activity 7 asked students to generate an argument supporting why statistics was important for them and an argument supporting why statistics was not important for them. Then, students were asked to choose which argument was truer for them. Activity 8 asked students to contrast positive incentives for learning statistics with obstacles standing in their way. This activity was taken from Oettingen et al. (2001) and adapted to focus on students' statistics course.

Control condition. Students read four passages on multicultural education: Passage 1 (2,192 words), Passage 2 (1,116 words), Passage 3 (2,155 words), and Passage 4 (1,043 words). Multicultural education was chosen as the topic of the control condition because learning about it was not expected to affect the variables of interest but could potentially be beneficial to students in other ways. After students read each passage, we asked them (a) to explain what they liked most about the reading and why; (b) what they liked least about the reading and why; and (c) to summarize some of the main points from the reading.

RESULTS

Reliability analyses of the pretest self-report measures yielded strong Cronbach's alpha coefficients: task value (.90), endogenous instrumentality (.88), and self-efficacy (.90). Pearson product-moment correlation coefficients suggested that the three self-report measures were intercorrelated. Self-efficacy was positively correlated with task value ($r = .38$, $p < .01$) and endogenous instrumentality ($r = .26$, $p < .05$), and task value was positively correlated with endogenous instrumentality ($r = .75$, $p < .01$). The high correlation between task value and endogenous instrumentality raised concerns about the redundancy of conducting analyses on

TABLE 2
Descriptive Statistics for Self-Report Measures by Intervention Group

	Pretest		*Immediate Posttest*		*2-Week Delayed Posttest*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Task Value						
Control	3.81	1.33	3.60	1.33	3.66	1.32
Value Reappraisal	3.51	1.39	4.26	1.37	4.00	1.35
Endogenous Instrumentality						
Control	3.85	1.69	3.91	1.65	3.93	1.65
Value Reappraisal	3.71	1.67	5.02	1.44	4.52	1.55
Self-efficacy						
Control	5.15	1.32	5.18	1.29	5.03	1.36
Value Reappraisal	5.22	1.13	5.36	1.03	5.19	1.01

Note. Control ($n = 41$) and VR ($n = 41$). A 7-point scale was used for each self-report measure.

both variables. However, because task value and endogenous instrumentality were found to be both empirically unique and theoretically distinct in previous work with much larger sample sizes, and because researchers whose work pertains to task value and endogenous instrumentality might prefer to see the results presented separately for each measure, both measures were retained and analyzed separately.

Table 2 presents the pretest, immediate posttest, and 2-week delayed posttest means and standard deviations for the Control and VR groups on all self-report measures. To check whether group differences existed at pretest, we conducted 2 (VR: present or absent) $\times$ 2 (instructor: A or B) $\times$ 2 (semester: fall or spring) analyses of variance (ANOVAs) for task value, endogenous instrumentality, and self-efficacy. No statistically significant intervention group, instructor, or semester main effects or interactions were detected on any of the pretest self-report variables. There were too few men in this study to examine the effect of gender in any of the analyses. In addition, the number of graduate students in this study was too small to examine differences with undergraduates. Because students' gender and year in school could potentially affect results, we used stratified random assignment to control for these variables.

A major purpose for this study was to examine the effect of VR on self-report measures of task value, endogenous instrumentality, and self-efficacy over time. Even though students were randomly assigned to either the Control or VR group within each section, it was possible that the VR intervention could have differentially affected students' ratings on the self-report measures on the basis of which instructor they had or which semester they were enrolled in the course. To investigate this, we ran a 2 (VR — present or absent) $\times$ 2 (instructor: A or B) $\times$ 2 (semester: fall or spring) $\times$ 3 (time: pretest, immediate posttest, 2-week

delayed posttest) repeated measures ANOVA for each self-report variable. We conducted a power analysis using G*Power 3.0.10, and it suggested that there was sufficient power (.95) to detect between-within interaction effects with a modest effect size ($\eta_p^2 = .03$), given the following inputs: $\alpha = .05$; $N = 82$; groups = 8; repeated measures = 3; correlation among repeated measures = .75; and nonsphericity correction $\varepsilon = .94$. No main effects or interactions involving instructor or semester were detected nor where there any effect sizes larger than $\eta_p^2 = .03$, so we dropped these two variables in further analyses to increase power.

We analyzed the data subsequently reported for measures of task value, endogenous instrumentality, and self-efficacy using 2 (VR − present or absent) × 3 (time: pretest, immediate posttest, 2-week delayed posttest) repeated measures ANOVAs. We used *F* tests using the Greenhouse-Geisser degrees of freedom adjustment for violations of the sphericity assumption (no violations of sphericity were observed, but this test was used because it is more conservative) to test the significance of the main and interaction effects of VR and time. In addition, we used Bonferroni adjustments for post hoc pairwise comparisons to control for increases in Type I error as a result of multiple comparisons.

Task Value

Repeated measures ANOVA results for task value showed a strong VR × Time interaction, $F(1.98, 158.48) = 16.99$, $p < .01$, $\eta_p^2 = .18$ (see Figure 1). Post hoc

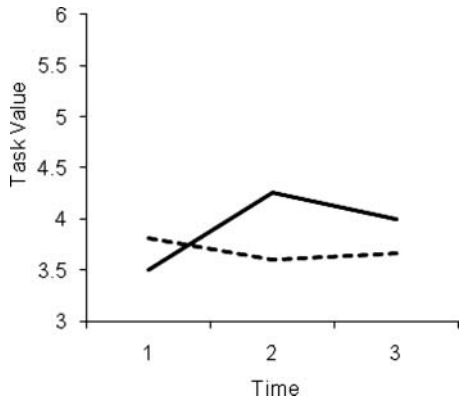

FIGURE 1 A statistically significant value-reappraisal x time interaction effect on task value is shown. Change over time is not statistically significant for the control group. The VR group increased significantly from Time 1 to 2 and Time 1 to 3, but change from Time 2 to 3 was not statistically significant. Time 1 = pretest. Time 2 = immediate posttest. Time 3 = two-week delayed posttest. Straight Line = VR group, Dotted Line = control group. Control ($n = 41$) and VR ($n = 41$).

tests using Bonferroni adjustments suggested that the control group did not make statistically significant gains or losses on task value over time. Conversely, the VR group made gains on task value from pretest to immediate posttest (difference in $M = 0.74$, $SE = 0.12$, CI = .44 to 1.04, $p < .01$, $d = .54$). These intervention effects were not found to attenuate significantly from immediate posttest to 2-week delayed posttest. Also, at the 2-week delayed posttest, students in the VR group still showed statistically significant gains on task value compared with their scores at pretest (difference in $M = 0.49$, $SE = 0.12$, CI = .20 to .78, $p < .01$, $d = .36$).

Endogenous Instrumentality

A similar pattern of results emerged for endogenous instrumentality as it did for task value. A strong VR was detected Time interaction ×, $F(1.98, 158.52) = 16.36$, $p < .01$, $\eta_p^2 = .17$ (see Figure 2). Post hoc tests using Bonferroni adjustments suggested that the control group did not make gains or losses on endogenous instrumentality over time. However, the value-reappraisal group made statistically significant gains on endogenous instrumentality from pretest to immediate posttest (difference in $M = 1.32$, $SE = 0.15$, CI = .94 to 1.70, $p < .01$, $d = .84$). These intervention effects were found to partially attenuate from immediate posttest to 2-week delayed posttest (difference in $M = –0.50$, $SE = 0.15$, CI = –.87 to –.14,

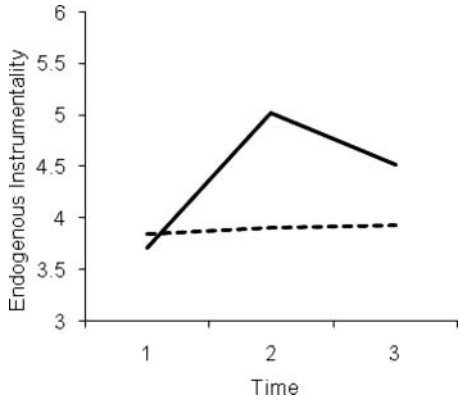

FIGURE 2 A statistically significant value-reappraisal x time interaction effect on endogenous instrumentality is shown. Change over time is not statistically significant for the control group. The VR group increased significantly from Time 1 to 2 and Time 1 to 3, and decreased significantly from Time 2 to 3. Time 1 = pretest. Time 2 = immediate posttest. Time 3 = two-week delayed posttest. Straight Line = VR group, Dotted Line = control group. Control ($n = 41$) and VR ($n = 41$).

$p < .01$, $d = -.33$). Despite this attenuation, the VR group made statistically significant gains on endogenous instrumentality from pretest to 2-week delayed posttest (difference in $M = 0.81$, $SE = 0.16$, CI = .42 to 1.21, $p < .01$, $d = .50$).

Self-Efficacy

Repeated measures ANOVA results revealed no statistically significant intervention effects on self-efficacy.

Choice-Behavioral Measure of Continued Interest

Whether or not students accessed two statistics Web sites that were posted on their course's Web site was tracked and used as a choice-behavior measure of interest in statistics. This measure was only administered to students in the Spring Semester and was thus limited to a total of 40 students (21 in the control group and 19 in the VR group). The data showed that all students who accessed one Web site also accessed the other website. Therefore, only one dichotomous outcome variable indicating whether or not students accessed both statistics Web sites was used. Of the 40 students, seven accessed both statistics Web sites that were posted (1 was in the control group and 6 were in the VR group; see Table 3). We used logistic regression to investigate intervention effects on this measure. First, we entered main and interactive effects of intervention group and instructor as predictors of choice behaviors. Because instructor and the interaction of instructor and intervention group were not statistically significant, they were removed from the model. The final model included intervention group as a predictor variable of the choice-behavior measure of interest in statistics, $\chi^2(1, N = 40) = 5.36$, $p < .05$, and explained approximately 13% of the variation in students' choice behaviors. As expected, a statistically significant VR main effect was detected (B = 2.22, SE = 1.14, p < .05, Odds Ratio = 9.23) (see Figure 1). This suggested

TABLE 3
Choice-BehaviorMeasure of Interest in Statistics by Group

	Accessed Websites		*Did Not Access Websites*	
	n	*%*	n	*%*
Control	1	4.8	20	95.2
Value Reappraisal	6	31.6	13	68.4

Note. Data on students' choice-behaviors were collected approximately 4 weeks after the administration of the VR intervention and control condition.

TABLE 4
Postintervention Standardized Exam Scores by Intervention Group and Instructor

	Instructor A			*Instructor B*		
	N	*Mean**	*SE*	*N*	*Mean**	*SE*
Control	22	.16	.2	19	$-.31_a$	.21
Value Reappraisal	22	−.22	.2	19	$.32_a$	.21

Note. Means sharing the same subscript are significantly different at $p < .05$.
*Means were adjusted for standardized pre-intervention exam scores.

that, on average, students in the VR group were 9.23 times more likely to access the statistics Web sites compared with students in the control group.

Postintervention Exam Performance

Another major purpose for this study was to investigate the effects of the VR intervention on students' postintervention exam performance. Furthermore, the possibility that the VR intervention differentially affected students' exam performance on the basis of which instructor they had or which semester they enrolled in the course needed to be examined. First, to check whether group differences existed on students' preintervention standardized exam scores, we conducted a 2 (VR − present or absent) × 2 (instructor: A or B) × 2 (semester: fall or spring) ANOVA. We detected no statistically significant group, instructor, or semester main effects or interactions on preintervention exam performance. Next, we analyzed students' postintervention standardized exam scores using a 2 (VR − present or absent) × 2 (instructor: A or B) × 2 (semester: fall or spring) analysis of covariance (ANCOVA), controlling for preintervention standardized exam scores. ANCOVA results suggested a statistically significant VR × Instructor interaction effect, $F(1, 73) = 5.93$, $p < .05$, $\eta_p^2 = .08$. Table 4 presents the adjusted means and standard errors for standardized postintervention exam scores by intervention group and instructor. For Instructor A's students, there was not a statistically significant effect of the VR intervention. However, for Instructor B's students, the VR group had significantly higher standardized postintervention exam scores compared with those of students in the control group (adjusted difference in $M = 0.62$, $SE = 0.30$, CI = .02 to 1.23, $p < .05$).

DISCUSSION

The hypotheses for task value and endogenous instrumentality were supported by the data. The VR group was found to make statistically significant gains on both

task value and endogenous instrumentality from pretest to immediate posttest and from pretest to 2-week delayed posttest. The control group, on the other hand, remained stable on these measures over time. Furthermore, measures of effect size suggested that the gains observed for the VR group were substantial, particularly on endogenous instrumentality. These findings suggest that the VR intervention was effective at helping students to place greater importance on the tasks in their statistics course and to increase how useful they think developing statistical knowledge and skills is for the attainment of their future goals.

The hypothesis for the choice-behavior measure of interest in statistics was also supported by the data. Results showed that students in the VR group were significantly more likely to access the statistics Web sites than were the students in the control group; despite that, overall, a small number of students accessed the Web sites. These findings imply that the VR Intervention may have helped some students generate an interest in learning about statistics, particularly because accessing the statistics Web sites was not a course requirement. Furthermore, these results show that the VR intervention was powerful enough to influence students' choices 4 weeks after receiving the intervention.

These findings add causal support to theory and research suggesting that value perceptions and choice behaviors can be modified through self-regulation interventions (Pintrich, 2000, 2004; Wolters, 1998, 2003). These results are promising because they suggest that students' preexisting value perceptions about learning statistics can be improved by presenting them with messages and guiding them in using self-regulatory strategies to explore the value of learning statistics.

Previous theory and research has suggested that providing students with purposes and reasons for engaging in academic tasks can help them to place more value on those tasks (Brophy, 1999; Hofer, 2002; Latham et al., 1988). Eccles et al. (1983) outlined four components of the value construct (attainment, utility, intrinsic, and cost), and this framework was used to help structure the arguments presented in the VR intervention. Using Eccles et al. framework may have contributed to the success of the intervention and could be important to consider when crafting an argument about the importance of academic tasks.

This study also helps to provide support for theory and research that has suggested that students can actively use strategies to increase the value they place on academic tasks (Pintrich, 2000, 2004; Wolters, 1998, 2003). Wolters's (1998) work in this area showed that students report using strategies to increase the value they place on their academic tasks. The current study adds to this line of research by showing that an intervention focused on guiding students in using value-reappraisal strategies (brainstorming, generating rationales, imagining, and contrasting pros and cons) can lead to increases in students' value-perceptions and influence students' choice behaviors. Accordingly, using value-reappraisal strategies may be important for self-regulating one's motivation.

Models of persuasion and conceptual change have tended to focus on the persuasive aspects of messages and personal characteristics of the participants (Bohner & Schwarz, 2001; Murphy, 2001) but have given relatively little attention to strategies that could be used to guide participants in actively processing messages through the central route. This study was unique because students were both presented with persuasive messages and guided in using value-reappraisal strategies to actively process those messages. Even though we did not examine the unique effect of value-reappraisal strategies on the study outcome variables, researchers interested in modifying attitudes may want to consider using value-reappraisal strategies to facilitate central-route processing of messages.

Although the VR intervention was successful at influencing students' value perceptions and choice behaviors, we did not find it to affect students' self-efficacy beliefs for successfully completing course tasks. This finding provides interesting data related to a causal relation between expectancies and values by suggesting that increasing value perceptions might not lead to short-term increases in self-efficacy. Bandura's (1997) theory and research suggested that self-efficacy beliefs are directly influenced by students' past successes and failures, vicarious experiences, verbal persuasion, and physiological arousal. If increasing students' value perceptions could lead students to have a greater number of successes in the course, then changes in self-efficacy beliefs could potentially be observed sometime after those successes were made. However, in this study, we measured students' self-efficacy beliefs only up to 2 weeks after students completed the VR intervention.

An effect of the VR intervention on students' exam performance was only observed for students who had Instructor B. For students who had Instructor A, the difference between the VR group and control group was not statistically significant. It is difficult to pinpoint why this effect was only observed for Instructor B. Although the exams had different items, the topics covered on each exam were similar for each instructor, and all students took the exam approximately 1 month after the intervention. This finding suggests that the VR intervention has the potential to positively affect students' learning and achievement in a course but that the benefit of the intervention might depend on and interact with other instructor and course factors. For instance, intervention effects on exam performance may be more pronounced in academic contexts in which there is little support offered to help prepare students for exams (e.g., review sessions, exam objectives, study tips). Also, students whose instructors effectively motivate them may benefit less from a motivational intervention.

Limitations

One limitation of this study was that students were nested within four sections of the course. Although stratified random assignment to interventions within each section allowed for meaningful comparisons between intervention groups, a study

with a more sufficient number of sections (at least 10) would allow for between class variance to be modeled hierarchically with participants at a lower level. Future studies could measure characteristics of the instructor and the course and examine them in interaction with the VR intervention. Another limitation of this study was that the sample was primarily women. It is, therefore, questionable whether these findings would generalize to male participants. Research on gender differences in math and science typically suggest that women have lower confidence and less interest in those subjects compared with men (see Wigfield & Eccles, 2002). Women may, therefore, be more likely to benefit from an intervention focused on increasing their value perceptions compared with men.

Future Research

While VR had positive impacts on students' values and choice behaviors, it is unclear what specific mechanisms within the intervention contributed to student gains. Students were asked to use a variety of value-reappraisal strategies (e.g., brainstorming attainment, utility, and intrinsic reasons for learning course content, generating rationales, imagining experiencing benefits resulting from learning course content, and contrasting benefits with costs of task engagement) and these strategies could have differentially affected students' values. A systematic investigation into the effects of different value-reappraisal strategies on students' values, choice behaviors, motivation, and achievement is an important area for future work. Furthermore, the messages students received about the reasons learning statistics might be important for them could have contributed to changes in students' values. The main and interactive effects of persuasive messages and value reappraisal strategies also need to be examined in future studies. In addition, it is important that future research examine the VR intervention over longer periods of time (e.g., months and years) and on other outcome measures (e.g., students' intentions to continue learning statistics and students' course enrollment decisions). It is also important to investigate whether students can be taught to successfully use value-reappraisal strategies on their own and without continual guidance from an intervention.

The high correlation between task value and endogenous instrumentality found in this study differed from previous research that found a fairly weak correlation between these measures (see Husman et al., 2004). However, the items used for each measure were not identical in both studies. In our research, we used a revised version of the endogenous instrumentality measure, and Husman et al. removed two items from the Task Value Scale because of poor reliability. More studies need to be conducted to further examine the uniqueness of these constructs. In future research on the VR intervention, we could try including either one general measure of task value or measuring specific components of the value construct.

Conclusion

Results from this study suggested that the VR intervention helped students to both increase the value they placed on learning statistics and develop a stronger understanding about how learning statistics could help them reach their future goals. The VR intervention was also found to positively affect students' choices to engage in learning activities related to statistics that were not required as part of the course. In addition, some tentative evidence was found that the VR intervention could increase students' performance on course exams but these benefits seemed to depend on unknown instructor and course factors which need to be further investigated in future research.

This research helps to address the growing economic and social needs to develop and test theory-based interventions aimed at increasing students' continued interest in math and science (National Science Foundation, 2006; U.S. Department of Education, 2006). The VR intervention could potentially be used in introductory statistics courses to help students increase the value they place on learning statistics. Because many undergraduate programs within the United States require successful completion of an introductory statistics course for graduation or entry into an upper division major, and because the number of students taking introductory undergraduate statistics courses has been reported to be increasing (Loftsgaarden & Watkins, 1998), this intervention may be relevant to a great deal of students. The VR intervention could also serve as a model for instructing students about the importance of learning course material in other math and science courses.

Theoretically, this research is important because it helps to expand and integrate research on self-regulation and motivation by examining an approach to modifying students' value perceptions that involves both presenting them with persuasive messages and guiding them in using value-reappraisal strategies. The framework used in this study could help guide other researchers interested in investigating the effects of persuasive messages and value-reappraisal strategies on students' value perceptions, continued interest, self-efficacy, and achievement in math, science, and statistics courses.

AUTHOR NOTES

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An Investigation of Mathematics Teachers' Mathematics Anxiety

This paper investigates the phenomenon of mathematics teachers' mathematics anxiety. Although one may think that mathematics teachers are the least likely to have high mathematics anxiety, some research indicates that there are mathematics teachers that do and that it is this characteristic that may be perpetuating it in their students. In particular, this study shows that there is a relationship between chosen middle school grade level and mathematics anxiety level; the lower the chosen grade level, the higher the mathematics anxiety level. Another outcome of this study is validation of gender discrepancies in regards to mathematics anxiety; females had a higher mathematics anxiety score than males. A discussion of conclusions regarding the results, recommendations for future studies, and suggestions for practice are included especially implications for mathematics teacher preparation programs.

Introduction

The statement of the problem, the purpose of the study, and the significance of the study are included in this section. The research question is then presented.

Statement of Problem

Mathematics anxiety is a pervasive phenomenon that may not be a learning disability but operates like one and is more widespread and disruptive (Ashcraft, Krause, & Hopko, 2007). Although it is not clear what percentage of the population has mathematics anxiety, an educated estimate is that approximately 1/5 of the American population has high mathematics anxiety (Ashcraft et al., 2007). Evidence suggests that many preservice teachers have mathematics anxiety (Cady & Reardon, 2007) and that a disproportionally large number of preservice elementary school teachers have high mathematics anxiety (Bursal & Paznokas, 2006).

It is worrisome that many people have mathematics anxiety especially since mathematics anxiety is linked to low mathematics academic performance and avoidance of mathematics altogether. In an ever-changing technological society, what it means to be a mathematically literate individual extends the notion of numeracy beyond arithmetic procedures. According to the National Council of Teachers of Mathematics (NCTM) (2000, p. 4), "the need to understand and be able to use mathematics in everyday life and in the workplace has never been greater and will continue to increase."

The negative consequences of mathematics anxiety are compounded when the notion of equity is included. The NCTM "Principles and Standards for School Mathematics" (2000) emphasizes the need for all students to have access to and success in mathematics. This implies that all students be provided opportunities to learn mathematics, accommodations for differences, and adequate resources and support for learning. Mathematics anxiety is related to poor attitude, low motivation, low self-confidence, low self-efficacy and poor academic performance. Thus, mathematics anxiety acts counter to achieving equity in mathematics.

The cycles that are associated with mathematics anxiety shed light on another concern: ineffective teaching. Namely, teachers with mathematics anxiety favor computational skills and are more likely to use lecture-based methods (Krantz, 1999). Moreover, teacher-centered instructional techniques, as opposed to student-centered approaches, are more likely to cause and/or perpetuate mathematics anxiety in students. The problem with mathematics anxiety and ineffective teaching becomes more complicated when academic performance is considered. Farrell (2006) claims that one of the main causes of mathematics anxiety is a "dropped stitch – a gap in a student's prior mathematics education that holds him or her back from learning more- complicated concepts" (p. A42). Ineffective teaching is strongly tied to low student academic performance. Students have gaps in their mathematical understanding which yields higher anxiety. High anxiety makes it difficult to acquire mathematical understanding. A compounding fact is that teachers are deemed ineffective primarily because of weak content knowledge. According to legislation such as the No Child Left Behind Act of 2001 a characteristic of "highly qualified" teachers is strong content knowledge.

Research points to attempts to alleviate the mathematics anxiety problem via teacher-based intervention and prevention techniques (Barnes, 2006; Chavez & Widmer, 1982; Ussimaki & Nason, 2004). Hence, there is a need to investigate mathematics anxiety in teachers.

Purpose

The purpose of this research study is to investigate the mathematics anxiety level of middle school teachers. In particular, the chosen grade level and mathematics anxiety level are determined for students (both pre- and in-

service mathematics teachers)[1] enrolled in transformed courses. Then, it will be determined if any relationship between these two research variables (chosen grade level and mathematics anxiety level) exists.

The focus on middle school is in large part associated with the fact that research shows that regardless of when and what triggers the onset of mathematics anxiety, it increases significantly during adolescence (Ashcraft et al., 2007). The rationale for studying participants in transformed courses stems from the desire to control for concerted teacher preparation efforts.

Significance of Study

According to Ashcraft et al. (2007), empirical studies focusing on mathematics anxiety began to appear in 1957 with the first study conducted by Dreger & Aiken. Since then, mathematics anxiety has become one of the most studied areas in the affective domain. Yet there are still many unknowns. For instance, "little is known about the onset of math anxiety, and even less is known about the factors that either predispose one toward or cause math anxiety" (Ashcraft et al., 2007, p. 341).

A review of the literature indicates that there is also a void in the research regarding middle school teachers. Because there is a significant increase in mathematics anxiety during adolescence (Ashcraft et al., 2007), there is a need to know the specific nature of middle school mathematics teachers in terms of mathematics anxiety.

Research Questions

Is there a significant difference between the chosen grade level of middle school mathematics participants of transformed courses and their mathematics anxiety level while controlling for status, gender, ethnicity, age, and classification?

The research variables are chosen grade level, middle school mathematics (6, 7, or 8, as stated in the Texas Essential Knowledge and Skills (TEKS)), and mathematics anxiety level (percentile using the Mathematics Anxiety Rating Scale – Short (MARS-S)). The control variables are status (inservice or preservice), gender (male or female), ethnicity (African-American, Mexican-American, White, Other), age (numeric), and classification (graduate or undergraduate). Transformed courses are courses that utilize the mathematics/science correlation model (Author, 2009), align to national and state standards, are writing intensive, and incorporate culturally responsive teaching, real-world experiential learning, and technology.

Literature Review

The following information provides a historical background of mathematics anxiety as well as an investigation of various definitions, cause/effects, and population characteristics. In particular, current research was reviewed in regards to mathematics teachers.

Historical Background

Prior to the 1960s, preservice teachers' future success in teaching was estimated by the level of their content knowledge but in the latter half of the century, the role of preservice teachers' beliefs and attitudes about classroom teaching was considered (Bursal & Paznokas, 2006). The earliest investigations of inservice teachers' mathematics anxiety were conducted by Chavez & Widmer in 1982; although literature addressed mathematics anxiety in inservice mathematics teachers, no formal research studies were found. In regards to teachers in general and mathematics teachers specifically, the literature provides no distinction between the definition and the type of mathematics anxiety that they may have.

Causes and Negative Effects

Many causes of mathematics anxiety are cited in the literature: negative past experiences with mathematics teachers or mathematics classes (Ashcraft et al., 2007; Barnes, 2006; Davidson & Levitov, 2000; Martinez & Martinez, 2003; Perry, 2004; Portal & Sampson, 2001; Scarpello, 2007; Ussimaki & Nason, 2004), lack of knowledge of basic mathematics (Farrell, 2006; Portal & Sampson, 2001; Ussimaki & Nason, 2004), inappropriate instructional methods (Martinez & Martinez, 2003; Perry, 2004; Portal & Sampson, 2001; Yenilmez, 2007), and negative parental attitude toward mathematics (Barnes, 2006; Davidson & Levitov, 2000; Portal & Sampson, 2001; Scarpello, 2007; Ussimaki & Nason, 2004). Although a cause may not have the same effect on all recipients, there are general trends in the outcomes including low academic performance, avoidance of mathematics and mathematics-related careers, and psychological symptoms such as tension and fear.

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[1] Students in transformed courses are both preservice and inservice mathematics teachers and will be referred to as "participants of the study" throughout this paper.

Negative experiences with mathematics classes and teachers are cited as a cause of mathematics anxiety (Ashcraft et al., 2007; Barnes, 2006; Davidson & Levitov, 2000; Martinez & Martinez, 2003; Perry, 2004; Portal & Sampson, 2001; Scarpello, 2007; Ussimaki & Nason, 2004). Many individuals afflicted with mathematics anxiety cited that a particular topic in mathematics, algebra, space, and number sense (Ashcraft et al., 2007; Uusimaki & Nason, 2004), and a certain action, such as performing mathematics on a chalkboard, began the mathematics anxiety (Ashcraft et al., 2007). Ussimaki & Nason's study revealed that 72% of their participants attributed their negative experiences to former teachers, specifically primary school teachers. In a study by Cady & Reardon (2007), 96% of preservice teachers indicated that their mathematics teacher influenced their mathematics attitude and that elementary teachers had a positive influence and college teachers had a negative influence. Portal & Sampson found that teachers create environments for students based on their beliefs about the students' abilities and that students internalize the teachers' beliefs about their abilities. For instance, students believed to have a lower ability in the content are not given a chance to answer questions, and therefore are not given the praise for answering the question correctly. More poignantly, "teacher attitudes affect student attitudes more than student achievement" (Portal & Sampson, 2001, p. 30).

Mathematics anxiety may be caused by a lack of basic mathematical knowledge. A gap in students' prior mathematics education restrains the student from learning more complex concepts (Farrell, 2006). Concepts can be missed because of a school absence or not asking questions when a concept is first presented (Portal & Sampson, 2001). Students have the most mathematics anxiety when asked to communicate their mathematical knowledge (Ussimaki & Nason, 2004). Students' current performance expectancies in mathematics and the perceived importance of mathematics are predictors of mathematics anxiety (Meece, Wigfield, & Eccles, 1990).

Teaching strategies may be another cause of mathematics anxiety. Martinez & Martinez (2003), citing Steele & Arth, claim that a middle school mathematics "teaching approach of explain-practice-memorize is the major source of mathematics anxiety" (p. 28). Traditional mathematics programs in the United States focus on computation, definitions, and calculations, not concepts (Perry, 2004; Portal & Sampson, 2001). Student avoidance in mathematics classes has resulted from a classroom atmosphere with a high demand for correctness and little cognitive or motivational support (Ashcraft et al., 2007). A contributing factor towards statistics anxiety in statistics students was a lack of connection from the material to the real world (Pan & Tang, 2005). Teachers teach the way they were taught and do not teach to different intelligences, making mathematics difficult for students (Portal & Sampson, 2001; Yenilmez, 2007).

Parents' beliefs about mathematics may contribute to mathematics anxiety (Davidson & Levitov, 2000; Portal & Sampson, 2001; Scarpello, 2007; Ussimaki & Nason, 2004). Parents may tell their children that mathematical ability is inborn and thus, if a student does not understand mathematics, parents may accept the student's poor grade (Portal & Sampson, 2001). This reassurance from parents that poor grades in mathematics is acceptable and expected from reasons outside of the student's control, such as heredity, does not encourage the child to learn, thus further hindering the students' performance and increasing their anxiety.

The effects of mathematics anxiety are visible in both psychological and physiological symptoms. Psychologically, a person affected by mathematics anxiety may feel panic, tension, nervousness, helplessness, fear, distress, shame, inability to cope (Malinsky, Ross, Pannells, & McJunkin, 2006; Ruffins, 2007). Other effects of mathematics anxiety include loss of ability to concentrate, going blank during a test or feeling helpless while doing homework (Malinsky et al., 2006; Ruffins, 2007). Physiological symptoms include sweaty palms, nervous stomach, and difficulty breathing (Malinsky et al., 2006).

Another negative effect of mathematics anxiety is avoidance of mathematics and thus, the avoidance of career and education choices which include mathematics (Ashcraft et al., 2007; Bai, Wang, Pan, & Frey, 2009; Bass, 2008; Hopko, 2003; Scarpello, 2007). Ashcraft et al. found that higher mathematics anxiety levels are typically associated with more negative attitudes about mathematics, lower enjoyment of mathematics, lower self-confidence in mathematics, lower grades in mathematics classes, and lower intent and incidence of enrollment in mathematics courses. A correlation of -0.31 exists between mathematics anxiety and enrollment of high school mathematics and a -0.32 correlation exists between mathematics anxiety and the intent to enroll in college mathematics (Ashcraft et al., 2007).

Teachers, like students, are not immune to mathematics anxiety. Mathematics anxiety in preservice teachers is caused by their "experiences as a mathematics student, the influences of prior teachers and teacher

preparation programs, and prior teaching experience" (Ussimaki & Nason, 2006, p. 370). Cady & Reardon (2007) also found that preservice teachers' confidence in mathematics is related to their experiences as a student. Bursal & Paznokas (2006) found that mathematics anxiety of preservice teachers leads to a lack of confidence in educational activities. Based on the findings, it does not seem that the causes of mathematics anxiety in mathematics teachers are thoroughly researched, plus literature is sparse.

Mathematics anxiety in teachers negatively impacts students and teaching methods. Teachers with mathematics anxiety may promote the early development of mathematics anxiety in their students (Beilock, Gunderson, Ramirez, & Levine, 2010; Isiksal, Curran, Koc, & Askun, 2009; Rule & Harrell, 2006; Swars, Daane, & Giesen, 2006). Swetman, Munday, & Windham (as cited by Isikal et al., 2009) observed that elementary school teachers with higher mathematics anxiety spent less time planning mathematics-related activities and dedicated fewer hours to mathematically-related activities than elementary school teachers with lower mathematics anxiety. Rule & Harrell support this claim by stating that teachers with high mathematics anxiety "have less confidence in teaching mathematics and frequently rely on teaching algorithms rather than cognitive thought processes, thereby fostering dependency in their students" (p. 241). Teachers with higher mathematics anxiety "use traditional teaching methods, such as lecture, …concentrate on teaching basic skills rather than concepts in mathematics, …devote more time to seatwork and whole-class instruction and less time to playing games, problem-solving, small-group instruction, and individualized instruction, …dominate the mathematics classroom and nurture a dependent atmosphere among students" (Swars et al., 2006, pg. 306). Overall, it was shown that preservice teachers with high mathematics anxiety have negative attitudes towards mathematics (Matthews & Seaman, 2007; Swars et al., 2006). Although negative effects of mathematics anxiety discovered for "teachers" can be applied to mathematics teachers, no literature specific to mathematics teachers has been located.

Characteristics of the Population

There are varying ideas of how much of the population is affected by mathematics anxiety and at what age mathematics anxiety begins. White (as cited by Barnes, 2006) determined that 60% to 80% of the population has mathematics anxiety in varying degrees while Ashcraft et al. (2007) concluded that roughly 17% of the population has high mathematics anxiety. When surveys were administered to an introductory mathematics class at Springfield College prior to June 2004 approximately 85% of the students claimed to have at least mild mathematics anxiety (Perry, 2004). Research suggests that mathematics anxiety begins between 4th grade (Martinez & Martinez, 2003; Scarpello, 2007) and 6th grade (Ashcraft et al., 2007) and peaks in middle school and high school (Scarpello, 2007), specifically near grades 9 and 10 (Bowd & Brady, 2003). Etsey & Snetzler (as cited by Rule & Harrell, 2006) found that females in high school and college have higher mathematics anxiety than males. A correlation was discovered between mathematics anxiety and age but no significant linear trend was established (Malinsky et al., 2006).

The relationship between gender and mathematics anxiety is a major topic in mathematics anxiety research (Ashcraft et al., 2007; Barnes, 2006; Bowd & Brady, 2003; Hembree, 1990; Malinsky et al., 2006; Marsh & Tapia, 2002; Ruffins, 2007). When it comes to competition in the mathematics classroom, females' performance suffers more than their male counterparts (Barnes, 2006). Similarly, when the suggestion is that females' performance is linked to biological or environmental factors, females' results are negatively impacted (Ruffins, 2007). Gender stereotypes are a possible cause of female mathematics anxiety (Ashcraft et al., 2007; Barnes, 2006; Ruffins, 2007). While Marsh & Tapia found no significant relationship between mathematics anxiety and gender, it has been ascertained that females do exhibit more mathematics anxiety than males in secondary school and college (Bowd & Brady, 2003; Hembree, 1990; Malinsky et al., 2006). This discovery agrees with the finding by Barnes that males have less mathematics anxiety than females after the age of 14. A study at a small Canadian university revealed a significant difference in gender and mathematics anxiety with a mean MARS score for women of 204.3 and for men of 173.41 (Bowd & Brady, 2003).

Research on ethnic groups and mathematics anxiety is found in the literature (Ruffins, 2007). Tobias (as cited by Ruffins, 2007) found that Black and Hispanic students' mathematics anxiety is affected additionally by "disorganized family environments, poor nutrition or inexperienced teachers with over-crowded classrooms" (p. 18). Muhammad (as cited by Ruffins, 2007) states that because society has created a distorted view of what Blacks are capable of, Black students are "comfortable with and satisfied with achieving at a below-average or average level in the math classroom" (p. 18).

Preservice teachers, elementary or otherwise, appear frequently in research about mathematics anxiety (Alsup, 2005; Bursal & Paznokas, 2006; Cady & Reardon, 2007; Greshman, 2008; Isikal et al., 2009; Matthews & Seaman, 2007; Swars et al., 2006). Preservice elementary teachers have the highest mathematics anxiety than any other major (Alsup, 2004; Bursal & Paznokas, 2006) while preservice teachers have higher mathematics anxiety than science anxiety (Cady & Rearden, 2007). Preservice teachers with the lowest degree of mathematics anxiety had the highest levels of mathematics teacher efficacy (Gresham, 2008; Swars et al., 2006). In addition, preservice teachers have been shown to "generally possess poor mathematical knowledge and also strong negative attitudes towards mathematics" (Matthews & Seaman, 2007, p. 1). Swars et al. state that there is a "significant, moderate negative relationship between mathematics anxiety and mathematics teacher efficacy (r = -.440, p < .05)". Isiksal et al. observed that senior preservice teachers have lower mathematics anxiety than junior preservice teachers. Characteristics of mathematics teachers' mathematics anxiety are not heavily researched, although it can be assumed that studies focusing on teachers in general include individuals concentrating on mathematics.

Methodology

The following section provides a description of the setting of the university as well as that of the sample surveyed. In addition, the research design is presented as are the instruments and the process for administering them.

Setting

The study occurred at a university located in central Texas in the spring and summer of 2009. This university serves approximately 30,000 students with 101 bachelor's, 88 master's, and 9 doctoral programs of study. This university population consists of approximately 35% ethnic minorities: ~24% Hispanic, ~6% Black, and ~5% Other. Approximately 14% of students receiving an undergraduate degree earn a teaching certificate with 3% concentrating in mathematics; this university is the largest university-based teacher preparation entity in Texas.

Research Design

Through a correlation study, the relationship between the chosen grade level of middle school mathematics participants of transformed courses and their mathematics anxiety level was investigated. Participants of the study were university students enrolled in one of ten targeted courses.

Student Participants

There were 109 participants in the study for which complete data were collected. The sample consisted of 81% female, 78% undergraduates, and 81% preservice teachers. In regards to ethnicity, the participants of the study consisted of ~ 69% white, ~25% Hispanic, ~3% Black, and ~1% other. See Table 1 for further demographic data about the student participants.

Instrumentation

MARS-S. A review of the literature shows the existence of at least five other instruments used to determine mathematics anxiety levels: Chavez & Widmer (1982) used Math Attitude Inventory; Furner & Duffy (2002) used Mathitude; Peskoff (2000) used Composite Math Anxiety Scale; Portal & Sampson (2001) used an instrument generated through a thesis; and, Marsh & Tapia (2002) used Attitudes Toward Mathematics Instrument. However, the most predominant is the MARS-S, created by Richard M. Suinn & Elizabeth H. Winston (Suinn & Winston, 2003). The MARS-S is a validated shortened version of the 98-item Mathematics Anxiety Rating Scale (MARS). The MARS-S was validated multiple ways (Hopko, 2003). The MARS-S is shown to be equivalent to the MARS by correlations between the two surveys: r = .92 (p < .001) for original testing and r = .94 (p < .001) for re-administered testing a week later (Suinn, 2003). Reliability of the MARS-S is .90 (Suinn & Winston, 2003).

The survey consists of 30 items selected from the MARS. Survey participants indicate their level of comfort or anxiety to each item using a Likert scale. Their ratings are added and then compared to a table of norms to reflect their level of mathematics anxiety.

Mathematics TEKS. The Mathematics TEKS is a set of mathematical content and process standards established by the Texas Education Agency (TEA). Mathematics teachers are expected to incorporate these standards into their lessons. All Texas public school students are assessed periodically of their knowledge of the TEKS standards through the Texas Assessment of Knowledge and Skills. Participants were asked to determine which grade he/she felt most comfortable teaching based on their understanding of the state curriculum standards.

Participants were also asked to complete a questionnaire about gender, ethnicity, age, status, and classification. These items were self-reported.

Procedures, Data Collection, and Recording

The study was conducted both face-to-face and through the mail. Administration of the survey and the questionnaire took place at the beginning of the targeted course. First, the MARS-S instrument, questionnaire, and TEKS were distributed. Then, oral directions for completing the scantron were given. Individuals that participated via mail were given the same materials and provided with a written set of instructions that were orally given to the face-to-face participants.

Results

Table 2 shows summary statistics for mathematics anxiety and grade point average (GPA). The normed mathematics anxiety scores for the MARS-S instrument were determined by Richard Suinn (2003) using a large sample of college age students. A score of 50 reflects the median anxiety observed in Suinn's sample. Since all respondents in this study are inservice or preservice mathematics teachers, one might predict that the mathematics anxiety level should be lower than the typical college age student (Malinsky et al., 2006). However, the average mathematics anxiety level, 50.65, is essentially equal to the anxiety level of college age students. An analysis of how outcomes are related to gender and mathematics GPA is presented below.

First, in regards to the research question, there is no significant difference between 7th and 8th grade but there was with 6th grade ($p < .01$). The respondents that chose 6th grade have higher mathematics anxiety than those who chose either 7th or 8th grade. For this reason, further analysis focuses on the grade choice: 6th grade or not. There is literature (Malinsky et al., 2006) that supports that elementary school teachers have higher mathematics anxiety than other teachers. The same is true for these populations as preservice teachers (Bursal & Paznokas, 2006). These results indicate that a similar phenomenon is occurring within the middle grades.

Next, control variables are considered. Status, ethnicity, age, and classification were not significant predictors neither individually nor when combined with other factors and were dropped from subsequent analyses. Gender, however, was consistently a significant factor. Overall females reported higher mathematics anxiety than males ($p = .004$). When combined with grade choice, gender difference maintained its significance ($p = .027$), but there was no significant interaction with choice of grade level. Hembree's (1990) meta-analysis of 151 studies involving mathematics anxiety included 31 studies focused on middle grade students and 122 studies focused on post-secondary students. Hembree found that females have a greater level of mathematics anxiety than males and the difference is greatest at the post-secondary level. For the post-secondary studies the average effect size was -.3. In this study, the effect size was considerably larger (see Table 3 and 4).

The results of the study provide an additional perspective on the relationship between gender, grade choice and mathematics anxiety. Figure 1 shows the means plot for a two-way ANOVA model including grade choice and gender. Interestingly, the magnitude of gender effect is nearly equal to the magnitude of the grade choice effect. Hence, the mean mathematics anxiety of the males who chose 6th grade is equal to that of the females that chose 7th and 8th grade.

In his meta-analysis study, Hembree (1990) found that mathematics anxiety is negatively correlated with grades in mathematics classes. The average correlation in the post-secondary studies was -.31 which is nearly identical to the -.317 observed here. In the studies focusing on 6th through twelfth grade students, the correlation depended on gender. It was significantly more negative for males (-.36) than for females (-.31), but the gender difference did not appear in the post secondary studies. When considering the effect of mathematics GPA on mathematics anxiety in the context of gender and grade choice for this study, the ANCOVA analysis does show that mathematics GPA is a significant covariate ($p = .005$) and consistent with the previous studies of adults. There is no significant interaction between mathematics GPA and gender or grade choice. Furthermore, inclusion of GPA in the model does not greatly change the magnitude of the gender and grade choice effects (compare Table 3 with Table 4). There was no gender effect ($p = .577$) or grade choice effect ($p = .399$) on the mathematics GPA, however. Figure 2 shows the estimated model relating mathematics GPA to mathematics anxiety for the different groups studied. It appears that females have a higher mathematics anxiety level but it is not because they are performing worse (mathematics GPA) than their male counterparts.

Discussion

This section provides information about the conclusions that are drawn from this study. In addition, the limitations/assumptions are presented as well as recommendations for future studies, and suggestions for practice.

Conclusions

In general, this research provides a platform for discussion directed at two groups that are marginally addressed in the literature: mathematics teachers with mathematics anxiety and middle school mathematics teachers. The fact that respondents that chose 6th grade had significantly higher mathematics anxiety than those who chose 7th and/or 8th grade indicates a relationship between these two variables. Namely, the higher the grade level, the lower the mathematics anxiety and vice versa. Other variables such as teacher content knowledge and self-efficacy play a role in these results. In regards to the results that females have a higher mathematics anxiety than males, this may be the actualizing of a self-fulfilling prophecy. Interestingly, there were more than four times as many females surveyed than there were males. Are more females choosing to have a mathematics concentration in spite of their self-reported high mathematics anxiety? And, could it be that females are more likely to recognize and report mathematics anxiety? Then, this could also imply that males may be expressing false confidence. There is evidence (mathematics GPAs) to suggest that this may very well be the case. In any event, these results shed light on the phenomenon of a disproportionate amount of female elementary teachers. High mathematics anxiety may make females more likely to choose to teach elementary school as opposed to high school. Similarly, this may be why there are more male high school mathematics teachers. Nevertheless, the results of this study are clear when it comes to the relativity of female and male mathematics anxiety scores. The author of the MARS (Suinn, 2003, p. 2) suggests that "an organization may wish to develop its own norms" and this may be a suggestion that should be considered. Perhaps different scales should exist for different genders so that appropriate thresholds can be utilized. This study, provides evidence that the metrics used to designate the level of mathematics anxiety should in fact be calibrated to account for mathematics teachers' tendencies especially with respect to gender.

Limitations/Assumptions

There were some assumptions and limitations to the study. One assumption was that reading the TEKS did not influence mathematics anxiety level. Another assumption is that the responses to the instruments administered in this study to collect data are answered truthfully. In regards to limitations, some of the subjects are not or will not be certified to teach middle school mathematics. For example, some subjects are receiving "generalist" certifications. Furthermore, the only options for grade were 6, 7, or 8. Thus, participants that may have wanted to choose 5th grade, for example, may have chosen the lowest available option, 6th grade in this case. Similarly, this is true for individuals wishing to choose a higher grade than 8th grade.

Recommendations

Recommendations for future studies include repeating the study solely with practicing mathematics teachers. In general, research focusing on mathematics inservice teachers is sparse. And, it is the inservice teachers that are on the front lines of the mathematics anxiety war.

Suggestions

There are many strategies that can be used to address mathematics anxiety that come from this study and are supported by the literature. Some suggestions are directed towards general mathematics teacher preparation strategies. For instance, there is a compelling argument for an additional preservice mathematics course that includes topics such as mathematics anxiety. Future mathematics teachers can take a mathematics anxiety survey and discuss manifestations of this particular anxiety, methods to lower it, and strategies to address it in the classroom. Raising awareness through review of literature is also a process that should be initiated. This study shows that traditional self-help opportunities (Barnes, 2006) may not work with this population: the gender discrepancy is an indication that males are not as anxious as females or at least not reporting it and mathematics GPA is not impacted.

This research study can further provide suggestions for many practical ways to combat mathematics anxiety especially for female lower grade middle school mathematics preservice teachers. As noted by Uusimaki & Nason (2004), there is a need for "interventions that facilitate fundamental shifts in preservice teachers' systems of beliefs and conceptions about the rational and discourse of mathematics in general" (p. 370). This includes reflective, concerted thought pinpointing feelings as well as incidents when anxiety may have been triggered. Thus, preservice teachers should engage in activities that allow them to express experiences that may have triggered their mathematics anxiety. For instance, writing a mathematics autobiography is a way to capture a person's mathematical journey. In addition, preservice teachers can utilize the linear aspect of mathematics courses to pinpoint an area or topic where one may begin to feel more anxious. For example, some individuals may recall their first encounter with

abstract proofs in Geometry and may favor algebraic concepts because it lacks (at least in lower grades) a two-column, axiomatic approach.

Best practices for mathematics teaching should be invoked since there is a strong relationship between lower mathematics anxiety and content mastery (Ashcraft et al., 2007). Preservice mathematics teachers need to be provided with learning environments where they can fully explore and communicate about mathematics in a supportive group environment, investigate basic mathematics concepts, plus apply this knowledge to authentic situations (Ma, 1999). One way to do this is to provide gender-specific workshops in order to reduce the likelihood of stereotype threat (Aronson, 2004). These seminars could provide future teachers with released middle school mathematics exams to help them build confidence and remove the "unknown" factor. In addition, seminars could utilize a workshop format where students can engage in contextual problems, especially those that allow them hands-on opportunities such as using technology to gather data about a bouncing basketball. These data are then modeled and studied. Interdisciplinary approaches will make it more likely that students can connect with mathematics through strategies that will make them less anxious. For instance, if a student is passionate about writing then including writing opportunities in a mathematics environment will provide a conduit for reducing mathematics anxiety. In any event, building learning communities capitalizes on the strengths of social academic environments (Treisman, 1992) and this too was shown to yield less anxiety and, thus, improved performance.

Providing for future mathematics teachers to be taught in a student-centered, constructivist way will make it more likely that they will invoke these instructional techniques in the classroom (Ma, 1999). This will make it less probable that mathematics anxiety will occur in their students. There is no one solution to overcoming mathematics anxiety; however, research shows that one major theme to combating the problem is a change in curriculum and instruction techniques (Portal & Sampson, 2001); a move from skills-based topics and traditional lecture-style methods to conceptual content and real-world application and diverse, student-centered pedagogy. Teachers trained in acknowledging and alleviating mathematics anxiety can then incorporate strategies to help prevent and/or alleviate anxiety in their students. Suggestions include providing a safe learning environment where students are challenged yet free to take risks without ridicule (Wadlington & Wadlington, 2008). Alternate lesson sequencing, like self-paced with mastery, could also be possibilities for ameliorating learning barriers, such as anxiety. Another item to provide is consistent policies and procedures in all aspects of the learning framework especially assessment and evaluation that embraces non-traditional methods such as journals and portfolios. A further idea is to include mechanisms for students to address affective issues, such as broaching these conversations with personal stories or popular culture. For example, David Robinson (professional basketball player) and Danica McKellar (actress and author of "Math Doesn't Suck"; McKellar, 2007) have degrees in mathematics. Also, change the pedagogical style in a way that includes cultural systems like in *Stand and Deliver*, which is a good inspirational movie to watch as well (Martinez & Martinez, 2003). Nevertheless, mathematics teachers should be given opportunities to master content and pedagogy.

Summary

This study provides insightful information to both mathematics teacher preparation programs and professional development providers. Namely, mathematics teachers with mathematics anxiety is a critical issue that must be addressed. As a result of this research, anxiety was shown to be prominent, especially in females with interests in teaching lower middle grades. Moreover, with the support of the literature, novel ways to break the cycle are provided.

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Table 1
Demographic Data

Variable	*f*	%
Gender		
Male	20	18.3
Female	89	81.7
Ethnicity		
African-American	4	3.7
Mexican-American	28	25.7
White	76	69.7
Other	1	0.9
Class		
Undergrad	85	78.0
Graduate	24	22.0
Status		
Preservice	88	80.7
Inservice	21	19.3

Table 2
Summary Statistics for Mathematics Anxiety and GPA

	N	Minimum	Maximum	Mean	*SD*	Correlation
Mathematics Anxiety	109	4	97	50.65	24.97	
Mathematics GPA	95	1.33	4.00	2.83	.59	-.317

Table 3
ANOVA Results: Mathematics Anxiety by Gender and Grade Choice

	Coefficient	*SE*	*p*	Effect Size
Intercept	46.79	3.43	.000	
Male	-13.33	5.94	.027	-.572
Sixth Grade	13.75	4.62	.004	.591

Note. For the dummy variables *Male* and S*ixth Grade* the effect size is the ratio of the coefficient to the square root of the mean square error. For continuous variable *Mathematics GPA*, the effect size is the ratio of the ratio of the coefficient to the square root of the mean square error times the standard deviation of *Mathematics GPA*.

Table 4
ANCOVA Results: Mathematics Anxiety by Gender and Grade Choice Controlling for Mathematics GPA

	Coefficient	*SE*	*p*	Effect Size
Intercept	78.11	12.16	.000	
Mathematics GPA	-11.52	3.98	.005	-.302
Male	-13.06	4.88	.007	-.576
Sixth Grade	13.51	3.98	.005	.596

Note. For the dummy variables *Male* and S*ixth Grade* the effect size is the ratio of the coefficient to the square root of the mean square error. For continuous variable *Mathematics GPA*, the effect size is the ratio of the ratio of the coefficient to the square root of the mean square error times the standard deviation of *Mathematics GPA*.

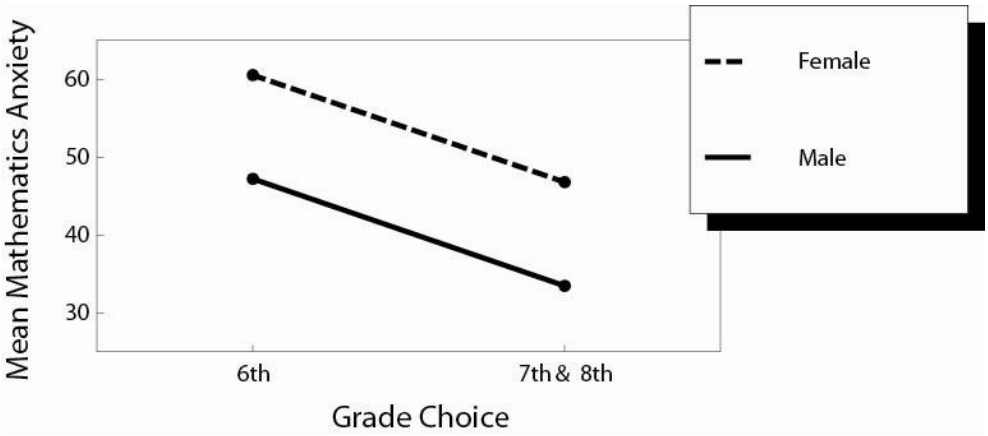

Figure 1. Estimated Marginal Means of Mathematics Anxiety

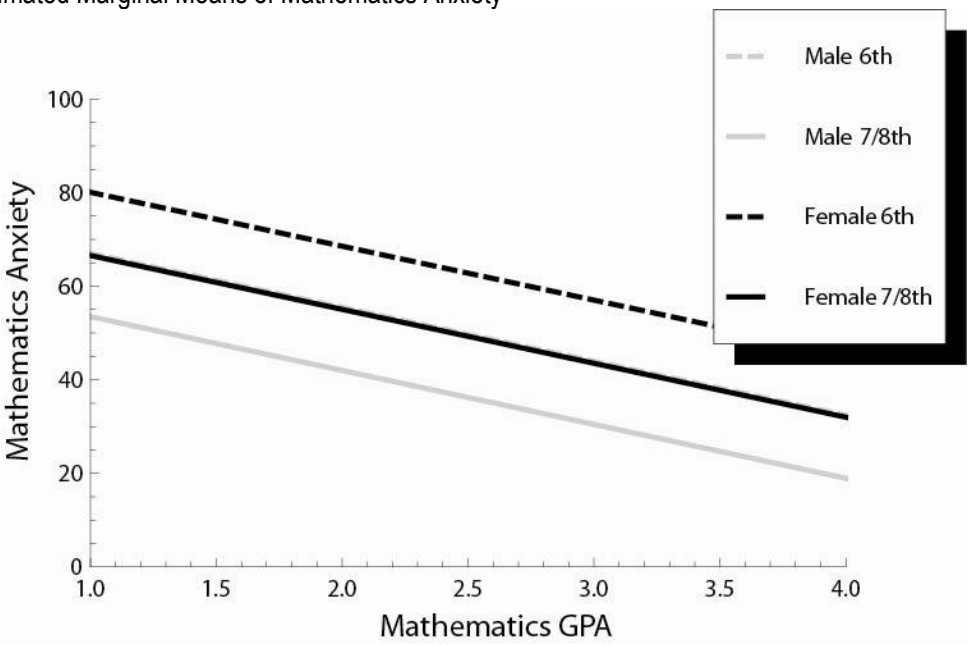

Figure 2. Model for Mathematics Anxiety versus Mathematics GPA by Gender and Grade Choice

Mireles, S. V., Westbrook, T., Ward, D., & Goodson, J. (2011). Evaluating the effectiveness of the mathematics software, Algebrator, in the developmental mathematics classroom. *Journal of College Reading and Learning*. Manuscript submitted for publication.

Investigating the Use and Evaluating the Effectiveness of the Mathematics Software, Algebrator™, in the Developmental Mathematics Classroom

Many colleges and universities use developmental education courses as a way to prepare students for college-level coursework. In fact, an astounding 78% of universities and 100% of two-year public colleges offer some form of developmental education coursework (Waycaster, 2001). Research has shown that developmental education courses are cost-effective investments that support student success (Trenholm, 2006; Waycaster, 2001). Also, "there is ample evidence that successful participation in developmental programs has a positive impact on persistence and success in subsequent courses in the regular curriculum" (Penny & White, 1998, p. 3). However, according to Taylor (2008), "if we are to succeed in educating the large number of entering college and university students who need remediation, effective instructional strategies must be addressed" (p. 37).

Determining effective instructional strategies in developmental mathematics classrooms is important for students that are not mathematically college ready. Developmental mathematics is defined by the author as all mathematics courses covering content below college algebra. Various standard documents have purported the use of technology in the mathematics classroom. For example, the American Mathematical Association of Two-Year Colleges' (AMATYC) *Crossroads in Mathematics: Standards for Introductory College Mathematics before Calculus* (Cohen, 1995) and the Texas Higher Education Coordinating Board (2008) *Career and College Readiness Standards* (CCRS) recommended the use of technology as an effective instructional practice. The National Council of Teachers of Mathematics (NCTM) (2000) asserted "technology is essential in teaching and learning mathematics" (p. 11). Forster (2006) claimed "the use of graphics calculators, computer algebra systems (CAS) and other computer technologies for teaching and learning mathematics is now widespread" (p. 145). Furthermore, Forster (2006) expanded on other forms of technology such as CAS calculators, computer software, calculator programs, Java applets, and spreadsheet applications. While some efforts have occurred in the developmental mathematics arena, additional implementation of technology needs to be explored. This paper provides insight into instructional methods, namely, preparation homework (pre-hw), for utilizing the mathematics software, Algebrator™ , which specifically addresses typical developmental mathematics algebraic content.

This pilot study adds to the research knowledge in at least two ways. First, there is a need for additional research regarding the effective use of mathematics software in the developmental mathematics classroom. Although there are studies that investigate computer-assisted instruction relative to traditional instructional techniques (Carter, 2004; Kinney & Robertson, 2003; Mahmood, 2006), this project addresses effective methods that include mathematics software in various ways (no access, access, or incorporated through lessons). Moreover, there are no studies regarding the use of Algebrator™ in the classroom.

A review of the literature also highlights voids in research regarding the use of pre-hw as an instructional practice. In general, the latest research dates back to 2007 with the publication of *The Battle Over Homework: Common Ground for Administrators, Teachers, and Parents* (Cooper, 2007). Although there is mention of studies relative to this practice, no published research studies were found. Thus, this article contributes research to the area of developmental mathematics instructional methods including computer technology and pre-hw.

Research Questions

The following research questions were investigated:

1. Does the use of Algebrator™ in a developmental mathematics classroom produce different outcomes in student academic performance as measured by examination scores?
2. Does the assignment of pre-hw in a developmental mathematics classroom produce different outcomes in student performance as measured by examination scores?
3. Does the use of Algebrator™ in a developmental mathematics classroom produce different outcomes in motivation as measured by a motivational survey?
4. Does the assignment of pre-hw in a developmental mathematics classroom produce strong self-efficacy as measured by a self-efficacy survey?

Background

For the purpose of reader understanding, the following list of operational definitions is included:

- Developmental mathematics–mathematics courses covering content below college algebra.
- Distributed-content homework–assignments that "include the material that was covered in lessons prior to the current day (practice content) or content that has not yet been covered in class (preparation content)" (Cooper, 2007, p. 43).
- Homework–traditional homework that is assigned immediately after content is discussed in class; also known as same-day-content homework.
- Mathematics software–mathematics software that requires user interface; does not have ready-made problem sets.
- Preparation homework (pre-hw)–assignments which "introduce material to be presented in future lessons" (Cooper, 2007, p. 6).

Computer Technology in the Developmental Mathematics Classroom

The use of computer technology has been shown to be beneficial for students. For example, research has indicated that computer-based or web-based instruction benefits students by improving motivation and satisfaction with the course. Baki and Guveli (2008) developed web-based mathematics teaching (WBMT) material regarding functions. Although that study focused on ninth grade students, the idea of function is a common developmental mathematics topic. The study concluded that the WBMT material fostered positive attitudes in students. In a similar fashion, Taylor (2008) conducted a quasi-experimental study and evaluated developmental mathematics classes that used the computer algebra program, Assessment and Learning in Knowledge Spaces (ALEKS) in. Taylor found that the students who used this on-line tool reported decreased anxiety and an overall improvement in their attitudes toward mathematics but, again, no significant performance benefits were seen.

Although benefits of computer technology have been noted, the impact of computer technology on academic achievement is uncertain. As outlined above, some studies have shown that the incorporation of computer technology in the mathematics classroom did not provide developmental mathematics students with significant performance benefits (Baki & Guveli, 2008; Kong, 2008; Taylor, 2008). However, other studies have concluded that computer technology has the ability to significantly improve student performance. Hagerty and Smith (2005) used ALEKS to replace traditional assignments in a college algebra class and found that students who used ALEKS showed short-term and long-term performance improvements. Similarly, McSweeney and Weiss (2003) found that the incorporation of Math Online, "a web based interactive system created… for the delivery of multiple-choice questions to reinforce and provide practice of algebraic and computational skills," in a calculus class led to students who, on average, had higher algebraic improvement scores than students who did not use Math Online (McSweeny & Weiss, 2003, p. 348).

Cooper (2007) cited seven studies in which the use of pre-hw and distributed-content homework was evaluated. Cooper concluded "distributed-content homework was more effective than same-day-content homework" (p. 44).

Methodology

The pilot study was conducted at a 4-year university in central Texas in the summer of 2008. The university has an enrollment of over 28,000 students of which approximately 70% are White and 56% are female. The median age of the students at the university is 22.

Research Design

This quasi-experimental mixed-methods design investigated the relationships between student performance and the integration of Algebrator™ and/or pre-hw. The pilot study utilized all four developmental mathematics sections. Students were allowed to enroll in the section of their choice; thus, random assignment of students to treatment groups was not possible. Students must register for a lecture class as well as a lab section. All students met for lecture twice a week and attend lab five times a week. The majority of course material is taught during the lab component of the course while examinations are given in the lecture component. Each of the four instructors was assigned a treatment method and then each instructor was randomly assigned a lab section of approximately 20 students. As shown in Figure 1, the study included four treatments.

Pre-hw (P)	Algebrator™ (A)

• Students did not have access to Algebrator™ • Pre-hw was assigned	• Students received an orientation to Algebrator™ • Students had access to Algebrator™ • Pre-hw was not assigned
Algebrator™ /pre-hw (AP)	**Lesson plans/Algebrator™ /pre-hw (LAP)**
• Students received an orientation to Algebrator™ • Students had access to Algebrator™ • Pre-hw was assigned	• Students received an orientation to Algebrator™ • Students had access to Algebrator™ • Algebrator™ was incorporated into five lesson plans • Pre-hw was assigned

Figure 1. Description of Four Treatments

The following null hypotheses were investigated in reference to the research questions (RQs):

- RQ1: There is no statistically significant difference in the means of Algebrator™ -related examination question scores.
- RQ2: There is no statistically significant difference in the means of pre-hw-related examination question scores.
- RQ3:
  - There is no statistically significant difference in the means of Technology Survey scores.
  - There is no statistically significant interaction in the means of Technology Survey scores among.
  - There is no statistically significant difference in the means of Algebrator™ Technology Survey scores.

The independent variables were the treatments (LAP, AP, A, and P). The dependent variables were the Algebrator™ -related examination question scores, pre-hw-related examination question scores, Technology Survey scores, and Algebrator™ Technology Survey scores. Copies of the surveys have been provided in Appendices B-E.

Student Participants

There were 85 students that participated in this pilot research study of which 59% were female and 66% were White/Non-Hispanic. Approximately 13% and 9% were College of Education and College of Liberal Arts majors, respectively. It is important to note that the developmental mathematics courses are part of a program in which each lab follows the same scope and sequence and students take departmental examinations.

Instrumentation

The lecture instructor developed the examinations using a test bank. The test bank, that accompanies the textbook, included questions that mirrored the pre-hw.

There were four surveys utilized in this pilot study: Technology Survey (see Appendix D), Algebrator™ Technology Survey (two versions – see Appendices B and C), and Pre-Homework Survey (see Appendix E). Since the study focused primarily on Algebrator™ , existing instruments were not applicable. The researchers developed each of the instruments. Hence, the instruments were not formally validated nor assumed to be reliable prior to their use in this study.

The Technology Survey was developed to determine students' experience, attitudes, and general feelings towards the use of technology in the mathematics classroom. There were two versions of the Algebrator™ Technology Survey developed to investigate students' attitudes toward the use of Algebrator™ in the developmental mathematics classroom. The version (Appendix C) administered to AP and A was used to determine the frequency of students' Algebrator™ use and students' general attitudes toward the use of Algebrator™. However, the version (Appendix D) administered to LAP included one additional question to determine if students who experienced lesson plans which incorporated Algebrator™ would have liked more of these types of lesson plans. The researchers also developed a Pre-Homework Survey to investigate students' responses toward the incorporation of pre-hw into the curriculum. This survey consisted of questions to determine students' perceived pre-hw completion rate and their general feelings towards the incorporation of pre-hw.

Procedures

Students in the A, AP, and LAP sections received an orientation to Algebrator™ on the first day of class. A crib sheet is included in Appendix A. The software was installed on the classroom computers. Students could use

the computers throughout class time; moreover, the students received free copies of the software program. Thus, the students could install the software on personal computers.

The general scope and sequence of the developmental mathematics course consists of one- and two-variable linear equations, systems of linear equations, polynomial expressions, rational expressions and equations, radical expressions and equations, and quadratic equations. However, five curriculum topics chosen for the specific purpose of incorporating Algebrator™ were: (a) solving linear equations in one variable, (b) finding equations of lines, (c) factoring polynomials using the greatest common factor, (d) adding and subtracting rational expressions using the least common denominator, and (e) solving radical equations. These lesson plans were used for LAP instruction. The other groups utilized lesson plans that contained no Algebrator™ -specific instructions.

Pre-hw consisted of approximately five problems and preceded every lesson except for two. It was assigned in conjunction with the homework for P, AP, and LAP sections. Instructors for AP and LAP graded each pre-hw as an individual assignment while the instructor for P used the pre-hw as a means for students to earn extra credit on the accompanying homework assignment. All three instructors graded pre-hw for completion rather than accuracy.

Data Collection and Recording

There were four multiple choice examinations and one multiple choice final examination. Students took these examinations in a lecture hall setting where Algebrator™ was not accessible, though students were allowed to use graphing calculators. All students were given parallel versions of the examinations and final. These examinations included questions regarding Algebrator™ topics as well as pre-hw. Examination scores, per section, were recorded using an Excel spreadsheet. Percentage of correct student responses were calculated and recorded for each section for all examination questions that related to Algebrator™ and pre-hw.

There were three surveys that various groups completed. The Technology Survey was administered to all students on the first and last day of classes. At the end of the semester, LAP, A, and AP groups were given the Algebrator™ Technology Survey. Note that the LAP section was administered a slightly different version that included one additional Likert scale question. The Pre-Homework Survey was distributed to LAP, AP, and P groups at the end of the semester as well. Student responses were recorded using an Excel spreadsheet and open-ended questions were coded positive, neutral, or negative. A response was coded neutral for two reasons: (a) the note was indifferent or (b) the comment contained both positive and negative remarks.

Instructors kept a daily journal of classroom events. This process provided no formal guidelines. Nevertheless, instructors were verbally directed to (a) note when Algebrator™ was referenced and/or used in the class, and (b) capture general feelings (instructor and students) toward the use of the Algebrator™.

Results

To investigate RQ1, AP and A were combined and compared with each of P and LAP. A one-factor analysis of variance (ANOVA) was performed on the treatments regarding the performance on Algebrator™ -related questions for each examination. The results showed no statistical significance and, thus, we failed to reject the null hypothesis.

The data pertaining to RQ2 were analyzed using two groups: the treatment that was not assigned pre-hw (A) and the treatments that were assigned pre-hw (LAP, AP, and P). A t-test was performed between the two groups for their performance on pre-hw-related questions on Examinations 3 and 4 and the final examination. The results showed no statistical significance and, thus, we failed to reject the null hypothesis.

The Technology Survey, the Algebrator™ Technology Survey, and teaching journals provided insight to RQ3. Three groups were used: LAP, AP and A (combined), and P. Regarding the Technology Survey, ANOVA's were performed on the Likert scale questions (Questions 2, 3, 5, and 6). No statistical significance was found. In Table 1, preferences as requested in Question 7 are noted.

Table 1

Student Preferences Regarding Calculators and Computers

Preference	A & AP		P		LAP	
	Pre	Post	Pre	Post	Pre	Post
Calculator	18	21	4	7	6	7
Computer	1	0	0	0	0	0
Both	10	7	6	3	3	2

Neither	0	1	0	0	0	0

The qualitative data for the pre- and post-Technology Survey were coded as positive, negative, or neutral to express the students' general feelings about technology use in the mathematics classroom. Table 2 shows the counts for each category relative to LAP, A and AP (combined), and P.

Table 2

Qualitative Question on Technology Survey

Code	A & AP		P		LAP	
	Pre	Post	Pre	Post	Pre	Post
Positive	22	9	5	2	5	4
Neutral	4	8	2	0	3	0
Negative	2	4	0	2	0	0

An ANOVA (see Table 3) was performed for each quantitative question on the Algebrator™ Technology Survey that was administered to AP and A versus LAP. Question 3, "Algebrator's menus are easy to navigate," and Question 7, "I used Algebrator in class" yielded statistically significant results at the 0.05 level with p-values 0.02 and 0.01, respectively. Cohen's d, using pooled standard deviation, determined each effect size. For Question 3, a large effect size (d = 0.8) places the mean score for LAP at the 79th percentile of A and AP combined. For Question 7, a larger effect size (d = 1.0) places the mean of LAP at the 84th percentile of A and AP combined.

Table 3

Analysis of Variance for Algebrator™ Technology Survey

Question	Treatments	Mean	*F*	p-value	Effect Size
3	A & AP	3.06	6.080	0.02	0.8
	LAP	3.67			
7	A & AP	2.71	7.040	0.01	1.0
	LAP	3.67			

Note. A & AP, *n* = 35; LAP, *n* = 12

A 95% confidence interval was used to evaluate the student response to the LAP-specific question on the Algebrator™ Technology Survey related to lesson plans that incorporated Algebrator™. The confidence interval is 2.4778 to 4.0222 which contains the neutral value of 3.

The qualitative data for the Algebrator™ Technology Survey was coded as positive, negative, or neutral to express the students' general feelings about Algebrator™. A total of 27 students responded to the qualitative portion of the survey. Table 4 shows the counts for each category relative to A and AP (combined) and LAP.

Table 4

Qualitative Question on Algebrator™ Technology Survey

Code	A & AP	LAP
Positive	4	2
Neutral	7	1
Negative	10	3

The LAP, AP, and A instructors maintained teaching journals throughout the summer session. The A and LAP instructors each indicated that the students used Algebrator™ in class at least 11 out of 23 days. The AP instructor recorded only 1 day of in-class usage by the students. Students posed questions, related to non-in-class Algebrator™ use, on approximately 17% of the days to each of the A and LAP instructors. The AP instructor noted these types of questions on 4% of the days. The AP and A instructors noted that computers were becoming a distraction in class.

To investigate RQ4, the Pre-Homework Survey results from LAP, AP, and P were combined and a 95% confidence interval was found to evaluate the extent that students thought pre-hw prepared them for the next day's class (Question 3). The confidence interval is 2.8952 to 3.5831 which includes the neutral value of 3.

The qualitative data were coded as positive, negative, or neutral. Of the 46 students who completed the survey, 38 responded to the qualitative portion of the survey: 13 positive, 10 neutral, and 15 negative.

Discussion

For RQ1, this pilot study found that LAP, A, and AP performed academically at the same level as P. Concerns that Algebrator™ does too much "thinking" for the students and may deprive students of real experiences with natural environments were not evident in this study.

In regards to RQ2, the pilot study found no statistically significant gains in performance from utilizing pre-hw. However, from reviewing the test results, the students in the LAP, AP, and P groups averaged higher scores on pre-hw questions than A. Thus, some positive gains in performance realized may be the result of the students being familiar with the questions through previous exposure.

In response to RQ3 through ANOVA, the Technology Survey results purported no statistical significance. The overwhelming majority, over 70%, of all students preferred to use calculators in the developmental mathematics classroom at the end of the course. This is an increase from an average of 56% in the beginning of the course. The preference to use only computers in the developmental mathematics classroom was close to zero for all groups throughout the course. These responses suggest that students believe that they are receiving more benefits from using a calculator than a computer. Some student comments included "calculators in the classroom are very helpful", "calculators are a resourceful tool", "the algebrator [*sic*] can be hard to understand so the calculator to me seems to be the better choice, plus not everyone has a personal computer", and "calculator – yes. can't use a computer on a test."

The open-ended responses of the Technology Survey displayed an array of changing attitudes toward use of technology in the classroom. By the end of the course, students in LAP believed unanimously that technology should be used in the developmental mathematics classroom. Those whose attitude changed to this position said "I think this class has changed my mind about computer use in class. Now I think that it is acceptable." The strength in positive comments together with the nature of the comments support the claim that the incorporation of computer-based instruction yields favorable results in regards to the affective domain. The combined students in A and AP sections as well as the P section had a decline in their overall attitude toward technology. Again, this is evidence that integration is more likely to yield positive results.

Regarding RQ3, the pilot study found statistical significance between LAP and combined A and AP for Questions 3 and 7 in the Algebrator™ Technology Survey. Question 3 focuses on Algebrator™ navigation. LAP found the Algebrator™ menus easier to use than A and AP (combined). Hence it can be concluded that the incorporation of Algebrator™ into the lessons had an effect on the feasibility of Algebrator™ usage. Question 7 asked about the use of Algebrator™ in class. Again, the statistically significant results show that the use of Algebrator™ -based lessons had favorable implications in terms of frequency of use. Question 3 and 7 together indicate that the students perceived the methods used to incorporate Algebrator™ in the classroom as effective. In a future study, continuing these methods is advised.

Question 8 solicits information about increasing the number of lessons that incorporate Algebrator™. The 95% CI captures the difference between those who responded positive and those who did not. Thus, future studies may find that increasing the number of lessons will not negatively impact the study, yet may produce stronger results.

The qualitative responses in the Algebrator™ Technology Survey suggest that the students believed that they either did not benefit from Algebrator™ or they found the software difficult to use. One negative response from LAP is "It didn't motivate students to learn the lesson, because it gave you the answers. Also, it didn't always clearly work a problem out." From the combined A and AP sections the following responses were noted, "I think it is hard to understand." and "I believe navigating is difficult. Also, input is difficult. What its uses are appear vague." The remarks seem to imply that possibly more instruction or training on the software could have helped the students with obtaining more assistance from the software. One student in the combined group said, "I wish I used it more." Four other students mentioned that they never used the Algebrator™. These statements of opinion hinted that possibly more integration and usage of the product could have helped students utilize and receive more support from Algebrator™. As can be seen from Table 4, some students did receive tutoring help from the software as shown in the following quote, "It's a really good program. It is easy to use and made homework a lot easier."

The teaching journals revealed that the LAP and A instructors reported some students regularly using Algebrator™ in class. Students used the product during lectures, group activities, and quizzes. The LAP and A students seemed more comfortable using the product than AP.

Overall, the more students were exposed to technology and/or engaged in technology in the classroom, the more likely their attitudes towards technology improved. In P, where no computers were in the classroom, there was

a dramatic decrease in the students' disposition towards technology in the classroom. But, "all" of LAP responded with the highest Likert score signifying that they definitely perceived a benefit from the use of calculators in the developmental mathematics classroom. Another observation was that students in the LAP, AP, and A sections did not recognize an overall increase in understanding in mathematics as a result of having access to Algebrator™ or from the integration of Algebrator™ into the lesson plans.

For RQ4, from the Pre-Homework Survey, the determination that the 95% confidence interval contained the neutral value 3 purports that LAP, AP, and P had mixed reactions regarding whether pre-hw better prepared them for the next day's class. Some students found pre-hw advantageous and stated, "The pre-homework helped me look ahead the the [*sic*] next lesson. Since I had already done the pre-homework the lesson was relivent [*sic*] and not foreign." Because the semester is a short summer session, some students did not have time to do pre-hw. A remark with this sentiment was "I do think the concept is great; but being in the summer session is already overwhelming with the amt. of homework issued. However, in the fall/spring semester, I think it's a good idea to get the student looking ahead." For other students, looking ahead and seeing what is scheduled for the next day's mathematics content was not a task they wanted to pursue and/or they felt unprepared. They stated, "Didn't prepare me because I didn't get any instructions on how to do it. Not good with learning on my own - need instruction on how to do it, it's just that I didn't know how to do any of the problems so I feel like it didn't really help a whole lot."

Limitations/Assumptions

This pilot study utilized three assumptions. First, the study assumes that all students responded truthfully to all survey questions. The second assumption is that a delay of three days in delivery of the software did not impede the student usage of the software product. The last assumption concerns the variations of grading policies for pre-hw. For P, the instructor added points to students' homework grades, thus it employed positive reinforcement in the classroom. In AP and LAP, the pre-hw was graded and recorded as a separate grade. Although awarding additional points can make a difference in students' results, it is assumed that these differences in grading policy did not influence the results found in the study.

This pilot study had 12 limitations. The first two limitations were associated with the students of the study. Student assignments in the developmental mathematics classes were not randomized and not all students who completed the course also participated in the various surveys. There were three limitations linked to the instructors involved in the pilot study. One instructor was a novice, all researchers were instructors, and all instructors had relatively minimal experience with Algebrator™. The next two limitations were related to the fact that the pilot study was conducted over a summer session that is less than 5 weeks long and not a longer 16-week semester, leaving students with less free time to learn and take advantage of a new software package. Additionally, the shorter session may have limited the pre-hw study because students may not have enough time to complete all assignments. The eighth and ninth limitations were that pre-Algebrator™ Technology surveys and pre-Pre-Homework Surveys were not conducted. The actual changes in self-efficacies before and after this course were not measured. The tenth limitation was that there were no pre-hw questions included in Examinations 1 and 2. Pre-hw questions were included in Examinations 3 and 4 and the final. The eleventh limitation was that for classes where Algebrator™ was either integrated or accessible, Algebrator™ was available for student use at anytime, except during examination time. The instructors allowed students to utilize calculators anytime during the classes, thus there were no limitations regarding calculator usage. The last limitation is that the sample size consisted of four sections of approximately 20 students each.

Recommendations

Based on the findings of this pilot study the following recommendations for a larger study should address the limitations. In particular the study should be conducted in a longer academic semester and pre-self-efficacy surveys should be administered. To further improve similar studies a recommendation regarding uncoupling the idea of investigating pre-hw and Algebrator™ effectiveness is essential. Nevertheless, these studies should invoke a true control group and consider developing a mathematics pre-test to serve as a covariate.

With no gains found with the incorporation of at most five Algebrator™ -dependent lessons, further research should be performed where Algebrator™ is utilized in a more integrated fashion. Possible implementations of the software may include

- The instructor could assign a problem to the students, direct the students to use the software to investigate the problem, and then ask the students to explain how to solve the problem. Thus, Algebrator™ would be used as part of a discovery instruction.
- The instructor could require students to write one or two sentences every time one of the Algebrator™ Explanation, Solve-Steps, or Solve-All tools is used. This technique provides students the opportunity to reflect on the algorithm or procedure being used to solve a problem. As technology use increases in the developmental mathematics classroom, the study of algorithm becomes more important (Heid, 1997). These writing exercises could assist students with learning the critical aspects of mathematical content when integrating technology in the classroom.
- The instructor could use Algebrator™ as an amplifier, a tool with the ability to increase the number of examples along with differing types of examples to students (Heid, 1997). Students get more practice in this environment. Also, the students are able to print those exercises which they find problematic and get further assistance from the instructor.
- The instructor could integrate Algebrator™ into all lesson plans of the developmental mathematics curriculum.

In regards to use of Algebrator™ three recommendations should be considered for similar studies. The first recommendation pertains to three useful applications: (a) the prompts in the Wizard are helpful when teaching a new topic, (b) the Solve-Step or Solve-All are nice features if a student wants to verify processes, and (c) the Explain feature includes definitions, properties, and formulas that allow students to build understanding. Second, the instructor should take measures to ensure that Algebrator™ displays the algorithm that supports their level of instruction because Algebrator™ is designed for Algebra I through College Algebra. Third, the instructor should verify that Algebrator™ generates explanations that support the instruction of their course.

In regards to aspects of the pre-hw study, recommendations for developing pre-hw are given. Pre-hw could include some guided instruction that would foreshadow the next lesson. A larger pool from which to draw pre-hw and examination questions will support the fidelity of the study.

Summary

This pilot study sought to evaluate the effectiveness of the use of Algebrator™ and pre-hw in a developmental mathematics course in regards to academic performance. Although it did not yield a change in academic performance, future studies may by addressing many of the limitations or by implementing the recommendations.

One of the most interesting conclusions is that incorporating technology in lesson plans yields more effective use by students. Students need to see and use the technology on a regular basis to become comfortable enough with the tool to use it on their own without being prompted.

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Texas State University – San Marcos

Evaluation of the Comprehensive Student Success Program

Attachment D: Evaluation Budget

I. RFP Budget Line Item	II. Item Description	III. Purpose and Explanation	IV. Percent of Time on Project	V. Amount (June 1, 2011 through August 31, 2011)	VI. Amount (September 1, 2011 through August 31, 2012)	VII. Total Amount
12.7.1	**Principal Investigator/Co-investigator(s)**			**$ 27,693**	**$ 39,723**	**$ 67,416**
		Dr. Selina V. Mireles, PI	25%	$ 7,526	$ 19,380	$ 26,907
		Dr. Eric Paulson, Co-PI	25%	$ 15,333	$ 7,897	$ 23,230
		Dr. Taylor Acee, Co-PI	25%	$ 4,833	$ 12,446	$ 17,279
12.7.2	**Other Professional Staff**			**$ 4,732**	**$ 43,902**	**$ 48,634**
		Dr. Fernando Vasquez	25%	$ -	$ 9,442	$ 9,442
		Ms. Thersa Westbrook	25%	$ -	$ 8,370	$ 8,370
		TBN, Post-Doctoral Research Specialist	25%	$ 2,500	$ 10,000	$ 12,500
		TBN (2), Doctoral Research Assistant, Mathematics Education and Developmental Education	25%	$ 2,232	$ 16,090	$ 18,322
12.7.3	**Support Staff**			**$ 2,100**	**$ 8,400**	**$ 10,500**
		Program Coordinator	10%	$ 750	$ 3,000	$ 3,750
		Logistics Coordinator	10%	$ 750	$ 3,000	$ 3,750
		Technology Support	20%	$ 600	$ 2,400	$ 3,000

12.7.4	**Fringe Benefits**			**$ 9,264**	**$ 23,368**	**$ 32,633**
12.7.5	**Travel**			**$ -**	**$ 5,271**	**$ 5,271**
		Site visits (5)		$ -	$ 3,240	$ 3,240
		Round-trip to Austin		$ -	$ 32	$ 32
		Conferences			$ 2,000	$ 2,000
12.7.6	**Professional or Other Fees**			$ 250	$ 1,250	$ 1,500
		Organizational Costs		$ 250	$ 1,250	$ 1,500
12.7.7	**Student Incentives (if applicable)**			**$ -**	**$ -**	**$ -**
12.7.8	**Other Direct Costs**			**$ 19,100**	**$ 47,250**	**$ 66,350**
		Resource Materials		$ 5,000	$ 15,000	$ 20,000
		Resource Materials for CSSPs		$ -	$ 7,500	$ 7,500
		Program Supplies and Materials		$ 5,000	$ 15,000	$ 20,000
		M&O		$ 4,100	$ 5,000	$ 9,100
		Technology Support		$ 5,000	$ 4,750	$ 9,750
Total ALL Program Costs (Equals total of 12.7.1 through 12.7.8 above)						$ 232,304
	Cost Sharing from Applicant			$ 4,000	$ 4,000	$ 8,000
		Department of Mathematics - Student Worker		$ 2,000	$ 2,000	$ 4,000
		Department of Curriculum and Instruction - Student		$ 2,000	$ 2,000	$ 4,000

		Worker				
Proposal Amount (Equals ALL Program Costs LESS Cost Sharing)				$ -	$ -	$ 232,304

Attachment E: Letters of Support

Attachment E-1: Letter of Support from the Chair of the Department of Mathematics

Attachment E-2: Letter of Support from the Chair of the Department of Curriculum & Instruction

Attachment E-3: Letter of Support from the Dean of the College of Science

Attachment E-4: Letter of Support from the Dean of the College of Education

Attachment F: Sample Instruments

Attachment F-1: Site visit protocol

Attachment F-2: Theoretical Framework of Rubric

Attachment F-3: THECB Suggested Evaluation Report Template

Attachment F-4: Sample Institutional Review Board Application

Attachment F-5: Using Qualitative Methods

Attachment F-6: Sample Advising Survey

Attachment F-1: Site visit protocol

Site Visit Protocol

1. Negotiate contact dates (pre-site visit (virtual), site visit, post-site visit (virtual)).
2. Establish logistics.
3. Host pre-site visit (virtual).
    a. Use rubric to identify interventions.
    b. Establish intervention effectiveness evaluation including tutorials on building self-evaluation tools especially methodology and understanding quantitative and qualitative data collection and analysis.
    c. Communicate site visit expectations and agenda.
    d. Provide technical assistance.
4. Conduct site visit.
    a. Host institution presents program description.
    b. CSSP evaluation team observes interventions at work.
    c. CSSP evaluation team meets with program faculty, staff, and students.
    d. CSSP evaluation team works collaboratively with CSSP site to complete intervention identification rubric.
    e. CSSP evaluation team provides technical assistance.
5. Host post-site visit (virtual).
    a. Provide feedback and recommendations.
    b. Provide suggestions for practice.
    c. Provide technical assistance.

Attachment F-2: Theoretical Framework of Rubric

Rubric Focus I. The CSSP Performance Measures. These are the three areas of *success*, *support*, and *training* as defined in the CSSP grant RFA, in Appendix C: Performance Measures.

CSSP Performance Measures: Success, Support, Training					
Performance Measure	**Essential Element**	**Existing**	**Developing**	**Expanding**	**Examples**
Success	Increase in the number of students who enroll in and successfully complete the targeted course(s).				• Number of students enrolled in targeted course(s), prior to and after interventions. •Number of students who complete the targeted course(s) with C or better prior to and after interventions.
Notes					
Success	Increase in the number of students in targeted courses who earn a diploma or certificate within 5 years of the beginning of the intervention.				Two to 5 year degree/certificate completion rates for cohorts of students enrolled in targeted courses (reported each semester).
Notes					
Support	Increase in the number, type and quality of structured activities or opportunities available to students in the targeted courses, including advising, counseling, and other support service(s).				•Number of structured activities or opportunities (e.g., advising, counseling, mentor services, and other support services) available to students in targeted courses, accompanied by descriptions and quality ratings of each intervention **prior** to program implementation and **after** program implementation (reported each semester).
Notes					
Support	Increase in the amount and quality of student contact with advisors, counselors, and additional support service(s) available to students in targeted course(s).				•Number of participant contacts with advisor, counselor or mentor, accompanied by descriptions and quality ratings of each intervention **prior** to program implementation and **after** program implementation (reported each semester).
Notes					

Training	Faculty and staff who work with students in targeted courses successfully complete training.				•Number of staff and faculty eligible for training (reported each semester). •Number of staff successfully completing training (reported each semester).
Notes					
Training	Faculty and staff who complete training are satisfied with the training, can articulate the vision of the training, and apply the theories and practices learned to help students succeed.				•Changes in faculty/staff beliefs, and professional behaviors after training compared to faculty/staff beliefs and professional behaviors prior to training as measured by surveys, interviews and observations.
Notes					

Rubric Focus II. Goals of Program. These are the comprehensive student success service goals as defined in the CSSP grant RFA, section 7.1.

Goals Of Program: Section 7.1.1 and Section 7.1.2

7.1.1: Identification of existing *policies/practices*	**Plan to Evaluate**	**Plan to Modify**	**Timeline to Modify**	**Objective Measures Accomplished**	**Outcome**
Notes					
Notes					
7.1.1: Identification of existing *faculty involvement & incentives*	**Plan to Evaluate**	**Plan to Modify**	**Timeline to Modify**	**Objective Measures Accomplished**	**Outcome**
Notes					
Notes					
7.1.1: Identification of existing *communications with students*	**Plan to Evaluate**	**Plan to Modify**	**Timeline to Modify**	**Objective Measures Accomplished**	**Outcome**
Notes					
Notes					

7.1.1: Identification of existing *resource connections*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

7.1.1: Identification of existing *GPA status of students*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

7.1.1: Identification of existing *community and academic services*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

7.1.2: Identification of existing *student completion rates in targeted courses*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

7.1.2: Identification of existing *degree/ certification completion rates for targeted students*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

7.1.2: Identification of existing *faculty involvement in success initiatives*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

7.1.2: Identification of existing *student participation in institutional activities*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

7.1.2: Identification of existing *policies / procedures to encourage student success and completion*	Plan to Evaluate	Plan to Modify	Timeline to Modify	Objective Measures Accomplished	Outcome
Notes					
Notes					

Rubric Focus III. Comprehensive Student Success Plan. This is the description of the required program components of student support services and faculty/staff training as defined in the CSSP grant RFA, section 10.1.2.

Performance Measure	Essential Element	Existing	Developing	Expanding	Examples
10.1.2.1 Student Support Services	create and/or expand the availability and quality of academic advising and counseling services for students enrolled in courses with a high withdrawal or failure rate				child care, financial aid packaging, supplemental instruction, mentoring, tutoring, career counseling, and other wrap-around services
Notes					

10.1.2.1 Student Support Services	provide advising, counseling, and other support services during times appropriate for prospective working adult students (i.e. evening and weekend access times)				
Notes					
10.1.2.2 Faculty and Staff Training on Access, Participation and Incentives	increase the availability of training opportunities and activities related to early and ongoing intervention and success				child care, financial aid packaging, supplemental instruction, mentoring, tutoring, career counseling, and other wrap-around services
Notes					
10.1.2.2 Faculty and Staff Training on Access, Participation and Incentives	comprehensive, sustained training for faculty providing direct services to students enrolled in courses with a high rate of failure or withdrawal				strengthening instructional delivery and pedagogy and/or specific orientation and program requirements
Notes	Activities such as one-time conferences and workshops for individuals are not allowed under this strategy.				

Rubric Focus IV. Integration of Texas College and Career Readiness Standards (CCRS). This is the aspect of the rubric that is concerned with the identification of existing performance indicators, missing performance indicators, and potential performance indicators for courses the institution designated in their Student Success Survey. This pertains to section 10.1.3 in the CSSP grant RFA.

Integration of Texas College and Career Readiness Standards (CCRS) 10.1.3				
Course Designated in Student Success Survey	***Existing* CCRS Performance Expectations**	***Absent* CCRS Performance Expectations**	***Potential* CCRS Performance Expectations**	**Plan for Implementing CCRS Performance Expectations**
Notes				
Notes				

Notes				
Notes				
Notes				
Notes				

Attachment F-3: THECB Suggested Evaluation Report Template

APPENDIX C - THECB SUGGESTED EVALUATION REPORT TEMPLATE[1]

I. Executive Summary (1 page maximum)
   a. Brief program description
   b. Key highlights findings (bulleted)
   c. Key Recommendations (bulleted)

   (Section I should be able to stand alone if pulled out from the full document. Use bullets where appropriate. Keep all text short and clean and to the point)

II. Introduction
   a. Brief history of the program (where applicable)
   b. Theoretical background of the program such as relevant literature, statute, policies, if applicable

III. Brief Description of Key Program Components
   a. Goals (long and short term)
   b. Inputs (resources, people)
   c. Outputs (people served by the program by relevant categories and characteristics)

IV. Evaluation Methods
   a. Research questions
   b. Briefly describe participants (samples/subsets/groups in analyses); procedures; measures/indicators; and data collection instruments/tools.
   c. Explain how all items above will document the goals, inputs, outputs, and outcomes.

V. Results/Outcomes
   a. Organize by research questions (not by data source) (use graphs and charts as appropriate)
   b.

VI. Summary/Conclusion
   a. General summary
   b. Strengths and limitations of the study
   c. Next steps
   d. Recommndations (as appropriate and in consulation with THECB research and evaluation staff).

VII. References (where applicable)

Appendix A: Separate reports on individual program sites (where applicable)

Appendix B-ZZ: Copies of instruments used (where applicable)

[1] All reports to the THECB should comply with the THECB Style manual. Awarded Applicant will be provided with a copy of the style manual.

Attachment F-4: Sample Institutional Review Board Application
Application for IRB Exemption Data Sheet

IRB Exemption Application Number: EXP2010C5141
Section I

1. This project is: Funded Research

2. If you are a student, please provide your supervising faculty member's full name:

Section II

1. If this is an academic or classroom project, does the scope extend beyond Texas State University?

No

2. Would you describe this project as "a systematic investigation, designed to develop or contribute to generalizable knowledge?

Yes

3. Will the results of your project be put on the internet, shared at a conference, published, or otherwise disseminated?

Yes

4. Will identifiable private information from individuals be collected from contact with research participants ?

No

5. Will identifiable private information from individuals be collected from other sources (e.g. medical records)?

No

6. Does the project involve fetuses, pregnant women or human in vitro fertilization?

No

7. Does the project involve prisoners?

No

8. Does the project involve any persons who are mentally impaired or homeless or who have limited autonomy?

No

9. Does the project involve the review of medical records if the information is recorded in such a way that subjects can be identified, directly or through identifiers linked to the subjects?

No

10. Does the project involve survey or interview techniques which include minors as subjects in which the researcher(s) participate in the activities being observed?

No

11. Will a drug, biological product, medical device, or other product regulated by the FDA be used in this project?

No

12. Will the participants be asked to ingest substances of any kind?

No

13. Will the participants be asked to perform any physical tasks?

No

14. Does the research attempt to influence or change participants' behavior, perception, or cognition?

Yes

15. Does the project involve questions or discussions of sensitive or deeply personal aspects of the subject's behavior, life experiences or attitudes? Examples include substance abuse, sexual activity, sexual orientation, sexual abuse, criminal behavior, sensitive demographic data, detailed health history, etc.

No

16. Does the project involve techniques which expose the subject to discomfort, harassment, embarrassment, stigma, alarm or fear beyond levels encountered in the daily life of a healthy individual?

No

17. Does the project involve the deception of subjects?

No

18. Does the project involve videotaping or audiotaping of subjects?

No

Section III

1. If you are choosing one of the six federal categories of exemption, which **one** are you choosing? **If your project falls under more than one exemption, choose the one that is most applicable. You may cite the others in #3 below.

Category 1 (ii)

Please note for questions 1, 3, and 4 :

The text areas are limited to 2000 characters/approximately 300 words. Even though you are allowed to type more than the specified limit, those additional words/characters will be cropped/cut off when you move to the next question.

2. What is the purpose of the project? (300 words or less)

The purpose of the project is to develop, demonstrate, and evaluate (1) innovative course options for mathematics, reading, and learning support; (2) on-line, non-course based thematic mathematics and learning support modules; (3) a systemic, unified curricular component based on the Texas College & Career Readiness Standards Cross Disciplinary Standards to be incorporated into each developmental

education course; and, (4) institutional frameworks that systemically afford equity and access to underprepared learners.

3. Explain how this exemption category pertains to your project: (300 words or less)

Category 1 (ii) pertains to this project in that the effectiveness of curricular innovative options will be evaluated. Furthermore, research-based instructional techniques already proven to be effective with developmental education students will be utilized.

4. If you believe your project poses no risk to human participants or should be exempt from IRB review for other reasons, please explain: (300 words or less)

This project poses no risk to human participants and should be exempt from IRB review.

Exempt Categories of Research listed at 45 CFR, Part 46, Sec. 101(b)
(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as
(i) research on regular and special education instructional strategies, or
(ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and
(ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
(Please note: Surveys on sensitive or personal topics which may cause stress to study participants may not be exempt from IRB review.)
(Note: The section of this category pertaining to standardized educational tests may be applied to research involving children. This category may also apply to research with children when the investigator observes public behavior but does NOT participate in that behavior or activity. However this section is NOT applicable to survey or interview research involving children.)
(3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (2) of this section, if:
(i) the human subjects are elected or appointed public officials or candidates for public office; or
(ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.
(Example: existing data, records review, pathological specimens)
(Note: This data must be in existence before the project begins)
(5) Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine:
(i) public benefit or service programs;
(ii) procedures for obtaining benefits or services under those programs;
(iii) possible changes in or alternatives to those programs or procedures; or

(iv) possible changes in methods or levels of payment for benefits or services under those programs.
(Note: Exemption category refers to federal government research)
(6) Taste and food quality evaluation and consumer acceptance studies,
(i) if wholesome foods without additives are consumed or
(ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture

Attachment F-5: Using Qualitative Methods

Using Qualitative Methods

Qualitative methods are useful for obtaining data that quantitative methods would not gather. Qualitative data capture complex human behavior and provide patterns and/or themes that emerge from all the textual data gathered by participants. Thus, no inherent hypothesis is stated when using qualitative methods. Instead, we wait for themes to emerge and we analyze data, interviews, dialogues, speeches, focus groups, etc. using inductive thinking.

We will concentrate on two approaches towards gathering qualitative data: focus groups and the interview process. We will also provide a system for analyzing qualitative data.

Focus Groups

Focus groups require an in-depth interviewing process. Interaction between the researcher, moderator, and group members is essential for mining information in a verbal format. The purpose of a focus group is to extract data and insight from a group that has a specialized view and knowledge about the particular area under study. Generally, the researcher needs to develop questions that are pertinent to the study taking place. Some sample questions could be as follows:

1. Tell us about your advising experience
2. What was your favorite part when you went through advising?

These questions are presented to the focus group, which then engages in a dialogue expressing how they felt with a particular process or experience they had. Groups like these are crucial because they have a shared experience of what they went through. Discussing the questions presented to the group allows for a comfortable understanding of what can be shared. Environments where an individual participant is alone may not invoke prior and crucial knowledge that could be useful to the researcher.

The interviewer or moderator is crucial in planning a successful focus group. He will lead the focus group discussion to the important elements that are needed for the research questions. The discussion should be recorded for detailed data analysis later with the help of qualitative software. First, the recorded data should be transcribed. Once transcribed, the researcher will input the transcribed data into a qualitative software program called NVIVO. NVIVO has been known for breaking down text into thematic units that are easy to understand. Again, an inductive approach is taken towards understanding the data. NVIVO will lead the researcher in finding common themes that have emerged from the recorded voices of our focus group. The common themes will converge to a point of relevance for the researcher. In other words, a theme of how they go about advising may emerge as something important to write about.

Interview Process

The interview is also a qualitative method that is valuable to the researcher. For the most part, interviews are conducted face-to-face. Interviews could be structured, unstructured, semi-structured, nondirected, and open-ended. The key to the one-to-one interview is to ask relevant questions that are pertinent to the research at stake. Here is a step by step guide to the interview process.

1. Theme: You should have a general theme for the research being investigated. Themes are important for formulating the proper interview questions to the interviewee.
2. Designing: Plan a design that facilitates the interview data and your research. In other words, make sure your interview questions are relevant to your research question.
3. Interviewing: Conduct the interviews based on an interview guide
4. Transcribing: Prepare the interview material transcription and analysis.
5. Analyzing: Decide what data analysis will be appropriate for your research. It is recommended that you use NVIVO, a qualitative software tool.
6. Verifying: Make sure the data are reliable and valid. Reliable results could be checked by looking for similar themes across the interviewees. Validity means that your questions or data gathered investigates what is intended to be investigated

7. Reporting: At this point, the findings of the data are communicated. The key is to make the data readable and relevant. We must make sure we are ethical about reporting the data appropriately.

Focus groups and the interview process are two simple qualitative tools that can be used for standalone research or it can be couple with quantitative methods. We should not discount the important of qualitative collection methods that are useful for any research. However, more importantly, it a bridge to those voices that are underrepresented.

Attachment F-6: Sample Advising Survey

This web survey is connected to your first meeting with your academic advisor. Type your advisor's name in the box below.

1. Did you seek advising from someone other than your assigned academic advisor?
   a) Yes
   b) No
2. What statement best describes how interactions between you and your advisor are initiated?
   a) I initiate contact via email, phone or office visits.
   b) My advisor initiates contact via email, letter, or phone.
   c) Neither of the above.
3. I prepare for meetings with my advisor (e.g., my questions/concerns about degree requirements, college policies/procedures, future academic plans, etc. are well thought out.).
   a) Strongly Disagree
   b) Disagree
   c) Neither Agree nor Disagree
   d) Agree
   e) Strongly Agree
4. My advisor is readily available to me during office hours, by appointment or by email throughout the semester.
   a) Strongly Disagree
   b) Disagree
   c) Neither Agree nor Disagree
   d) Agree
   e) Strongly Agree
5. My advisor helps me understand degree requirements, college policies/procedures, asks about my academic progress, and refers to necessary report, transcripts, College Catalog(s), etc.
   a) Strongly Disagree
   b) Disagree
   c) Neither Agree nor Disagree
   d) Agree
   e) Strongly Agree
6. My advisor helps me identify my educational goals and interests and seems genuinely interested in the successful attainment of my goals, (e.g., helps me develop an academic plan).
   a) Strongly Disagree
   b) Disagree
   c) Neither Agree nor Disagree
   d) Agree
   e) Strongly Agree
7. My advisor encourages me to ask questions and to discuss my concerns.
   a) Strongly Disagree
   b) Disagree
   c) Neither Agree nor Disagree
   d) Agree
   e) Strongly Agree
8. If my advisor cannot respond to my concerns, s/he makes the effort to refer me to the appropriate person, office, or resource.
   a) Strongly Disagree
   b) Disagree
   c) Neither Agree nor Disagree
   d) Agree
   e) Strongly Agree
9. My advisor shows concern for me as an individual.
   a) Strongly Disagree
   b) Disagree
   c) Neither Agree nor Disagree
   d) Agree
   e) Strongly Agree
10. What statement best describes how you would rate your advisor overall?
    a) No opinion
    b) We didn't meet, I don't need an advisor
    c) Fair job, met once, briefly, for registration code
    d) Good job, helped me to understand my degree requirement
    e) Great job, helpful in areas beyond degree requirements

Attachment G: Tables

Table 1

CSSP Intervention Evaluation Table of Possible Group Comparisons for Each Outcome Measure.

Possible Groups	Outcomes					
	Course Completion	GPA	Earned Credit Hours	Degree/Certificate Completion	Pre/Post Strategic Learning Assessment Gains	Other measures to be determined based on specifics of intervention
Statistically-Matched Baseline Comparison Group					N/A	
Control Group						
Intervention Group						

Note. Data will be entered into each cell to form the basis of group comparisons.

Attachment H: References

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AMENDMENT TO CONTRACT

BMS Amendment Reference No. **6726**

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CONTRACTING PARTIES

Receiving Agency: Texas Higher Education Coordinating Board
Performing Agent: Texas State University – San Marcos
Amendment No.: **BMS 7159**

It is mutually understood and agreed by and between the undersigned contracting parties to amend said Contract as follows:

The following adds to Section 3 (STATEMENT OF SERVICES TO BE PERFORMED) A:

In addition to the Services specified in the original contract, the Performing Agency shall:

1. Perform one site visit of one-to-two day duration by at least one staff member each in fall 2011 and spring 2012 at each of the five CSSP sites; including preparation of site visit reports for each site visit that occurs.
2. Provide additional technical assistance to each of the five CSSP sites during spring 2012, including the drawing of appropriate random samples of 500 students (250 who were exposed to the interventions and a control group of 250 who were not exposed) to complete a measure (to be selected by THECB) in fall 2011 and spring 2012.

The following replaces and restates Section 4 (CONTRACT AMOUNT AND PAYMENT FOR SERVICE), A (CONTRACT AMOUNT):

> The total costs to be reimbursed by THECB to the Performing Agency during the term of this Contract shall not exceed **302,304.00, Three hundred and two thousand, three hundred and four dollars and no cents** ("Contract Amount").

The following replaces and restates Section 4 (CONTRACT AMOUNT AND PAYMENT FOR SERVICE), B (PAYMENT FOR SERVICES), 2:

> Subject to funding availability and to THECB's receipt of detailed invoices from Performing Agency, THECB shall reimburse Performing Agency in the following manner:
>
> First payment in the amount of $58,076.01 payable upon signing of the contract and receipt of an invoice on or about the first day of the month of August 2011, with three subsequent payments to be payable upon receipt and acceptance of deliverables and invoiced on the first of the months of February, 2012 (preliminary report), April, 2012 (completion of all spring site visit reports) and August, 2012 (final report) in the amount of $81,409.33 each.

To the extent there is any advancement of funds by THECB to Performing Agency, this is necessary to enable Performing Agency to fully perform the Services described in this Contract.

The following replaces and restates Section 6 (TERMS AND CONDITIONS), E (AUDIT AND ACCESS TO RECORDS), 2 (REIMBURSEMENT):

Reimbursement - In those cases where THECB advanced funds to Performing Agency, Performing Agency shall submit a final financial report to THECB within sixty (60) days following the expiration or termination of this Contract, setting forth the actual costs incurred. The report shall be accompanied by a payment in the amount of any excess funds, if any, advanced by THECB over costs actually incurred. Likewise, THECB reserves the right to require the reimbursement of any over-payments determined as a result of any audit or inspection of records on work performed under this Contract. Performing Agency shall reimburse THECB within 30 calendar days of receipt of notice from THECB of overpayment. Performing Agency's failure to comply with this provision shall constitute a breach of Contract. This provision survives the termination of this Contract.

The following replaces and restates Section 6 (TERMS AND CONDITIONS) F (OWNERSHIP OF WORK):

1. Ownership of Work – All work product generated as a result of this Contract Project, including but not limited to all information, materials, products, research, reports, studies, statistical analyses, work papers, approaches, designs, deliverables, systems, documentation, methodologies, concepts, research materials, data, photos, software, intellectual property or other property produced or generated in connection with this Contract, either completed or partially completed, shall be the sole property of THECB and all rights, title, and interest in and to the work product shall vest in THECB upon payment for the Services. All such work product shall be delivered to THECB by Performing Agency upon completion, termination, or cancellation of this Contract. All property rights, including publication rights, hereunder shall be retained by THECB, and Performing Agency shall assert no right in law or equity to such work product. THECB shall have the right to obtain and to hold in its own name any and all patents, copyrights, marks, or such other protection as may be appropriate to the subject matter, and any extensions and renewals thereof. Performing Agency shall ensure that this provision, "Ownership," is contained in any subcontract Performing Agency is authorized by THECB to award. Performing Agency may, at its own expense, keep copies of all its writing for its personal files. Performing Agency shall not use, willingly allow, or cause to have such work product used for any purpose other than the performance of Performing Agency's obligations under this Contract without the prior written consent of THECB; provided, however, that Performing Agency shall be allowed to use non-confidential materials for writing samples in pursuit of work.

2. License – In addition, and as a limited exception to Section F. 1., THECB hereby grants a non-exclusive, non-transferable, non-assignable license to Performing Agency and its faculty associated with the Work Product to use the Work Product under this Contract for educational purposes consistent with Performing Agency's educational mission, including publication of scholarly works. This license is revocable by THECB at any time and for any reason or no reason at all. The license

rights do not excuse Performing Agency from compliance with applicable requirement of any federal or state laws, rules, or regulations that apply to this license for this purpose from THECB. Each research product produced pursuant to this license through use of the Work Product under this Contract shall contain a disclaimer that clearly states that the conclusions of the researcher or other producer are not necessarily those of the THECB or the State of Texas. The parties may jointly waive this requirement in writing for any individual project.

APPROVAL

The parties signing below accept this amendment. All work performed shall be to the satisfaction of the THECB. All other terms and conditions not hereby amended are to remain in full force and effect.

Texas Higher Education Coordinating Board

_____ _____

Susan Brown, Date
Assistant Commissioner
Planning and Accountability
Texas Higher Education Coordinating Board

Texas State University - San Marcos

_____ _____

W. Scott Erwin Date
Director, Office of Sponsored Programs
Texas State University-San Marcos

THECB Contract Number: **BMS 10473**

STATE OF TEXAS §
COUNTY OF TRAVIS §

INTERAGENCY CONTRACT

This Contract is entered into by and between the Texas State Agencies shown below as Contracting Parties, pursuant to the authority granted and in compliance with the provisions of the Interagency Cooperation Act, Texas Government Code, Chapter 771.

Section 1.0 CONTRACTING PARTIES:

Receiving Agency:	Texas Higher Education Coordinating Board 1200 East Anderson Lane Austin, Texas 78752
Performing Agency:	Texas State University-San Marcos 601 University Drive San Marcos, TX 78666

Performing Agency's Remittance Address
(if different from Permanent Mailing Address listed above):

Section 2.0 TERM OF CONTRACT:

The term of this Contract shall begin on **October 31, 2012** and shall expire **October 31, 2013** ("Contract Term").

Section 3.0 PURPOSE AND STATEMENT OF SERVICES TO BE PERFORMED:

A. Evaluation of Comprehensive Student Success Program (CSSP)

SERVICES: During the Contract Term, the Performing Agency shall provide the following services ("Services"):

The evaluation shall include the following unless a change is approved in writing by THECB:

- Revised, detailed evaluation plan and timeline for the contract period with critical dates for deliverables and assigned roles and responsibilities submitted to THECB staff for the review and approval within the first month after the contract is executed;
- A process evaluation including: 1) at least one site visit to each of the four continuing CSSP sites (North Central Texas College, University of Houston Downtown, Austin Community College and Houston Community College) between October 31, 2012 and June 1, 2013; 2) at least two site visits, one

in the fall and one in the spring, to each of the four new CSSP sites (Texas A&M-Commerce, University of Texas-Pan American, Texas Woman's University and the University of Houston) of which one may be a virtual site visit.

- Revise site visit protocols, data collection forms, and rubrics as needed in collaboration with THECB staff.
- Purchase and monitor the administration of the LASSI to students in the intervention and control courses identified by the program sites.
- Order LASSI's for all sites, and distribute access and testing information on the LASSI assessment to all sites. Submit bills for reimbursement to the sites and THECB as directed by THECB staff not to exceed $20,000 total.
- Collaborate with THECB staff to determine what outcome data to collect.
- Collect, verify and analyze outcomes data from each participating institution from the appropriate institutional office; including, but not limited to course grades and withdrawal rates, and semester-to-semester persistence rates for the intervention and control courses for data elements and program years (e.g., 2010-2011 and 2012-2013) not available in the THECB CBM data sets or not expected in time to meet reporting deadlines.
- Collaborate with THECB staff on generating suitable data from the THECB CBM data sets for data elements and years these data are available, for analysis by the Texas State research staff.
- Report on short-term and mid-term attainable outcomes, such as course completion and semester-to-semester, year-to-year persistence. Develop specific measure in collaboration with THECB staff.
- Write a preliminary report on the evaluation work, due January 30, 2013. Write a preliminary annual report due August 1, 2013 on data from sites covering the period October 31, 2012 through June 1, 2013. Submit a final evaluation report no later than October 1, 2013.All reports should include, to the extent possible, information on promising CSSP models, best practices, and challenges to successful implementation and evaluation. Site visit reports must be submitted to THECB and the project sites simultaneously as soon as possible after their completion, but no later than the submission of the August 1, 2013 preliminary annual report.
- Provide at least two presentations addressing the CSSP and evaluation activities and findings to THECB Board, Board Committees or other appropriate stakeholders and audiences as agreed upon with THECB staff.
- Attend and participate in CSSP Program meetings and workshops.

B. CHANGE ORDERS OR AMENDMENTS: Performing Agency shall maintain an ongoing relationship with THECB during the Contract Term and will collaborate with the THECB on any modifications that may be necessary to the Services to meet the objectives of this Contract. A change may not be made to the Services except by a written request for change signed by the THECB and Performing Agency (a "Change Order" or "Amendment"). Each Change Order shall be sequentially numbered and deemed to automatically incorporate the terms of this Contract. Any alterations, additions, or deletions to the terms of this Contract shall be by an Amendment or

Change Order in writing and executed by both Parties to this Contract. All amendments shall be approved by THECB prior to THECB's execution. No contract amendment shall occur without the issuance of a written contract amendment by THECB. Costs not included and pre-approved by THECB shall not be eligible for reimbursement.

To the extent applicable laws, regulations, court orders, or official interpretations require either Party to include additional language in its contracts, each agrees to amend this Contract and to cooperate in the execution of any amendment to this Contract necessary to effectuate such laws, regulations, court order, or official interpretations unless the effect of such laws, regulations, orders or interpretation is to render performance hereunder impossible or in violation of law.

C. **INVOICES:** Performing Agency shall, in a good and satisfactory manner carry out the Services as called for in this Contract. Submission of an invoice shall constitute Performing Agency's certification that the Services have been performed in accordance with this Contract.

Section 4.0 CONTRACT AMOUNT AND PAYMENT FOR SERVICES:

A. **CONTRACT AMOUNT:** The total costs to be reimbursed by THECB to the Performing Agency during the term of this Contract shall not exceed **$230,000.00** ("Contract Amount).

B. **PAYMENT FOR SERVICES:**

1. The basis for computing reimbursable costs shall be as follows:

- ☒ Services of employees (e.g., salary, wages, fringe benefits)
- ☒ Service of supplies and materials
- ☐ Services of equipment
- ☐ Subcontracting costs or purchases of equipment
- ☐ Indirect costs
- ☒ Other: approved travel expenses, supplies and materials as referenced in revised budget submitted on or before November 30, 2012.

Costs not listed above must receive prior written approval from THECB.

THECB reserves the right to require the reimbursement of any over-payments under this Contract. The Performing Agency shall reimburse THECB for any over-payments within thirty (30) calendar days of receipt of THECB's written notice.

2. Subject to funding availability and to THECB's receipt of detailed invoices from Performing Agency, THECB shall reimburse Performing Agency in the following manner. All funds must be expended prior to August 13, 2013. Funds will be disbursed in five equal payments of $46,000 each based on the following deliverables schedule:

On or about, November 15, 2012	Upon receipt and approval of 2012-13 evaluation plan, timeline, and budget
On or about, December 21, 2012	Upon approval and distribution of annual data request to the sites
On or about, January 30, 2013	Upon receipt and approval of fall 2012 site visit reports and preliminary report
On or about, May 31, 2013	Upon receipt and approval of spring 2013 site visit reports
No later than, August 1, 2013	Upon receipt and approval of preliminary annual report

To the extent there is any advancement of funds, this is necessary to enable the Grantee to fully perform its obligations.

3. Payment by THECB shall be issued in accordance with Texas Government Code, Chapter 771 (the Interagency Cooperation Act).

Section 5.0 General and Special Provisions of Contract, Certain Certifications

Attached hereto and incorporated herein by reference are the General Provisions and the Special Provisions indicated below with an "X" beside each:

☒ Special Provisions A: Debarment and Suspension (required if using federal funds)
☒ Special Provisions B: Anti-Lobbying (required if using federal funds)
☒ Special Provisions C: Federal Terms and Conditions (required if using federal funds)
☒ Special Provisions D: Federal Funding Accountability and Transparency Act (FFATA) Addendum (required if using federal funds)
☐ Special Provisions E: Historically Underutilized Business Subcontracting Plan (HSP) (required for projects over $100,000 where subcontracting is anticipated)

Performing Agent further certifies that the individual or business entity named in this Contract is not ineligible to receive the specified contract and acknowledges that this Contract may be terminated and payment withheld if this certification is inaccurate.

Pursuant to Texas Government Code Section 572.054(b), a former employee/retiree shall not perform services on a particular matter that the former employee/retiree participated on (either through personal involvement or because the matter was within the employee's official responsibility) while employed at THECB. A violation of Texas Government Code Section 572.054(b) is considered a criminal offense. As such, Performing Agent must make full disclosure to THECB prior to entering into this Contract if it currently employs or subcontracts with a former employee/retiree of the THECB. Likewise, Performing Agent must make full disclosure of its intent to employ or subcontract with an individual who is a former employee/retiree of THECB.

Section 6.0 TERMS AND CONDITIONS:

A. ASSIGNMENT OR SUBCONTRACTING: No contractual rights, interest, or obligation shall be assigned, delegated, or subcontracted by the Performing Agency without prior written permission of THECB. Any attempted assignment, delegation, or subcontract by the Performing Agency shall be wholly void and ineffective for all purposes unless made in conformity with this section. No assignment, delegation, or subcontract shall relieve the Performing Agency of any obligation or responsibility under this Contract.

B. DISPUTE RESOLUTION: The dispute resolution process provided for in Texas Government Code, Chapter 771 (the Interagency Cooperation Act) shall be used by THECB and the Performing Agency to attempt to resolve any claim for breach of contract.

C. TERMINATION: THECB may terminate this Contract in accordance with the following:

1. Convenience – THECB may terminate this Contract for convenience upon thirty (30) days written notice to the Performing Agency.

2. Cause – Either Party may terminate the Contract immediately, either in whole or in part, upon notice to the breaching Party, or at such later date as the terminating Party may establish in such notice, upon the occurrence of any material breach, including failure to perform any or all of the Services under this Contract within the time specified, or, if applicable, any extension thereof. The terminating Party will provide an opportunity for consultation with the breaching Party prior to termination.

3. Interpretation – THECB may terminate this Contract immediately upon notice to Performing Agency in the event federal or state law is enacted, amended, or judicially interpreted so as to render continued fulfillment of the Contract, on the part of THECB, wholly unreasonable or impossible. THECB reserves the right, at its sole discretion, to unilaterally amend this Contract throughout the Contract Term to incorporate any modifications necessary for THECB's

compliance, as an agency of the state of Texas, with all applicable state and federal laws, rules, regulations, requirements, and guidelines.

4. Non-Appropriation – This Contract may be terminated if funds allocated to THECB should become reduced, depleted, or otherwise unavailable during the Contract term and to the extent that THECB is unable to obtain additional funds for such purposes. Upon receipt of THECB's written termination notice, the Performing Agency shall not incur new obligations after the effective date of termination and shall cancel as many outstanding obligations as reasonably practicable.

5. Upon termination for any reason, the Performing Agency shall deliver to THECB all work products produced hereunder as well as a comprehensive program evaluation. Performing Agency shall, unless otherwise mutually agreed upon in writing, cease all Services immediately upon the effective date of termination. THECB shall be liable to Performing Agency for that portion of Services authorized by THECB and which have been completed prior to the effective date of termination

D. APPLICABLE LAW AND VENUE: The exclusive venue of any suit brought concerning this Contract or its incorporated documents is fixed in any state or federal court of competent jurisdiction in Travis County, Texas. This Contract shall be construed by and governed in accordance with the laws of the State of Texas. Each Party shall comply with all applicable federal and state statutes, rules, and regulations. Performing Agency shall comply with all orders and decrees of any court or administrative bodies or tribunals in any matter affecting Performing Agency's performance, including if applicable, workers' compensation laws, minimum and maximum salary and wage statutes and regulations, and licensing laws and regulations. For the entire duration of the Contract, Performing Party shall maintain all required licenses, certifications, permits, and any other documentation necessary to perform this Contract. When required or requested by the Agency, Performing Party shall furnish THECB with satisfactory proof of its compliance with this provision.

E. AUDIT AND ACCESS TO RECORDS: Performing Agency understands that acceptance of funds under this Contract, or indirectly through a subcontract under this Contract, acts as acceptance of the authority of the State Auditor's office, THECB or any successor agency, as well as any external auditors selected by the State Auditor's office, THECB or any auditors selected by the United States (collectively referred to as "Audit Entities"), to conduct an audit or investigation in connection with those funds. Performing Agency further agrees to cooperate fully with Audit Entities in the conduct of the audit or investigation, including providing all records requested. The Performing Agency shall ensure that this clause concerning the authority to audit funds received indirectly by subcontractors through the Performing Agency and the requirement to cooperate is included in any subcontract the Performing Agency awards.

1. Maintenance of Records – The Performing Agency shall establish, maintain, and utilize internal program procedures sufficient to provide for the appropriate and effective management of all activities relevant to this Contract. Records and accounts shall be maintained in a manner that assures a full accounting for all funds received and expended by the Performing Agency in connection with this Contract. The Performing Agency shall make available for review, inspection, and/or audit all books, records, documents, and other evidence reasonably pertinent to performance on all work under this Contract, including any amendments hereto, in accordance with accepted professional practices for a minimum of three (3) years after completion or termination of this Contract.

2. Reimbursement – THECB reserves the right to require the reimbursement of any over-payments determined as a result of any audit or inspection of records on work performed under this Contract. The Performing Agency shall reimburse THECB for any over-payments within thirty (30) calendar days of receipt of THECB's written notice.

F. Ownership of Work – All work product generated as a result of this Contract Project, including but not limited to all information, materials, products, research, reports, studies, statistical analyses, work papers, approaches, designs, deliverables, systems, documentation, methodologies, concepts, research materials, data, photos, software, intellectual property or other property produced or generated in connection with this Contract, either completed or partially completed, shall be the sole property of THECB and all rights, title, and interest in and to the work product shall vest in THECB upon payment for the Services. All such work product shall be delivered to THECB by Performing Agency upon completion, termination, or cancellation of this Contract. All property rights, including publication rights, hereunder shall be retained by THECB, and Performing Agency shall assert no right in law or equity to such work product. THECB shall have the right to obtain and to hold in its own name any and all patents, copyrights, marks, or such other protection as may be appropriate to the subject matter, and any extensions and renewals thereof. Performing Agency shall ensure that this provision, "Ownership," is contained in any subcontract Performing Agency is authorized by THECB to award. Performing Agency may, at its own expense, keep copies of all its writing for its personal files. Performing Agency shall not use, willingly allow, or cause to have such work product used for any purpose other than the performance of Performing Agency's obligations under this Contract without the prior written consent of THECB; provided, however, that Performing Agency shall be allowed to use non-confidential materials for writing samples in pursuit of work.

G. License – In addition, and as a limited exception to Section F. 1., THECB hereby grants a non-exclusive, non-transferable, non-assignable license to Performing Agency and its faculty associated with the Work Product to use the Work Product under this Contract for educational purposes consistent with Performing Agency's educational mission, including publication of scholarly works. This license is revocable by THECB at any time and for any reason or no reason at all. The license rights do not excuse Performing Agency from compliance with applicable requirement of any federal or state laws, rules, or regulations that apply to this license for this purpose from THECB. Each research product

produced pursuant to this license through use of the Work Product under this Contract shall contain a disclaimer that clearly states that the conclusions of the researcher or other producer are not necessarily those of the THECB or the State of Texas. The parties may jointly waive this requirement in writing for any individual project.

H. INDEPENDENT CONTRACTORS: For purposes of this Contract and all services to be provided hereunder, the parties shall be, and shall be deemed to be, independent contractors and not agents or employees of the other party. Neither party shall have the authority to make any statements, representations, nor commitments of any kind, nor to take any action that shall be binding on the other Party, except as may be expressly provided for herein.

I. PROVISION OF WORK PRODUCT: Upon any request by THECB for the remittance of any work product, the Performing Agency shall immediately remit such work product. Any failure to immediately remit such work product shall be considered a breach of Contract.

J. PUBLIC DISCLOSURE: Except as otherwise required by law, the Performing Agency understands and agrees that no public disclosures or news releases pertaining to this Contract, including any results, findings or reports conducted to fulfill requirements of this Contract shall be made without prior written approval of THECB.

K. IRB APPROVAL: Pursuant to federal regulations found at 45 CFR 46, any research conducted by the Performing Agency involving human subjects must receive approval from the Performing Agency's Institutional Review Board (IRB).

L. STRICT PERFORMANCE/WAIVER: Failure by THECB at any time to require strict performance of any contractual provision or obligation contained herein shall not constitute a waiver or diminish THECB's rights thereafter to demand strict compliance.

M. FERPA: In compliance with the Family Educational Rights and Privacy Act (FERPA), the Performing Agency agrees (1) to protect any confidential student information it receives or accesses that could make a student's identity traceable, and (2) any data analysis or report shall not be disclosed to any third party without THECB's prior written consent.

N. CONTACTS: Unless otherwise agreed to in writing by the Parties, primary contacts for routine communications related to the performance of work under this Contract are as follows:

THECB STAFF	PERFORMING AGENCY STAFF

Program Manager: Robin Zuniga Senior Program Evaluator Phone: (512) 427-6536 Robin.zuniga@thecb.state.tx.us	Vendor Contact: Selina V. Mireles Center for Mathematics Readiness Texas State University sv10@txstate.edu (512) 245-1211

O. NOTICE: Notices occur when there are substantial changes that effect the Contract terms and conditions in the form of an amendment or termination of the Contract. All notices required to be given hereunder shall be in writing and shall be given by delivery thereof or by overnight courier or certified or registered mail, postage prepaid, to the office shown below. Notices may be sent by facsimile during normal business hours; however, they shall be followed up with a hardcopy original document via one of the above delivery methods. Any notice served shall be deemed given on the date of hardcopy original document delivery.

THECB NOTICE ADDRESS	PERFORMING AGENCY NOTICE ADDRESS
Texas Higher Education Coordinating Board Office of Contract Management Services P.O. Box 12788 Austin, Texas 78711-2788 Fax: (512) 427-6472	Texas State University-San Marcos 601 University Drive San Marcos, TX 78666

P. FEDERAL LAWS: If federal monies are funding this Contract, Performing Agency must comply with all federal laws, rules, and regulations pertaining to this Contract, including but not limited to those referenced in any attachments regarding Debarment, Lobbying, and Applicable Federal Laws. Any such attachments are herein incorporated into the Contract for all purposes.

Q. DRUG FREE WORK PLACE: The Performing Agent shall comply with the applicable provisions of the Drug-Free Work Place Act of 1988 (Public Law 100-690, Title V, Subtitle D; 41 U.S.C. 701 et seq.) and maintain a drug-free work environment; and the final rule, government-wide requirements for drug-free work place (grants), issued by the Office of Management and Budget and the Department of Defense (32 CFR Part 280, Subpart F) to implement the provisions of the Drug-Free Work Place Act of 1988 is incorporated by reference and the Performing Agent shall comply with the relevant provisions thereof, including any amendments to the final rule that may hereafter be issued.

R. ENTIRE AGREEMENT AND ORDER OF PRECEDENCE: This Contract consists solely of the following documents, and, in the event of conflicts or inconsistencies between this Contract and its exhibit or attachments, such conflicts or inconsistencies shall be resolved by reference to the documents in the following order of precedence: (1) the Contract (including its Exhibits, if any), (2) THECB's Request for Proposals, if any (and its addenda, if any), and (3) Performing Agent's Proposal, if any (and its addenda, if any). This Contract (including its Exhibits, if any) contains the final, complete and exclusive understanding of the Parties, and supersedes all prior contemporaneous, oral or written understandings, representations, and negotiations between Parties relating to the subject matter of this Contract. The Parties further agree that this Contract may not in any way be explained or supplemented by a prior or existing course of dealings between the Parties, by usage of trade or custom, or by any prior performance between the Parties pursuant to this Contract or otherwise.

Section 7.0 SIGNATURES:

By signature hereon, the individuals below represent and warrant they are duly authorized representatives of their respective agencies and have the authority to bind their respective agencies in a contractual agreement.

W. Scott Erwin
Director, Office of Sponsored Programs
Texas State University-San Marcos

11/13/12

Date

for Arturo Alonzo

Arturo Alonzo, Jr.
Deputy Commissioner for Bus & Fin/COO
Texas Higher Education Coordinating Board

11/12/2012

Date

TEXAS HIGHER EDUCATION COORDINATING BOARD

Certification Regarding Debarment,
Suspension, Ineligibility and Voluntary Exclusion
Lower Tier Covered Transactions

This certification is required by the Department of Education regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85.

1. By signing this contract, the prospective tower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the Texas Higher Education Coordinating Board ("THECB") if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," " person," "primary covered transaction," " principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact THECB for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by signing this contract, should the proposed covered transaction be entered into, that it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by signing this contract that it will include a clause titled: "Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion-Lower Tier Covered Transactions", stating the Certification listed below without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may but is not required to, check the Non-procurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification

(1) The prospective lower tier participant certifies, by submission of its Proposal/Application and/or by signature on any resulting Agreement/Contract, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

(3) The prospective lower tier participant certifies that it will comply with all applicable provisions of 34 CFR Part 85.

CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,00 0 and not more than $100,000 for each such failure.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions. Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subjec t to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

* APPLICANT'S ORGANIZATION			
Texas State University - San Marcos			
* PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE			
Prefix: Mr.	* First Name: W. Scott	Middle Name:	
* Last Name: Erwin		Suffix: Sr.	
* Title: Director			
* SIGNATURE:		* DATE: 11/13/12	

DISCLOSURE OF LOBBYING ACTIVITIES

Approved by OMB
0348-0046

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure.)

1. Type of Federal Action:
[a] a. contract
b. grant
c. cooperative agreement
d. loan
e. loan guarantee
f. loan insurance

2. Status of Federal Action:
[b] a. bid/offer/application
b. initial award
c. post-award

3. Report Type:
[a] a. initial filing
b. material change
For Material Change Only:
year _____ quarter _____
date of last report _____

4. Name and Address of Reporting Entity:
☐ Prime ☒ Subawardee
Tier _____, *if known*:
Texas State University-San Marcos
601 University Drive
San Marcos, TX 78666
Congressional District, *if known*: 4c TX-025

5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime:
Texas Higher Education Coordinating Board
1200 East Anderson Lane
Austin, TX 78752
Congressional District, *if known*:

6. Federal Department/Agency:
DEPT OF EDUCATION

7. Federal Program Name/Description:
CFDA Number, *if applicable*: 84.378A

8. Federal Action Number, *if known*:

9. Award Amount, *if known*:
$

10. a. Name and Address of Lobbying Registrant
(*if individual, last name, first name, MI*):
N/A

b. Individuals Performing Services (*including address if different from No. 10a*)
(*last name, first name, MI*):
N/A

11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signature: 
Print Name: W. Scott Erwin
Title: _____
Telephone No.: _____ Date: 11/13/12

Federal Use Only:

Authorized for Local Reproduction
Standard Form LLL (Rev. 7-97)

W. Scott Erwin
Director, Sponsored Programs
Texas State University-San Marcos
601 University
San Marcos, Texas 78666
512-245-2102 FAX (512) 245-1822

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.

2. Identify the status of the covered Federal action.

3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.

4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.

6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."

9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.

10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).

11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

Federal Terms and Conditions
College Access Challenge Grant Program, 84.378A

Federal Rules, Laws, and Regulations That Apply to all Federal Programs: Grantee shall be subject to and shall abide by all applicable federal laws, executive orders, regulations and policies, pertaining to the Grant, including, but not limited to:

1. **Civil Rights:** All federal statutes relating to nondiscrimination, including but not limited to: Title VI of the Civil Rights Act of 1964, as amended, 42 USC 2000d et seq., as implemented at 28 CFR 42 and 34 CFR 100; The Age Discrimination Act of 1975, as amended, 42 USC 6101 et seq., as implemented at 45 CFR 90 and 34 CFR 110; Age Discrimination in Employment Act, as amended, 29 USC 621 et seq., as implemented at 29 CFR 1625; Title IX of the Education Amendments of 1972, as amended, 20 USC 1681 et seq., as implemented at 45 CFR 86 and 34 CFR 106; Section 504 of the Rehabilitation Act, as amended, 29 USC 794, as implemented at 28 CFR 41, 34 CFR 104, and 34 CFR 105; Executive Order 11246 as amended by Executive Order 11375, and as supplemented at 41 CFR 60); and American with Disabilities Act, as amended, P.L. 101-366, 42 USC 12101 et seq., and as implemented at 28 CFR 35, 28 CFR 36, and 29 CFR 1630; and the law set forth in OMB Standard Form 424B.
2. **Labor Standards:** Fair Labor Standards Act, as amended, 29 USC 201 et seq., as implemented at 29 CFR 500 et seq.; Davis-Bacon Act, as amended, 40 USC 276(a) et seq., as implemented at 29 CFR 5.1 et seq.; and The Contract Work Hours and Safety Standards Act, as amended, 40 USC 3701 et seq., as implemented at 29 CFR 5.1 et seq.
3. **Intergovernmental Review:** The Intergovernmental Cooperation Act of 1968, as amended, 31 USC 6501 et seq.
4. **Drug-Free Workplace:** Drug-Free Workplace Act of 1988, as amended, P.L. 100-690, 41 USC 8101 et seq.
5. **Conservation in Procurement Activities:** Resources Conservation and Recovery Act, as amended, 42 USC 6962 and Executive Order 12873, as implemented at 40 CFR 247 et seq.
6. **Crimes and Prohibited Activities:** The Copeland "Anti-Kickback" Act, as amended, 18 USC 874, as implemented at 29 CFR 3.1 et seq.; False Claims Act, as amended, 31 USC 3729 et seq.; and Program Fraud Civil Remedies Act, as amended, 31 USC 3801-3812.
7. **Trafficking in Persons:** The Department of Education adopts the requirements in the Code of Federal Regulations at 2 CFR 175 and incorporates those requirements into this grant through this condition. The grant condition specified in 2 CFR 175.15(b) is incorporated into this grant with the following changes. Paragraphs a.2.ii.B and b.2.ii. are revised as follows:

   "a.2.ii.B. Imputed to you or the subrecipient using the standards and due process for imputing the conduct of an individual to an origination that are provide un 34 CFR part 85."

   "b.2.ii. Imputed to the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 34 CFR part 85."

   Under this condition, the Secretary may terminate this grant without penalty for any violation of these provisions by grantee, its employee, or its subrecipients.
8. **Prohibiting Smoking in the Presence of Children:** Pro-Children Act of 2001, as amended, 20 USC 7181 et seq., which states that no person shall permit smoking within any indoor facility owned or leased or contracted and utilized for the provision of routine or regular kindergarten, elementary, or secondary education or library services to children. In addition, no person shall permit smoking within any indoor facility (or portion of such a facility) owned or leased or contracted and utilized for the provision of regular or routine health or day care or early childhood development (Head Start) services to children . Any failure to comply with a prohibition in this Act shall be considered to be a violation of this Act and any person subject to such prohibition who commits such violation may be liable to the United States for a civil penalty, as determined by the Secretary of Education.
9. **Antitrust**: The federal antitrust laws such as the Sherman Antitrust Act, as amended, 15 USC 1 et seq.; and the Clayton Act, as amended, 15 USC 12 et seq.

Federal Terms and Conditions
College Access Challenge Grant Program, 84.378A

10. **Family Educational Rights and Privacy Act (FERPA) of 1975**, as amended, 20 USC 1232g (ensures access to educational records for students and parents while protecting the privacy of such records), and any regulations issued thereunder, including Privacy Rights of Parents and Students (34 CFR 99 et seq.).
11. **Buy American Act:** Grantee certifies that it is in compliance with the Buy American Act in that each end product purchased under any federally funded supply contract exceeding the micro-purchase threshold is considered to have been substantially produced or manufactured in the United States. End products exempt from this requirements are those for which the cost would be unreasonable, products manufactured in the U.S. that are not satisfactory quality, or products for which the agency head determines that domestic preference would be consistent with the public interest. Grantee also certifies that documentation will be maintained that documents compliance with this requirement (FAR 25.1-).
12. **Public Education Acts:** P.L. 103-227, Title X, Miscellaneous Provisions of the GOALS 2000: Educate America Act; the No Child Left Behind Act (the Elementary and Secondary Education Act), as amended.
13. **Prohibition of Text Messaging and Emailing While Driving During Official Federal Grant Business**: Federal grant recipients, sub recipients and their grant personnel are prohibited from text messaging while driving a government owned vehicle, or while driving their own privately owned vehicle during official grant business, or from using governmental supplied electronic equipment to text message or email when driving. Recipients must comply with these conditions under Executive Order 13513, "Federal Leadership On Reducing Text Messaging While Driving," October 1, 2009.
14. **General Education Provisions Act (GEPA),** as amended, applicable to all federal programs funded or administered through or by the U. S. Department of Education.
15. **Rights to Inventions Made Under a Contract or Grant**: Contracts or Grants for the performance of experimental, development, or research work shall provide for the rights of the Federal Government in accordance with the Bayh-Dole Act and its implementing regulations at 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts, and Cooperative Agreements," and any implementing regulations issued by the awarding Federal agency. THECB shall have the same rights as the Federal Government to any inventions conceived or first actually reduced to practice in the performance of this Grant. Likewise, Grantee shall have the same obligations to THECB regarding the subject invention as it has to the Federal Government.
16. **Special Conditions for Disclosing Federal Funding in Public Announcements**: When issuing statements, press releases, requests for proposals, bid solicitation and other documents describing projects or programs funded in whole or in party with federal money, all Grantees receiving federal funds included in the corresponding U.S. Department of Education Appropriations Act, including but not limited to State and local governments and recipients of Federal research grants, shall clearly state –
    (1) The percentage of the total cost of the program or project which will be financed with federal money;
    (2) The dollar amount of federal funds for the project or program; and
    (3) Percentage and dollar amount of the total cost of the project or program that will be financed by non-governmental sources.
17. **Time and Effort Recordkeeping:** For those personnel whose salaries are prorated between or among different funding sources, time and effort records will be maintained by Grantor that will confirm the services provided within each funding source. Grantor must adjust payroll records and expenditures based on this documentation. This requirement applies to all projects, regardless of funding source, unless otherwise specified. For federally funded projects, time and effort records must be in accordance with the requirements in the applicable OMB cost principles.
18. **ACORN:** No portion of this award may be provided to the Association of Community Organizations for Reform Now (ACORN) or its subsidiaries without prior written approval from THECB and the relevant program office in the U.S. Department of Education. This condition takes into account Division B, Title I, Section 1104, of the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P. Law No. 112-10), which incorporates the conditions specified in Division E, Section 511 of the Consolidated Appropriations Act, 2010 (P. Law No. 111-117) and pending litigation on related matters.
19. **Federal Funding Accountability and Transparency Act of 2006 (FFATA):** The Federal Funding Accountability and Transparency Act of 2006 (FFATA) ensures that the public can access information on all entities and organizations receiving federal funds. Central to the law was the development of www.USASpending.gov, a publicly-available website with searchable information on each federal grant and contract. As part of the

FFATA guidance, THECB will be responsible for providing award information to USASpending, but Grantee will be responsible for registering with the System for Award Management (SAM) website prior to receiving federal funds from THECB. Once Contractor is registered with SAM, THECB will have the information required to submit the federally required reporting elements. Grantee must also comply with any additional applicable FFATA requirements, including any applicable requirements.

20. **Registration with System for Award Management (SAM) is an essential part of receiving this Grant.** SAM is a free website that consolidates the capabilities formerly found in CCR/FedReg, ORCA, and EPLS. If you had an active record in CCR, you have an active record in SAM. Both current and potential federal government registrants are required to register in SAM in order to be awarded contract by the federal government. Although Grantee may already be registered, it is incumbent upon the Grantee to ensure this compliance. No entity may receive a subaward from THECB unless the entity has provided its DUNS number to THECB. The link for SAM registration is: https://www.sam.gov. In addition to SAM registration, Grantee must provide THECB with:
    1. Data Universal Numbering System Number established by Dun and Bradstreet, Inc. (DUNS Number) https://iupdate.dnb.com/iUpdate/viewiUpdateHome.htm
    2. Congressional district where the services will be performed/located
21. **Clean Air Act and the Federal Water Pollution Control Act.** Contracts and subgrants of amounts in excess of $100,000 shall contain a provision that requires the recipient to agree to comply with all applicable standards, order or regulations issued pursuant to the Clean Air Act, as amended, 42 USC 7201 et seq., and the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq.
22. **Federal Regulations Applicable to All Federally Funded Grants, including from the U.S. Department of Education, include but are not limited to:**
    1. **For Institutions of Higher Education (IHEs):** 28 CFR 35, 28 CFR 36, 29 CFR 1630, the Education Department General Administrative Regulations (EDGAR), and OMB Circulars A-21 (Cost Principles), A-133 (Audits), and A-110 (Uniform Administrative Requirements including Appendix A of 2 CFR 215);
    2. **For Nonprofit Organizations:** 28 CFR 35 , 28 CFR 36 , 29 CFR 1630, the Education Department General Administrative Regulations (EDGAR), and OMB Circulars A-122 (Cost Principles), A-133 (Audits), and A-110 (Uniform Administrative Requirements including Appendix A of 2 CFR 215);
    3. **For State Agencies:** 28 CFR 35, 28 CFR 36, 29 CFR 1630, the Education Department General Administrative Regulations (EDGAR), and OMB Circulars A-87 (Cost Principles), A-133 (Audits), and A-102 (Uniform Administrative Requirements);
    4. **For Commercial (for-profit) Organizations:** the Education Department General Administrative Regulations (EDGAR); OMB A-110 (Uniform Administrative Requirements including Appendix A of 2 CFR 215), if corresponding federal agency applied this Circular; 29 CFR 1630 and 48 CFR Part 31 (Contract Cost Principles); requirements establishes pursuant to OMB Circular A-133 §___.210(e).
23. **Certification Regarding Lobbying:**

    (a) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the making of any Federal grant, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;

    (b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, Grantee shall complete and submit Standard Form – LLL "Disclosure Form to Report Lobbying," (34 CFR Part 82, Appendix B) in accordance with its instructions;

    (c) The Grantee shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants and grants under grants and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

    This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a

prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Federal Laws governing the College Access Challenge Grant Program: The laws and rules governing the College Access Challenge Grant Program can be found at ***http://www2.ed.gov/programs/cacg/index.html.*** Grantee agrees to comply with the authorizing program statutes (20 USC 1141 et seq., as amended), regulations, non-regulatory guidelines, and other guidance in the implementation of the programs receiving funding under the College Access Challenge Grant Program as well as any other federal statutes, regulations, and guidance which directly affects the performance under this Grant. All such are hereby incorporated by reference.

Additionally, the U.S. Department of Education's Memorandum on Cash Management Policies, EDGAR Advisory to Grantee, and Memorandum to ED Grantees Regarding the Use of Grant Funds for Conferences and Meetings (a copy of each is attached hereto) are herein incorporated into this Grant.

Grantee's submission of a bid or Proposal in response to THECB's solicitation (Request for Applications) and/or Grantee's signature on any resulting Grant Award indicates Grantee's certification of compliance with this document.

MEMORANDUM

Enclosure 4
June 15, 2010

To: Recipients of grants and cooperative agreements

From: Thomas Skelly, Delegated to Perform Functions of Chief Financial Officer

Subject: Department of Education Cash Management Policies for Grants and Cooperative Agreements

The purpose of this memorandum is to remind the Department of Education's (the Department's) grant and cooperative agreement recipients (recipients) of existing cash management requirements regarding payments. The Department expects that recipients will ensure that subrecipients are also aware of these policies by forwarding a copy of this memorandum to them.

There are two different sets of payment requirements that apply to the draw of funds from recipient accounts at the Department. Payments to a State under programs covered by a State's Treasury State Agreement (TSA) are subject to the requirements of the *Cash Management Improvement Act of 1990 (CMIA)* as published in 31 United States Code 6503.

All other payments to States and all payments to other types of recipients are subject to the requirements in either 34 Code of Federal Regulation (CFR) Part 74, applicable to nongovernmental entities, or 34 CFR Part 80, applicable to State, local, and Indian tribal governments. These regulations are part of the Education Department General Administrative Regulations (EDGAR) and are available on the Web at http://www.access.gpo.gov/nara/cfr/waisidx_08/34cfrv1_08.html.

CMIA Requirements

States that draw funds under programs subject to the *CMIA* must draw funds as required under the TSA for the State. If a State draws funds under one of these programs to make payments to a subrecipient, the payment request to the Department should only be made at the request of the subrecipient, which must make draw requests to the State as required under the requirements in EDGAR, as described below.

EDGAR Requirements

Payments to States under programs not covered by the State's TSA and payments to other governments are subject to the requirements in Part 80 of EDGAR. These payment requirements also apply to all other types of recipients under Part 74 of EDGAR, which applies to nonprofit organizations, institutions of higher education, hospitals, and commercial organizations. States that draw funds on behalf of subrecipients under programs not covered by a TSA should remind subrecipients that they may only request funds from the State under the payment standards in Part 74 or Part 80, as applicable.

For any cash drawn from your program or project account at the Department:

- Recipients must minimize the time between the recipient's draw down of funds from its grant account at the Department and the time the recipient disburses those funds to payees via electronic transfer, check redemption or other means of transfer. See 34 CFR 74.22(a) and 80.21(b). Specifically, recipients may only draw funds to meet the immediate cash needs of the grant or cooperative agreement.

- For recipients subject to Part 74 of EDGAR, unless the conditions described in 34 CFR Part 74 Section 22(k) exist, these recipients must deposit advances of Federal funds in interest bearing accounts.

- Recipients subject to Part 74 of EDGAR must return to the U.S. Department of Health and Human Services (HHS) the interest earned on advances of grant funds except that the recipient may retain up to $250 of interest earned on the account each year to pay for the costs of maintaining the account. These requirements also apply to subrecipients subject to Part 74 Section 22 (l) which requires these recipients and subrecipients to annually remit interest earned on advances of funds. The address for interest remittances to HHS is:

  U.S. Department of Health and Human Services
  P.O. Box 6120
  Suite 1133
  Rockville, MD 20852

  The remittance should be accompanied by a letter stating that the remittance is for "interest earned on Federal funds" and should include the DUNS number.

- Recipients subject to Part 80 of EDGAR must return to the Department the interest earned on advances of grant funds except that the recipient may retain up to $100 of interest earned on the account each year to pay for the costs of maintaining the account. Section 80.21(i) requires these recipients to promptly (at least quarterly) remit interest earned on advances to the Department. These requirements also apply to subrecipients subject to Part 80. The address for interest remittances to the Department is:

  U.S. Department of Education
  P.O. Box 979053
  St. Louis, MO 63197-9000

  The remittance should be accompanied by a letter stating that the remittance is for "interest earned on Federal funds" and should include the DUNS number.

- Recipients must use grant funds only for obligations incurred during the funding period.

- Recipients must distribute Federal funds to subrecipients only when requested by the subrecipient and as needed to pay program costs.

Recipients have other responsibilities regarding the use of Federal funds. We highlight the following practices related to the draw of Federal funds that are either required by EDGAR or will assist recipients in meeting their responsibilities under EDGAR.

- Recipients must regularly monitor the payment requests made by their subrecipients to ensure that those requests conform to the same payment requirements that apply to the recipient. See 34 CFR Part 80 Section 20(b)(7);

- Recipients must regularly monitor the fiscal activity of their subrecipients on a continuous basis and ensure that their subrecipients return interest earned;

- If expenditures under the program or project require the recipient's board or specified officials to approve expenditures, the recipient should obtain that approval before making the payment request for any expenditure, thus minimizing the period of time that funds remain in the recipient's bank account pending disbursement of the funds for expenditures under the program or project. See 34 CFR 74.21(b)(5) and 80.22(a); and

- Plan carefully for cash flows for your grant project and review projected cash requirements before each drawdown. See 34 CFR 74.21 and 74.22 or 80.20 and 80.21, as applicable.

Recipients that do not follow the cash management requirements applicable to their grants could be:

- Placed on a "cash-reimbursement" payment method, i.e., a recipient would have to pay for grant activities with its own money and submit documentation of the expenditures to the Department before receiving reimbursement from the Department;

- Designated a "high-risk" recipient under 34 CFR 74.14 or 80.12, as applicable, which may involve the imposition of conditions in addition to that of being placed on a reimbursement payment system;

- Subjected to further corrective action, including withholding of funds, suspension, and termination of the award. See 34 CFR 74.62 or 80.43, as applicable;

- Denied funding under future Department discretionary grant competitions. See 34 CFR Part 75 Section 217(d)(3)(ii); and

- Debarred or suspended under 34 CFR Part 85 from receiving future Federal awards from any executive agency of the Federal government.

A small number of ED grant programs have program-specific cash management and payment requirements based on the authorizing legislation or program regulations. These program-specific requirements may supplement or override the general EDGAR cash management or payment requirements. If you have any questions about your specific grant, please contact the program officer, whose contact information is on your Grant Award Notification (GAN).

ED's Office of the Chief Financial Officer will provide ongoing outreach efforts regarding cash management and payment requirements, including supplementary webinars, URL links and Frequently Asked Question sheets.

Thank you for your attention to this matter. If you have any questions, please contact Cynthia Heath at (202) 245-8043 or cynthia.heath@ed.gov

Enclosure 6

EDGAR Advisory to Grantees

The Education Department General Administrative Regulations (EDGAR) are a compilation of regulations applicable to ED grantees, composed of Parts 74-99 of Title 34 in the U.S. Government's Code of Federal Regulations (CFR). The CD-ROM of EDGAR distributed with Grant Award Notifications since early 2009 contains the version of Part 99 [Family Educational Rights and Privacy] issued by the Department in December, 2008.

The Department published just recently a new version of Part 99, containing numerous amendments and updates, which was effective on January 3, 2012. The new Part 99 will be formally codified in the CFR later in 2012. In the meantime, grantees are directed to the version of the new Part 99 that can currently be found online at the Government Printing Office's e-CFR website. The e-CFR is a regularly updated, unofficial, non-legal edition of the CFR, created in partnership with the Office of the Federal Register.

The Department's website contains a link to the e-CFR version of the new Part 99 and all the other parts of EDGAR at:

http://www2.ed.gov/policy/fund/reg/edgarReg/edgar.html

Grantees wishing to review the background and discussion of the changes made to Part 99 in the new version can find the Department's *Federal Register* issuing notice at the same web link. The *Federal Register* notice updates the previous one shown in Appendix B on the EDGAR CD_ROM and contains the name and contact information for the ED staff member who can respond to inquiries about the new Part 99.

UNITED STATES DEPARTMENT OF EDUCATION
Office of the Chief Financial Officer

MEMORANDUM to ED GRANTEES REGARDING THE USE OF GRANT FUNDS FOR CONFERENCES AND MEETINGS

You are receiving this memorandum to remind you that grantees must take into account the following factors when considering the use of grant funds for conferences and meetings:

- Before deciding to use grant funds to attend or host a meeting or conference, a grantee should:
  - Ensure that attending or hosting a conference or meeting is consistent with its approved application and is reasonable and necessary to achieve the goals and objectives of the grant;
  - Ensure that the primary purpose of the meeting or conference is to disseminate technical information, (e.g., provide information on specific programmatic requirements, best practices in a particular field, or theoretical, empirical, or methodological advances made in a particular field; conduct training or professional development; plan/coordinate the work being done under the grant); and
  - Consider whether there are more effective or efficient alternatives that can accomplish the desired results at a lower cost, for example, using webinars or video conferencing.
- Grantees must follow all applicable statutory and regulatory requirements in determining whether costs are reasonable and necessary, especially the Cost Principles for Federal grants set out at 2 CFR Part 225 (OMB Circular A-87, State, Local, and Indian Tribal Governments), (http://www.gpo.gov/fdsys/pkg/CFR-2011-title2-vol1/xml/CFR-2011-title2-vol1-part225.xml); 2 CFR Part 220 (OMB Circular A-21, Educational Institutions), (http://www.gpo.gov/fdsys/pkg/CFR-2011-title2-vol1/xml/CFR-2011-title2-vol1-part220.xml); and 2 CFR 230 (OMB Circular A-122, Non-Profit Organizations) (http://www.gpo.gov/fdsys/pkg/CFR-2011-title2-vol1/xml/CFR-2011-title2-vol1-part230.xml). In particular, remember that:
  - Federal grant funds cannot be used to pay for alcoholic beverages; and
  - Federal grant funds cannot be used to pay for entertainment, which includes costs for amusement, diversion, and social activities.
- Grant funds may be used to pay for the costs of attending a conference. Specifically, Federal grant funds may be used to pay for conference fees and travel expenses (transportation, per diem, and lodging) of grantee employees, consultants, or experts to attend a conference or meeting if those expenses are reasonable and necessary to achieve the purposes of the grant.
  - When planning to use grant funds for attending a meeting or conference, grantees should consider how many people should attend the meeting or conference on their behalf. The number of attendees should be reasonable and necessary to accomplish the goals and objectives of the grant.
- A grantee hosting a meeting or conference may not use grant funds to pay for food for conference attendees unless doing so is necessary to accomplish legitimate meeting or conference business.
  - A working lunch is an example of a cost for food that might be allowable under a Federal grant if attendance at the lunch is needed to ensure the full participation by conference attendees in essential discussions and speeches concerning the purpose of the conference and to achieve the goals and objectives of the project.

- A meeting or conference hosted by a grantee and charged to a Department grant must not be promoted as a U.S. Department of Education conference. This means that the seal of the U.S. Department of Education must not be used on conference materials or signage without Department approval.
    - All meeting or conference materials paid for with grant funds must include appropriate disclaimers, such as the following:

      The contents of this (insert type of publication; e.g., book, report, film) were developed under a grant from the Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.
- Grantees are strongly encouraged to contact their project officer with any questions or concerns about whether using grant funds for a meeting or conference is allowable prior to committing grant funds for such purposes.
    - A short conversation could help avoid a costly and embarrassing mistake.
- Grantees are responsible for the proper use of their grant awards and may have to repay funds to the Department if they violate the rules on the use of grant funds, including the rules for meeting- and conference-related expenses.

June 2012

FFATA ADDENDUM

FEDERAL FUNDING ACCOUNTABILITY AND TRANSPARENCY ACT (FFATA)

REPORTING GUIDANCE

This addendum provides background information for the Federal Funding Accountability and Transparency Act (FFATA) requirements and requests information from you as a contractor/awardee of federal funding. The information you are required to submit is summarized at the bottom of this letter.

The White House Office of Management and Budget (OMB) recently issued additional guidance regarding the FFATA reporting requirement which took effect on October 1, 2010. This law, passed in 2006, and amended in 2008, requires any person or entity receiving contract or grant funds directly from the federal government to report certain information regarding those funds through a centralized website, www.fsrs.gov . The following information applies.

- **Sub-recipient contract awards** equal to or greater than $25,000 must be reported if they were awarded on or after October 1, 2010.
- **Prime awardees** (those agencies or entities receiving funds ***directly*** from the federal government) must report certain information regarding those funds.
- Compensation of the top five executives within an organization must be reported as well, if certain criteria apply.
- Grant information reported for American Recovery and Reinvestment Act (ARRA) grants is not required to be reported in the FFATA Subaward Reporting System (FSRS).

The purpose of this addendum is to inform you that the Texas Higher Education Coordinating Board (THECB) is the prime awardee for this federal award. As a result, THECB is responsible for reporting sub-award information to the federal government. Unlike ARRA, prime recipients like THECB must enter the sub-award data themselves and do not have the option of coordinating with sub-recipients to enter the relevant information.

FFATA ADDENDUM

Sub-recipients must provide THECB with all required information to accurately report on the FSRS website. OMB guidance outlines the sub-award and compensation reporting requirements for sub-recipient contracts equal to or greater than $25,000 awarded on or after October 1, 2010. If a new award is initially below $25,000 but subsequent contract modifications result in a total award equal to or greater than $25,000, the award will be subject to FFATA reporting requirements as of the date the award exceeds $25,000. THECB is reporting all sub-recipient contracts regardless of initial amount.

You are receiving this FFATA Addendum because our records identify you as a sub-recipient under a THECB award. In our efforts to comply with the reporting requirements under FFATA, THECB is asking that you provide certification regarding the applicability of the following criteria to your organization using Attachments A, B, and C.

If you should meet the requirements THECB will need the compensation and names of the entity's top five highly compensated officers/senior executives, if applicable, on the attached FFATA Reporting Template. Additionally, THECB is responsible for first-tier sub-award reporting, which includes sub-recipient entity information, sub-award description/title, and date of award.

FFATA and subsequent rules published by the White House OMB require that sub-recipients have a Data Universal Numbering System (DUNS) Number to receive federal funds of any type. If you have not already done so, you must register your organization for a DUNS Number and provide that to THECB. Instructions to complete these are included in this letter as Attachment A (How to Request or Verify a DUNS Number). **If you have multiple contracts with THECB, only one certification per State fiscal year is required.**

Summary of Information Requested:

1) **As applicable, register your organization for a DUNS Number (Attachment A); and**
2) **Complete and return the FFATA Certification Form (Attachment B);**
3) **Complete and return the FFATA Reporting Template (Attachment C)**

The required FFATA Certification Form and the FFATA Reporting Template must be completed and returned to THECB as a requirement to receive your award. If you have any questions regarding this correspondence, please contact kathy.wood@thecb.state.tx.us.

FFATA ADDENDUM

Attachment A

How to Request or Verify a DUNS Number

Most entities receiving federal funds already have a DUNS number and may even have several DUNS Numbers. THECB must use the primary DUNS Number assigned to the entity when reporting FFATA obligations and expenditures. If your organization has multiple DUNS Numbers, the primary DUNS Number will usually be the first number listed. Go to http://www.dnb.com/us/ to request a DUNS Number or to verify the primary DUNS Number for your organization. Obtaining a DUNS Number is free of charge.

Requesting a DUNS Number

1) To verify an existing DUNS Number or to request a new DUNS Number, go to the Dun & Bradstreet website at http://fedgov.dnb.com/webform/displayHomePage.do. You can also call 1-866-705-5711 to request a DUNS number over the phone.

2) You will need the following information to obtain a DUNS number:
   a. Legal name of organization;
   b. Doing business as (DBA) or other name by which your organization is commonly known or recognized;
   c. Headquarters name and organization address;
   d. Name of Chief Executive Officer (CEO)/organization owner;
   e. Business structure of the organization (corporation, partnership, proprietorship);
   f. Year the organization started;
   g. Primary type of business; and,
   h. Total number of employees (full and part time).

Please be advised that THECB does not have the technical expertise to assist contractors in applying for a DUNS Number. All questions regarding the DUNS Number should be directed to Dun & Bradstreet.

SAM (System for Award Management)

The System for Award Management (SAM) is a free web site that consolidates the capabilities you used to find in CCR/FedReg, ORCA, and EPLS. If you had an active record in CCR, you have an active record in SAM. You do not need to do anything in SAM at this time, unless a change in your business circumstances requires a change in SAM in order for you to be paid or to receive an award. SAM will send notifications to the registered user via email 60, 30, and 15 days prior to expiration of the record. You can search for registered entities in SAM by typing the DUNS number or business name into the search box. Both current and potential federal government registrants are required to register in SAM in order to be awarded contracts by the federal government. To register and get additional information, go to www.sam.gov.

FFATA ADDENDUM

Attachment B

Texas Higher Education Coordinating Board

Federal Funding Accountability and Transparency Act (FFATA) Certification

The certifications enumerated below represent material facts upon which THECB relies when reporting information to the federal government required under federal law. If the THECB later determines that the Contractor knowingly rendered an erroneous certification, THECB may pursue all available remedies in accordance with Texas and U.S. laws. Signor further agrees that it will provide immediate written notice to THECB if at any time Signor learns that any of the certifications provided for below were erroneous when submitted or have since become erroneous by reason of changed circumstances. ***If the Signor cannot certify all of the statements contained in this section, Signor must provide written notice to THECB detailing which of the below statements it cannot certify and why.***

A. Certification Regarding Percent (%) of Annual Gross from Federal Awards

Did your organization receive 80% or more of its annual gross revenue from federal awards during the preceding fiscal year? ☐ Yes ☒ No

B. Certification Regarding Amount of Annual Gross from Federal Awards

Did your organization receive $25 million or more in annual gross revenues from federal awards in the preceding fiscal year? ☐ Yes ☐ No

If your answer is Yes to both questions A and B, you must answer question C.

If your answer is No to either question A or B, skip question C and continue to section D. You need not complete column I of the attached FFATA Reporting Template.

C. Certification Regarding Public Access to Compensation Information.

Does the public have access to information about the highly compensated officers/senior executives in your business or organization (including parent organization, all branches, and all affiliates worldwide) through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986?

☒ Yes - you need not complete column I of the attached FFATA Reporting Template.

☐ No - provide the names and total compensation of the top five highly compensated officers/senior executives using the attached FFATA Reporting Template.

FFATA ADDENDUM

D. Signatures

As the duly authorized representative (Signor) of the Contractor, I hereby certify that the statements made by me in this certification form are true, complete, and correct to the best of my knowledge.

Signature of Authorized Representative	
Printed Name of Authorized Representative	
	W. Scott Erwin Director, Sponsored Programs Texas State University-San Marcos 601 University San Marcos, Texas 78666 512-245-2102 FAX (512) 245-1822
Title of Authorized Representative	
Legal Name of Contractor	
Date	
11/13/12	
DUNS #: 074602368	

FFATA ADDENDUM

Attachment C
FFATA Reporting Template Instructions

INSTRUCTIONS

A. THECB Source Program ID

THECB enters the Source Program ID.

B. Contractor DUNS number

Enter the first nine (9) digits of the primary DUNS number assigned to the entity when reporting FFATA obligations and expenditures. If your organization has multiple DUNS numbers, the primary DUNS number will usually be the first number listed.

C. Contractor Dun +4 digits

As applicable, enter the last four (4) digits of the primary DUNS number assigned to the entity when reporting FFATA obligations and expenditures.

D. Primary City

Enter the name of the primary city in which the services will be performed. If services will be performed in multiple places, list the information for the place that will receive the greatest benefit from these federal funds.

E. Primary State

Enter the name of the primary city in which the services will be performed. If services will be performed in multiple places, list the information for the place that will receive the greatest benefit from these federal funds.

F. 9 character zip code

Enter the 9 character zip code in which the services will be performed.

G. Primary Country

Enter the name of the primary country in which the services will be performed. If services will be performed in multiple places, list the information for the place that will receive the greatest benefit from these federal funds.

H. THECB Contract Number

THECB contract number 0xxxx.