University System of Georgia (USG) STEM Initiative

Annual Report Form for FY2014 (2013-2014)

I. STEM Initiative Program Overview

Throughout this report, the University of West Georgia BOR STEM Initiative will be referred to as UWise (University of West Georgia Institutional STEM Excellence).

A. Program Implementation and Operation – This section covers the operation of your institution's STEM Initiative Program:

1. Identify and explain the **key programs and projects** (i.e. mini-grant program, FOCUS-derived project, etc.) that comprise the STEM Initiative at your institution. (You will be asked more detailed questions about these later.)

The UWise project has six major components. Each is identified and explained in this section.

- Summer Bridge Program
- UWise learning community
- XIDS 2002: Freshman seminar courses to enhance STEM career awareness
- Peer Mentoring Embedded in Undergraduate Research
- Faculty Development
- Service Learning

Summer Bridge Program:

The UWise Summer Bridge Program was a residential academic program scheduled for the last session of the Summer 2013 term. The UWise faculty designed the program to support the academic success of incoming freshmen who intend to major in a STEM field. The thirty-six students who took credit-bearing classes (six credits) attended structured study halls in the evenings, guest lectures during lunchtime and participated in two weekend excursions which were linked to their courses.

a. Credit-bearing courses:
   XIDS 2100: Arts and Ideas: UWise, a three credit hour course on critical reading and writing in the STEM disciplines, which counts in area C of the core.
   Math 1111: College Algebra, a three credit hour course, which prepares the students to succeed in math courses.
b. Structured evening sessions
   English writing: Mandatory two-hour tutorial sessions, held twice weekly, were run by English graduate assistants.

Mathematics homework: Mandatory two-hour problem sessions, held twice weekly, were run by Mathematics faculty members, UWise staff, and undergraduate students.

c. Guest lectures:
Topics include - Time-management, study skills, campus safety and student services.

d. Weekend excursions:
The Georgia Aquarium (Atlanta, GA)
Callaway Gardens (Pine Mountain, GA)

Students paid tuition and fees for their courses, and UWise provided all expenses associated with housing, meals and weekend excursions. UWise also paid stipends of $300 to each student for his or her work in providing evaluation data to help answer questions about the effectiveness of the program.

UWise Learning Community:

Lessons learned from Cohort II (2012-2013) led the UWise faculty to redesign the course offerings in the fall semester for UWise Summer Bridge program students, who were placed in a learning community. They took the following courses together:

- ENGL 1101 (three hours): English Composition I
- CHEM 1211K (four hours): Principles of Chemistry I
- MATH 1113 (four hours): Precalculus or MATH 1634 (four hours): Calculus I
- XIDS 2001 (one hour): What Do You Really Know About: *STEM Professions*

The difference, as compared to 2012, was the replacement of a seminar class for freshman (UWG 1101) with XIDS 2001 class focused on STEM professions. In this course, students learned about an array of career options, while briefly discussing the Nipah viral outbreak.

XIDS 2002: Freshman seminar courses to enhance STEM career awareness:

The UWise faculty wanted to expand the influence of the STEM initiative beyond the targeted group of students who participated in the Summer Bridge program. Thus, four faculty members developed two new XIDS courses to attract students who might be interested in STEM professions, or who had already decided to major in a STEM discipline. These courses used a problem-based learning format to study interesting, real-world problems (i.e., problems and professions related to the Nipah virus and chemistry of cooking), with the goal of making a connection between course content and careers. Both courses were refined and offered in Spring 2014:

- XIDS 2002: What Do You Know about Health Professions? (Two concurrent sections taught by Dr. F. Khan and Dr. S. Mruthinti; n = 40 students total)
- XIDS 2002: Chemistry of Cooking (one section co-taught by Dr. S. Basu-Dutt and Dr. V. Geisler, n = 24 students)

Peer Mentoring Embedded in Undergraduate Research:

Lessons learned from Cohort II's peer-mentoring experience led to the redesign of this component for Cohort III (2013-2014). The revised component embedded peer-mentoring in faculty-directed undergraduate research. In this model, one or two UWise students were paired with a junior or senior STEM major who mentored the beginning student(s) within faculty-directed undergraduate research

projects. A total of ten undergraduate research grants (three in Chemistry, three in Physics, two in Biology, and one each in Geosciences and Mathematics) were funded, with ten student mentors (juniors and seniors) working with fifteen UWise mentees.

The students who conducted undergraduate research through the peer-mentoring model presented their learning at a special poster session on July 14, 2014 (during 2014 Summer Bridge program), for the benefit of incoming Cohort IV (2014-2015) students. The aim of the special poster session was to introduce the incoming freshmen to research very early in their college careers. Faculty also attended this meeting to showcase their research and to attract the UWise cohort to their research programs. The funding for the undergraduate research program resulted in thirty-two student presentations and posters at various regional and national meetings, which include:

- Six at the National Conference on Undergraduate Research in Lexington. KY
- Four at the Georgia Academy of Science meeting in Augusta, GA
- Two at the Southeastern Sectional Meeting of the Geological Society of America in Blacksburg, VA
- Two at the Georgia Undergraduate Research Conference in Columbus, GA
- One at the American Association of Physics Teachers Winter Meeting in Orlando, FL
- One at the LSAMP (Georgia-Alabama Louis Stokes Alliance for Minority Participation) in Atlanta, GA
- Sixteen at Sigma Xi and BigNight student research presentations on the campus of University of West Georgia, Carrollton, GA.

The funding for the UWise undergraduate research program also led to three peer-reviewed publications in 2013-2014, which are listed below (students are identified by asterisks).

1. Grovenstein PB, Wilson DA*, Lennox CG*, Smith KP*, Contractor AA*, Mincey JL*, Lankford KD*, Smith JM*, Haye TC* and Mitra M. Identification and molecular characterization of a novel *Chlamydomonas reinhardtii* mutant defective in chlorophyll biosynthesis. [http://f1000r.es/1ic] F1000Research 2013, 2:138 (doi: 10.12688/f1000research.2-138.v2)
2. Tashana C. Haye*, Darryel A.Wilson*, Abigail R. Lennox*, Alisha A. Contractor*. Employing functional genomics to study chlorophyll biosynthesis in the green micro-alga *Chlamydomonas reinhardtii*. Proceedings National Conference on Undergraduate Research (NCUR), 2013 p256-264 (published on 14th October, 2013).
3. Andrew Vinyard*, Kaj A. Hansen*, Ross Byrd*, Douglas A. Stuart, John E. Hansen (2014) Design of a Simple Cryogenic System for Ultraviolet–Visible Absorption Spectroscopy with a Back-Reflectance Fiber Optic Probe, Appl. Spec. 68(1): 118-123. doi: 10.1366/13-07129.

Of further interest is the fact that four of the ten peer mentors are beginning graduate programs or professional school in Fall 2014. These high achieving mentors have served, or will continue to serve, as role models to the cohorts of UWise students, not only in the area of research, but also in the planning that is also necessary to gain admission to graduate and professional schools.

Faculty Development:

Building instructional capacity through faculty development is a notable outcome of the UWise program. These capacity-building activities encouraged STEM faculty to “try out” new or refine existing instructional practices and study their effectiveness for improving student learning. The work was supported through mini-grants awarded to faculty members who developed proposals that fit the stringent criteria outlined in the UWise Mini-grant request for proposals. Faculty indicated in their

proposals how they hoped to investigate evidence-based teaching practices in their STEM courses, with the understanding that they would develop essential expertise to engage in this work through the support provided by Center for Teaching and Learning.

SoTL (Scholarship of Teaching and Learning) based on mini-grants process: Building on the gains from the previous year (Year II), faculty members who received mini-grants from UWise participated in a year-long faculty learning community on the scholarship of teaching and learning (SoTL). Each faculty member developed research questions, data collection strategies, an implementation plan, and a timeline for research studies. Then, throughout the fall and spring semesters, the Director of the Center for Teaching and Learning worked individually with these faculty members to develop assessments and instruments, analyze data, and write final reports describing student outcomes. This approach was successful, as Year III results indicated increased student learning and engagement in most of the courses involving the FY14 mini-grant projects. (Please see *Table 20* for a description of the projects and their findings).

Two peer-reviewed publications resulted from faculty activities supported by the UWise Initiative.

1. Baylen, D. and Goldberg, C., Exploration, Engagement and Inquiry in Undergraduate Education: A Case Study of Learning about Science Using LEGO® and Technology, Emerging Technologies for Learning: Open and Global Learning, Refereed Proceedings, 2014.
2. Remshagen, A. and Rolka, C. Contextualized Learning Tools: Animations and Robots. Proceedings of the 52nd Annual ACM Southeast Conference, 2014.

Service Learning:

The University of West Georgia is one of three institutions in Georgia selected to replicate the innovative and highly successful UTeach model for secondary math and science teacher preparation. The national replication program was specifically created to attract the widest range of bright science and mathematics majors into secondary teaching careers, to prepare them with an advanced, field-intensive curriculum, and to promote field retention through induction support and ongoing professional development.

FY14 UWise students (Cohort III) were invited to participate in “service learning” through enrollment in UTeach courses that allowed students to “try out” teaching in actual K-12 classrooms. Two UWise students from Cohort III enrolled in UTCH 2001 class. As discussed in FY13 annual report, the decreasing trend is likely due to revisions in the UWise summer bridge program that changed the “workshop” format to a credit-bearing, academic experience. These purposeful changes were the result of focus group sessions that identified challenges associated with the potpourri of science and mathematics content in the XIDS course in Fall 2011. However, the portion of the XIDS course that *was* successful (i.e., learning about K-12 teaching as a career) was not a good fit in the new credit-bearing mathematics course. Alternatively, faculty attempted to incorporate exposure to K-12 teaching through several guest lectures during the 2013 Summer Bridge evenings. Parenthetically, we note that the XIDS course in Fall 2013 (Khan and Mruthinti, two concurrent sessions, n = 36*) What do you know about STEM professions?* was revised to explicitly incorporate two sessions taught by COE colleagues, as well as a service learning component worth 10% of the grade.

As of writing this report, five FY15 UWise students (Cohort IV) are taking UTCH 2001 course, suggesting a steady increase in interest in K-12 teaching career on the part of UWise students.

2. Identify **key personnel** associated with your institution's STEM Initiative program and briefly describe **each person's role**. Be certain to include all personnel whose salaries have been paid, either fully or partially, by STEM Initiative funds. Include any faculty or staff receiving course release time or some comparable form of compensation to participate.

Table 1: UWise Participants with no STEM Initiative Funding (n=4)

Name	Position	Affiliation	In-Kind	UWG Match	STEM Funding	No STEM Funding
Gantner, Myrna	Associate Vice President for Academic Affairs, Associate Professor of Educational Leadership	Office of the Provost and Vice President for Academic Affairs	X			X
Swamy, Mruthinti	Associate Dean, Professor of Biology	College of Science and Mathematics		X		X
Hendricks, Cher	Director of the Center for Teaching and Learning, Associate Professor	Center for Teaching and Learning		X		X
Adams, Sonya	Budget Analyst	College of Science and Mathematics	X			X
Wright, Amanda	UWise Program Coordinator	STEM Initiative, College of Science and Mathematics			X	

Tables 2 – 9 indicate program personnel paid with FY14 STEM Initiative funds. An "X" in a column indicates participation in that activity. Acronyms used include COSM (the College of Science and Mathematics); COE (the College of Education); and UGRP (Undergraduate Research Program).

Table 2: Biology Personnel Paid through FY14 STEM Initiative Funds (n=3)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
Edelman, Andrew	Biology				X	X
Mitra, Mautusi	Biology					X
Swamy, Mruthinti	Biology, Dean's Office			X		

Table 3: Chemistry Personnel Paid through FY14 STEM Initiative Funds (n=7)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
Dutt, Sharmistha	Chemistry			X	X	
Fujita, Megumi	Chemistry					X
Geisler, Victoria	Chemistry			X	X	X
Ray, Partha	Chemistry				X	
Stuart, Douglas	Chemistry				X	
Boatright, David	Chemistry				X	
Hansen, John	Chemistry				X	

Table 4: Computer Science Personnel Paid through FY 14 STEM Initiative Funds (n=2)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
Remshagen, Anja	Computer Science				X	
Yang, Li	Computer Science				X	

Table 5: Geosciences Personnel Paid through FY 15 STEM Initiative Funds (n=3)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
Deline, Bradley	Geosciences					X
Berg, Christopher	Geosciences				X	
Rose, Shae	Geosciences				X	

Table 6: Mathematics Personnel Paid through FY 15 STEM Initiative Funds (n=5)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
Khodkar, Abdollah	Mathematics					X
Thielemier, Carrie	Mathematics				X	
Jett, Christopher	Mathematics				X	
Leach, David	Mathematics				X	
Sykes, Scott	Mathematics	X	X		X	

Table 7: Physics Personnel Paid through FY 14 STEM Initiative Funds (n=5)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
DeSilva, Ajith	Physics				X	X
Hasbun, Javier	Physics				X	X
Talbot, Julie	Physics				X	
Chesnut, Neal	Physics				X	
Sterling, Nicholas	Physics				X	

Table 8: College of Education Personnel Paid through FY 14 STEM Initiative Funds (n=2)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
Edelman, Jennifer	Leadership and Instruction				X	
Duplechain, Rosalind	Learning and Teaching				X	

Table 9: College of Arts and Humanities Personnel Paid through FY 14 STEM Initiative Funds (n=3)

Name	Department	Program Planning	Summer Bridge	XIDS 2002	Mini-Grants	UG Research
Harrison, Rebecca	English		X			
Ellison, Amy	English		X			
Parks, Brooke	English		X			

Students listed in Tables 10 - 15 received FY14 STEM Initiative funding for services within UWise program components such as undergraduate research, faculty mini-grants, video/web production for UWise student recruitment, or as student assistants for the Summer Bridge Program

Table 10: Biology Students Paid by FY 14 UWise Program (n=7)

Student	Department	Faculty Mentor	UG Research	Summer Bridge	Mini-Grants
Fuller, Theresa	Biology	Mitra	X		
Haye, Tashana	Biology	Mitra	X		
Lewis, Shelby	Biology	Edelman	X		
Rouse, Mathew	Biology	Edelman	X		
Sprayberry, Ty	Biology	Edelman	X		
Smith, Katherine	Biology	Mitra	X		
Smith, Megan	Biology	Edelman	X		

Table 11: Chemistry Students Paid by FY 14 UWise Program (n=16)

Student	Department	Faculty Mentor	UG Research	Summer Bridge	Mini-Grants
Alexander, Soyoung	Chemistry	Fujita	X		
Blair, Nicholas	Chemistry	Khan	X		
Brown, Casey	Chemistry	Khan	X		
Contractor, Alisha	Chemistry	Fujita	X		
Doles, Nancy	Chemistry	Fujita	X		
Grant, Cherie	Chemistry	Geisler	X		
Hogle, RaeAnna	Chemistry	Stuart	X		
Kazerouni, Amaan	Chemistry	Fujita	X		
Kimbrell, Jacob	Chemistry	Khan	X		
Obeng, Samed	Chemistry	Geisler	X		
Steward, Walter	Chemistry	Khan	X		
Umoren, Edidiong	Chemistry	Geisler	X		
Rizzo, Ashley	Chemistry	Basu-Dutt	X		
Akers, Kristopher	Chemistry	Basu-Dutt	X		
Fowler, Evan	Chemistry	Geisler			X
Yash, Raval	Chemistry	Geisler			X

Table 12: Mathematics Students Paid by FY 14 UWise Program (n=5)

Student	Department	Faculty Mentor	UG Research	Summer Bridge	Mini-Grants
Collins, Dana	Mathematics	Khodkar	X	X	
Hartman, Daniel S.	Mathematics	Khodkar	X	X	
Wagner, Alexis	Mathematics	Khodkar	X		
Saltiel, Sarah	Mathematics	Thielemier			X
Gromoll, Tesa	Mathematics	Khodkar	X		

Table 13: Physics Students Paid by FY 14 UWise Program (n=11)

Student	Department	Faculty Mentor	UG Research	Summer Bridge	Mini-Grants
Barnes, Brianna	Physics	DeSilva	X		
Coburn, LaShan	Physics	DeSilva	X		
Davis, Marcus	Physics	Hasbun, DeSilva	X		X
Donato, Anthony	Physics	DeSilva	X		
Hartman, Daniel	Physics	Powell	X		
Hogan, Ben	Physics	Hasbun	X		
Kerlin, Austin	Physics	Hasbun	X		
Landry, Ryan	Physics	DeSilva			X
Mashburn, Amanda	Physics	Powell	X		
Roper, Chris	Physics	DeSilva, Sterling	X		X
Pullen, Adam	Physics	DeSilva, Sterling			X
Truoung, Tai	Physics	DeSilva, Sterling			X

Table 14: Geoscience Students Paid by FY 14 UWise Program (n=4)

Student	Department	Faculty Mentor	UG Research	Summer Bridge	Mini-Grants
Parker, Runeshia	Geoscience	Deline	X		
Thomason, Rachael	Geoscience	Deline	X		
Fanning, Taylor	Geoscience	Berg			X
Mozley, Chrystal	Geoscience	Berg			X

Table 15: Miscellaneous Students Paid by FY 14 UWise Program (n=5)

Student	Department	Faculty Mentor	UG Research	Summer Bridge	Mini-Grants
Black, Joshua	English	Harrison		X	
Bolding, Sydney	English	Harrison		X	
Hendricks, Sarah	English	Harrison		X	
Lucas, Kendal	Education	Duplechain, Baylen			X
Michael, Michelle	Education	Duplechain, Baylen			X

3. Identify partnering departments, offices, or centers participating in the STEM Initiative at your institution. Briefly discuss their relationship with the STEM Initiative and note any relevant contributions.

The 2013 UWise Sumer Bridge Program was based on the collaboration between the College of Science and Mathematics, the College of Arts and Humanities and the College of Education. Faculty members from all three colleges were instrumental in the development, planning and instruction for the Summer Bridge Program. Faculty members from the College of Science and Mathematics taught the MATH 1111 class, and coordinated mathematics study halls and the weekend excursions. Faculty members from the College of Arts and Humanities taught XIDS 2100, English writing and participated in weekend excursions. Faculty members from the College of Education presented the UTEACH program and facilitated the advisement of STEM students interested in careers in K-12 Teaching.

The University of West Georgia also benefits in numerous ways from the strong working relationship between Academic Affairs and Student Affairs. This collaborative relationship was again evident in the successful planning and implementation of the month-long 2013 Summer Bridge program.

The Admissions Office ensured that students were eligible to be registered for summer classes. The Financial Aid Office processed FAFSA and Hope Scholarship applications. The Office of First Year Experiences facilitated the academic advising and registration of students into summer courses as well as Fall UWise Learning community courses. Residence Life handled logistical arrangements for the residence halls and provided Residence Assistants (RAs), who supervised the UWise students after hours. Auxiliary Services (Division of Business and Finance), through Food Services, ensured smooth coordination with all meals. Although these partnerships did not contribute directly to the academic mission, the Summer Bridge program would not have been successful without the support of these units.

B. *Program Successes* – This section covers the key accomplishments of your institution's STEM Initiative program during FY2014:

1. Explain how your program has made progress toward Goal 1, **improving the readiness of P-12 students** for STEM in college. (You may wish to draw upon service learning programs, among other efforts. You also may wish to describe bridge programs or similar efforts directed at incoming freshmen.)

2013 SUMMER BRIDGE PROGRAM

In early Spring 2013, a formal letter of invitation to attend the 2013 Summer Bridge program was sent to about 700 incoming freshman to the University of West Georgia who had expressed an interest in majoring in a Science, Technology, Engineering, or Mathematics (STEM) discipline. Faculty members and Ms. Amanda Wright, UWise Coordinator, gave presentations about the program at UWG orientation sessions and preview days for incoming students and their parents. These orientations occurred in Spring and Summer of 2013. Faculty and Staff also visited several local high schools to give presentations about the UWise program.
Of the seventy-one students who indicated interest in the program, sixty students were accepted based on high school GPA and SAT or ACT scores. Thirty-six students chose to attend the program, which occurred from June 30 - July 26, 2013, on the UWG campus. Students paid for their courses and the UWise program paid for room and board on campus.

Over the course of the four-week Summer Bridge program, students took two courses for academic credit:

- **XIDS 2100** (**English Writing**). This three-hour writing course explores science concepts such as sustainability and the environment, within the context of the 'logical writer.'
- **MATH 1111 (College Algebra).** This is a standard three-hour college algebra course.

Students' daily schedule for Sumner Bridge program was:

9:00 am – 11:30 am:	XIDS 2100 (English Writing)
11:45 am – 12:30 pm:	Lunch/Speakers
1:00 pm – 3:30 pm:	MATH 1111 (College Algebra)
5:15 pm – 6:00 pm:	Dinner
6:00 pm – 8:00 pm:	Mandatory Study Hall

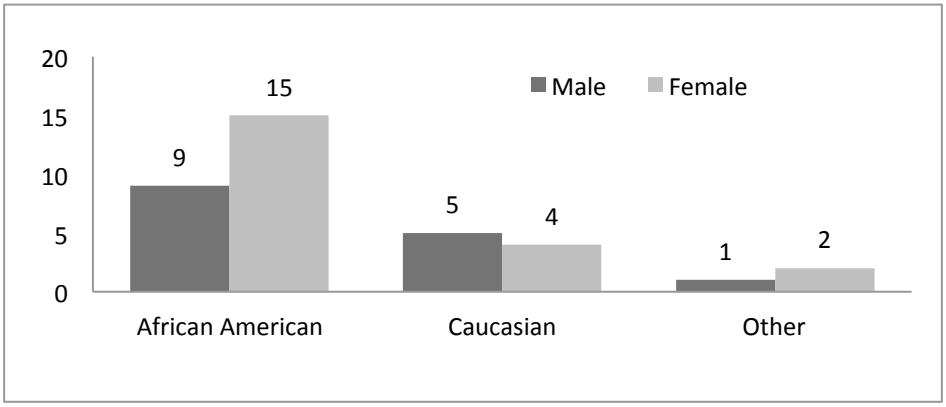
The program also included two weekend excursions. The first trip was to the Georgia Aquarium in Atlanta, GA. The second was to Callaway Gardens in Pine Mountain, GA.
These students were placed into a student learning community in Fall 2013, taking the following courses together:

- ENGL 1101 (three hours): English Composition I
- CHEM 1211K (four hours): Principles of Chemistry I
- MATH 1113 (four hours): Precalculus **or** MATH 1634 (four hours): Calculus I
- XIDS 2001 (one hour): What Do You Really Know About: *STEM Professions*

2013 Summer Bridge Student Demographics

Of the thirty-six students that chose to attend the 2013 Summer Bridge program, fifteen are male and twenty-one are female. Twenty-four are African-American, nine are Caucasian, one is American Indian, one is Asian or Pacific Islander, and one is listed as 'Other.'

Figure 1. Number of Summer Bridge 2013 Participants (Gender & Race)

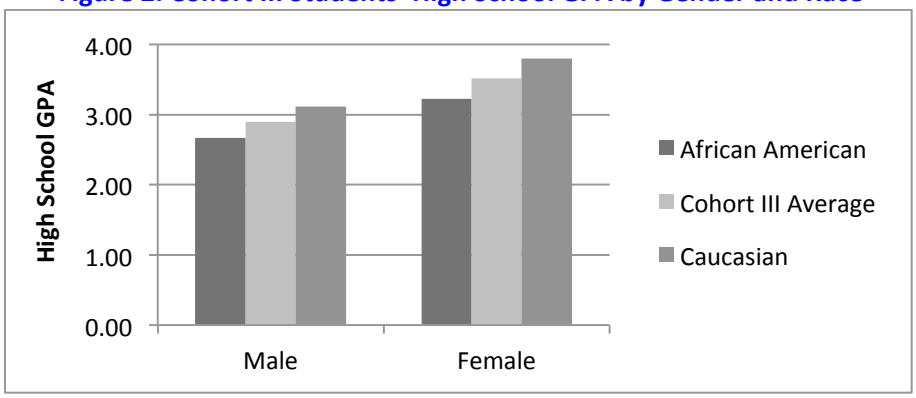


As illustrated in *Figure 1*, there were six more African-American females (15) than males (9) in Cohort III. There were fewer Caucasian students in this Cohort, but almost equal male (5) and female (4) students

in this ethnic group. Two females are listed in the "other" category; one listed herself as 'Other,' and the second listed herself as Asian or Pacific Islander.

Students' admissions data included their high school grade point average (GPA), either SAT or ACT scores, as well as their freshman index calculated by the University of West Georgia. The average high school GPA for all Cohort III students was 3.11. Caucasian students' high school GPA was higher (3.46) than their African-American counterparts' GPA (2.95), and females' was higher (3.51) than males' high school GPA (2.89). As shown in *Figure 2*, African-American males had the lowest high school GPA (2.67), and Caucasian females had the highest high school GPA (3.80).

Figure 2. Cohort III Students' High School GPA by Gender and Race



All but one of the admitted students took the SAT for admissions, although several students took both the SAT and the ACT. The average SAT scores by section are as follows:

Table 16. 2013 Summer Bridge Students' Admissions SAT Scores by Gender and Race

	African-American Male	African-American Female	Caucasian Male	Caucasian Female
SAT-M	509	474	552	528
SAT-CR	478	488	526	525
SAT-W	453	475	482	508

In *Table 16*, please note that Caucasian SAT scores are higher in each category than African-American SAT scores. Caucasian males had the highest scores on SAT-M and SAT-CR, whereas Caucasian females had the highest score on SAT-W. African-American females had the lowest score in SAT-M, and African-American males had the lowest scores in SAT-CR and SAT-W.

Student Suggestions to Improve Summer Bridge

The majority of students who attended the 2013 Summer Bridge program found the experience to be positive, felt like they were able to get a head start on college, and did well in their academic courses. Students were most satisfied with their Math 1111 course as well as English course experiences and were least satisfied with English tutoring sessions. These students suggested that the summer program could be improved by providing more free time in the schedule, improving the excursions, and changing study hall policies. These suggestions were taken into consideration while refining the 2014 summer bridge program, allowing more free time after the classes, allowing students to leave the mathematics tutoring after the completion of homework assignments and limiting the number of weekend excursions.

*Matched Non-Bridge group***.** For each UWise student in a given Cohort, a matched non-bridge student was selected, in a blind fashion, by matching SAT scores, freshman index, and high school GPA. Only STEM majors were considered for the matched non-bridge group. Data were provided by the Office of Institutional Effectiveness and Assessment.

PROGRESS TOWARD STEM GOAL 1

A. The Fall-Spring retention rate for 2013 Summer Bridge students (Cohort III) was 76.6% compared to 65.3% for matched Non-Bridge students. At the end of freshman year, the GPA of UWise Cohort III was 2.47 compared to 2.13 for matched Non-Bridge students.
B. Bridge students outperformed their non-Bridge peers in ENGL 1101, ENGL 1102, CHEM 1211 and MATH 1113, whereas their performance was essentially the same in Math 1634 and lower in CHEM 1212.
    - In ENGL 1101, Bridge students' average GPA was 2.67 compared to 2.19 for their matched Non-Bridge peers. The DFW rate was 12.5% for Bridge students and 31.25% for matched Non-Bridge students.
    - IN ENGL 1102, Bridge students' average GPA was 3.25 compared to 2.56 for their matched Non-Bridge peers. The DFW rate was 15.4% for Bridge students and 27.8% for matched Non-Bridge students.
    - In MATH 1113, Bridge students' average GPA was 2.48 compared to 2.36 for their Non-Bridge peers. The DFW rate was 18.2% for Bridge students and 32.14% for matched Non-Bridge students.
    - In MATH 1634, Bridge students' average GPA was 2.12 compared to 2.44 for their Non-Bridge peers. The DFW rate was 40% for Bridge students and 40% for matched Non-Bridge students.
    - In CHEM 1211, Bridge students' average GPA was 2.56 compared to 2.56 for their matched Non-Bridge peers. The DFW rate was 15.15% for Bridge students and 23.53% for matched Non-Bridge students.
    - In CHEM 1212, Bridge students' average GPA was 1.88 compared to 2.43 for their matched Non-Bridge peers. The DFW rate was 42.86% for Bridge students and 25% for matched Non-Bridge students.

Upon entering the Summer Bridge program, 41.7% planned to major in Biology, 19.4% planned to major in Computer science, 11.1% planned to major in Chemistry, 11.1% were undecided, 5.6 % planned to major in Geoscience, 5.6% planned to major in Mathematics, 2.8% planned to major in pre-engineering, 0% in Physics, and 2.8% planned to pursue other disciplines. At the end of their freshman year, a total of six students changed their majors (two each from Biology, Geoscience and Mathematics). At the same time six students decided to pursue other majors. This may be due to the fact that the UWise students were highly encouraged by UWise faculty and staff to officially change their majors if they expressed a desire to change.

We have reviewed the year-to-year retention rates (*Table 17* below) for the UWise Summer Bridge students as compared to their matched Non-Bridge peers and the general UWG population. The UWise students have a considerably higher first year retention rate than matched Non-Bridge students. However, second and third year retention rates of UWise students were slightly lower than their peers. It is somewhat disheartening to see the gains made in the first year are lost by the second and third years. One of the possible reasons could be that there is no UWise support structure after first year,

excepting voluntary participation in "BeWise," the UWise student organization. Academically, they have to figure out their class schedules and register. The UWise team is considering extending the academic and career counselling support in the second and third years with the help of newly reorganized UWG Center for Academic Success and the Office of Career Counseling.

Table 17. Student Retention Rates - UWise Summer Bridge vs. Matched STEM Non-Bridge*

Group	First Year Retention	Second Year Retention	Third Year Retention
Cohort I – Summer Bridge 2011	76.60%	53.20%	47.40%
Matched Non-Bridge STEM	65.30%	54.70%	47.40%
All UWG Freshmen Who Entered Fall 2011	70.17%	55.41%	49.15%
Cohort II – Summer Bridge 2012	72.40%	51.70%	
Matched Non-Bridge STEM	65.50%	55.20%	
All UWG Freshmen Who Entered Fall 2012	70.76%	56.21%	
Cohort III – Summer Bridge 2013	75.00%		
Matched Non-Bridge STEM	55.60%		
All UWG Freshmen Who Entered Fall 2013	74.16%		

*All Freshmen Students who entered in the same academic year as the UWise Summer Bridge Students are included for comparison to the UWise Cohort and Matched, Non-Bridge STEM Comparison Group.

2. Explain how your program has made progress toward Goal 2, **improving student success and completion rates**, by discussing how your program, a) **increased STEM majors**, b) **supported student retention and progression in STEM**, and c) **increased STEM degree completion**.

A. There was an increase in the number of STEM majors between AY 2012-2013 and 2013-2014. STEM majors increased from 1937 to 2189 (+252). However, the number of STEM education majors decreased from 256 to 192 (-64). Areas of growth across all STEM fields included:
    - Biology (from 919 to 1009)
    - Chemistry (from 211 to 237)
    - Computer Science (from 284 to 405)
    - Physics (from 28 to 32)
    - Geoscience (from 100 to 156)
    - Engineering (from 87 to 106 majors)

B. Total number of STEM degrees awarded rose from 248 in AY 2012-2013 to 276 in AY 2013-2014, an 11.3% increase. Increases were in the following disciplines:
    - Biology (from 109 to 130 graduates, a 19% increase)
    - Computer Science (from 21 to 38 graduates, a 80.9% increase)
    - Physics (from 5 to 6 graduates, a 20% increase)
    - Geoscience (from 14 to 35, a 150% increase)
    - B.S. in Mathematics Education (from 8 to 9, a 12.5% increase)
    - B.S. in Science Education (from 5 to 6, a 20% increase)

C. DFW rates declined in most of the STEM courses and but rose in few courses.
   a. 2013-2014 DFW rates decreased from 2012-2013 rates in the following areas:
      - BIOL 1107 (from 36.3% to 20.1%)
      - BIOL 1108 (from 27.4% to 13%)
      - BIOL 2108 (from 14.4% to 11.9%)
      - CHEM 1211(from 34.1% to 27.2%)
      - CHEM 1212 (from 26.9% to 25.1%)
      - MATH 1111 (from 37.9% to 30.2%)
      - MATH 1113 (from 37.9% to 35.7%)
      - MATH 1634 (from 38.8% to 36.6%)
      - PHYS 1111 (from 21.7% to 20.8%)

   b. 2013-2014 DFW rates increased from 2012-2013 rates in the following areas:
      - BIOL 2107 (from 23.8% to 24.8%)
      - PHYS 1112 (from 11.5% to 17.7%)
      - PHYS 2211 (from 34.1% to 36.7%)
      - PHYS 2212 (from 19.3% to 34.7%)

3. Explain how your program has made progress toward Goal 3, **improving the pre-service P-12 STEM teacher preparation and production**.

UWise students were recruited by the UTeach program to explore K-12 science and/or mathematics teaching through the UTeach Step 1 (UTCH 2001) and Step 2 (UTCH 2002) courses. These courses (one credit hour each) allow students to "try out" teaching in elementary and middle schools, using structured lessons developed by master teachers and practiced in the UTCH 2001/2002 classes prior to students executing them in real classrooms. Students who successfully complete UTCH 2001 are reimbursed for their tuition for that course; this is also true for successful completion of UTCH 2002.

Twenty FY12 UWise (Cohort I) students enrolled in UTCH 2001 and eight of those enrolled in UTCH 2002. Of the eight, two of students enrolled in 3000 level UTeach courses, meaning that they have selected K-12 science and mathematics teaching as a career option.

One of the FY13 UWise (Cohort II) students enrolled in 3000 level UTEACH courses, meaning that this person choose K-12 science and mathematics as a career option.

Two FY14 UWise students enrolled in UTCH 2001. As discussed in FY13 annual report, the decreasing trend is likely due to revisions in the UWise summer bridge program that changed the "workshop" format to a credit-bearing, academic experience. These purposeful changes were the result of solid data that identified challenges associated with the potpourri of science and mathematics content in the XIDS course in Fall 2011. However, the portion of the XIDS course that *was* successful (i.e., learning about K-12 teaching as a career) was not a good fit in the new credit-bearing mathematics course. Alternatively, faculty members attempted to incorporate exposure to K-12 teaching through several guest lectures during the 2013 Summer Bridge evenings. Parenthetically, we note that the XIDS course in Fall 2013 (Khan and Mruthinti, two concurrent sessions, n = 36*) What do you know about STEM professions?* was revised to explicitly incorporate two sessions taught by COE colleagues, as well as a service learning component worth 10% of the grade.

As of writing this report, five FY15 UWise students (Cohort IV) are taking UTCH 2001 course, suggesting a slow but steady increase in interest in K-12 teaching career on the part of UWise students.

4. Discuss **other key successes** of your institution's STEM Initiative program.

In addition to the activities discussed in other sections of this report, three additional successes associated with UWG's UWise program are noteworthy. The first derived from outstanding results in (1) a supplemental instruction program in an organic chemistry mini-grant, and (2) the continued success of supplemental instruction in introductory physics courses. The second is the result of our successful collaboration with English faculty, which resulted in the addition of English writing with a STEM focus to the 2012 and 2013 Summer Bridge Programs and continued emphasis on STEM to STEAM throughout the semester. The third is students' participation in undergraduate research.

*Supplemental Instruction in Organic Chemistry and Principles of Physics***.** Organic Chemistry is a key gateway course for STEM careers, particularly in the healthcare field. At the same time, it is one of the, if not the most, challenging courses with relatively high DFW rates. Supplemental Instruction (SI) was implemented in three sections of Organic Chemistry in the 2013-2014 academic year. SI is an academic support program where a trained peer tutor who has successfully completed the class attends the lecture class and facilitates three out-of-class problem sessions per week. The SI leader functions as a role model and works to facilitate group interaction and provide study strategies for success. Four SI leaders went through a training conducted by the campus EXCEL center (the UWG student academic support center). A total of two hundred students were enrolled in these three sections and one hundred and fifty seven of those students (78.5%) participated in at least one session. A total of one hundred and nine SI sessions were offered and students participated in nine hundred and seven hours of supplemental instruction, an average of over five hours for each participating student. The students who attended at least one session scored an average of half a letter grade (0.63 out of 4) better than those students that did not participate.

Similarly, supplemental instruction continued to show positive results in introductory physics courses. Students in PHYS 2211 who attended at least two-thirds of the workshops performed substantially better. The DFW rate is almost double for the students who did not attend workshops, compared with the ones who did attend the workshops.

STEM to STEAM: English Writing with a STEM Focus. Recognizing that English writing and analytical skills are critical components for overall success of STEM students, we have introduced STEM as one of the themes for their English writing assignments in the 2012 Summer Bridge program. This component was further refined in the 2013 Summer Bridge program. In Fall 2013 and Spring 2014, we continued the same theme in selected sections of ENGL 1101/1102. This resulted in a decrease of DFW rates by about one-half compared to matched Non-Bridge students. This cross-disciplinary approach to teaching and learning (from STEM to STEAM, bringing the A in for the Arts) is the basis for a recently funded *Complete College Georgia Replicate Grant* aimed at significantly expanding the number of STEM-based ENGL 1101 and ENGL 1102 courses over a three year period and to potentially serve as a model to replicate in other colleges and universities in USG.

Third, providing a hands-on research approach through undergraduate research experience is vital to the preparation of STEM students. It not only reinforces the content, but also prepares them for successful careers in STEM professions. The positive impact of UWise undergraduate research support is evidenced in thirty-two student presentations in a single year.

It is noteworthy that UWise has been recognized as the best program at UWG under the auspices of Regents' Teaching Excellence Awards (in the programs and departments category) for the 2013-2014 academic year. UWise competed, unsuccessfully, for similar recognition at the USG system level. **BeWise,** the student organization consisting of UWise students has been recognized as the best new student organization on campus in the 2013-2014 academic year.

C. *Program Challenges* – This section covers challenges that continue to face your institution's STEM Initiative program:

1. What challenges has your program encountered in **increasing the number of STEM majors**?

As noted in the FY13 annual report, the challenges UWG faces with attempts to increase the number of STEM majors are no different from those faced by many institutions. Our incoming freshmen, for the most part, are underprepared in science and mathematics. Further, they struggle with the Core Area A1 requirements (i.e., two freshman writing composition courses). Our institutional data, which is agreement with national statistics, show that students who do not successfully complete the freshman "gateway" courses in mathematics and English are less likely to earn a STEM degree.

2. What challenges has your program encountered in **increasing STEM degree production**?

UWise program was in its third year of implementation in 2013-2014, which was too early to impact STEM degree production. However, interim indicators of student progress suggest that the gains after first year are lost during the second and third years. We are considering extending the academic support structure through recently reorganized center for academic success.

One of the most poignant "lessons learned" from the FY14 UWise program was the level of enthusiasm of COSM faculty in Scholarship of Teaching and Learning. One of the requirements for UWise funding is mandatory participation in the Faculty Learning Community to design research investigation that will help faculty determine the effectiveness of their own teaching and their students' learning. These efforts are beginning to bear fruits as evidenced in the faculty focus groups and surveys.

However, large-scale faculty buy-in continues to be an uphill task. In collaboration with the newly formed UWG Center for Teaching and Learning, UWise is providing a framework for COSM faculty development through a series of workshops and one-on-one support sessions designed as a "Faculty Learning Community." This approach has been quite successful. Please see *Table 20* for a list of the FY13 faculty mini-grants and their findings.

Similarly, "institutionalization" of the successful components of UWise is yet to be realized. Now, having the President and Provost in place, who are the great supporters of UWise program, we anticipate that some of the successful components, such as Summer Bridge program and Supplemental Instruction will be institutionalized in coming years.

3. Are there any **program-specific** (i.e. mini-grants, service learning opportunities) challenges that your program has encountered?

As noted earlier in FY13, the data-driven decision to schedule UWise students in credit-bearing courses in the Summer Bridge program possibly interfered with recruiting UWise students in the UTeach program. UWise and UTeach leadership and faculty are continuing to work to mitigate this situation.

4. Are there any **other challenges** that your program has encountered that you have not described (i.e. departmental buy-in, personnel issues).

In our FY12 and FY13 reports, we discussed the buy-in by the COSM department chairs. The UWise administration in collaboration with COSM Dean's office continues to work with the Chairs to address these issues. As discussed in section C 3, the UWise team is also working with COSM faculty members for large-scale faculty buy-in. It should be noted that about one-third of the COSM faculty participate in the UWise program and this trend continues to grow each year.

D. Did you implement the STEM Initiative program at your institution **as described in your project proposal** for FY2013? Please describe any notable changes from the proposal that you made (additional project components, project deletions).

For the most part, the FY14 UWise program followed its plans, as noted in the original proposal and proposed modifications noted in the FY13 UWise Annual Report. However, changes to the 2013 Summer Bridge program include - replacement of XIDS 2002 (Science and Math exploratory course) with Math 1111, College Algebra (three credits) and elimination of PWLA 1634 (one credit).

The XIDS 2001 Summer Bridge Program writing class (STEM focus) was highly successful, although this program component was developed after the submission of the original UWise proposal. These evolving events, precipitated by formative evaluation findings as well as increasing UWise faculty sophistication with regard to those factors that act as barriers to STEM student success, are normal outcomes of program evaluation when it is designed well and implemented effectively.

II. Data Sheet Addendum

A. If you reported **engineering majors** in FY2014 (Row 12), please identify relevant subfields (mechanical engineering, electrical engineering, engineering technology, etc.) and specify the number of majors in each.

Chemistry/Dual Degree Engineering: 28 majors
Physics- Pre-Engineering: 19 majors
Physics-2 year Engineering transfer: 1 major
Physics/Dual Degree Engineering: 58 majors

Additional data are provided in the *Table 18* below.

Table 18. Engineering Majors at the University of West Georgia AY 2013-2014

Degree	Total Majors	Race								Gender	
		Ameri-can Indian	Asian	Black	His-panic	Pacific Islan-der	Multi-Racial	White	Un-know n	F	**M**
Chemistry/ Dual Degree Engineer	28	0	0	8	2	0	0	18	0	10	**18**
Physics- Pre-Engineering	19	0	0	7	2	0	0	10	0	4	**15**

Physics-2 yr Engineer Transfer	1	0	0	0	0	0	0	1	0	0	**1**
Physics/Dual Degree Engineering	58	0	0	16	2	0	3	36	1	5	**53**
Totals	106	0	0	31	6	0	3	65	1	19	**87**

B. If you reported majors in the field **"Other"** (Row 13), please identify those degree programs and specify the number of majors in each.

Not Applicable.

C. If you reported **engineering degrees awarded** (Row 91), please identify the specific degrees (i.e. BS in mechanical engineering, BS in electrical engineering, etc.) and specify the number of awardees for each.

B.S. in Physics/Dual Degree Engineering: 2 graduates

D. If you reported **degrees in the category "Other"** (Row 92), please identify the specific degrees and specify the number of awardees for each.

Not Applicable.

E. If you have any **additional notes** to offer relevant for the data sheet, please enter those here.

According to the College of Education, three students completed a Non-Degree program during 2013-2014 (One each in Science, Biology, and Middle Grades Mathematics). More data on Post-Baccalaureate Program Enrollees in 2013-2014 are provided in the table below.

Table 19: Post-Baccalaureate Program Enrollees 2013-2014

Post-Bac Programs	Total Enrolled	Race								Gender	
		American Indian	**Asian**	**Black**	**Hispanic**	**Pacific Islander**	**Multiracial**	**White**	**Un-known**	**F**	**M**
Non-degree-Biology/Secondary Education	**4**	0	0	2	0	0	0	2	0	2	2
Non-degree-Earth Science SEC	**1**	0	0	0	1	0	0	0	0	1	0
Non-degree-Mathematics Teacher Education	**2**	0	0	1	0	0	0	1	0	2	0

Non-degree-Physics/ SEC	**1**	0	0	0	0	0	0	1	0	0	1
Non-degree Science Teacher Education	**2**	0	0	1	0	0	0	0	1	2	0
Non-degree MATH Endorsement	**13**	0	0	2	0	0	1	10	0	13	0
Totals	**23**	**0**	**0**	**6**	**1**	**0**	**1**	**14**	**1**	**20**	**3**

III. Programmatic Components

A. Faculty Mini-grants

During the Fall 2013 semester, faculty members were invited to submit a proposal to receive a mini-grant that could be used to improve instruction and enhance the success of students in science and math courses. Projects supported faculty in the development and implementation of innovative instructional strategies to improve student learning. All full-time faculty members from the COSM and COE were eligible to apply. For faculty members in the COSM, proposals could be submitted by an individual faculty member, a group of faculty members, or by a department as a whole by the Department Chairperson. For COE faculty, grants were available to support proposals that provided students the opportunity to gain teaching experience in science and mathematics. Awardees from the previous mini-grant cycle (2012-2013) were also encouraged to submit a proposal to refine or broaden the scope of their previous projects.

The recipients of mini-grants were expected to implement pedagogical innovations in Fall 2013 and Spring 2014, analyze the data in May, 2014, and submit the final report by June, 2014. Faculty members supported through mini-grants were required to form the Faculty Learning Community (FLC) during the Spring semester of 2014. The FLC activities were coordinated by the Director of the UWG Center for Teaching and Learning.

Eighteen mini-grant proposals were submitted and fifteen were funded. The funded proposals included three from Mathematics, four from Physics, two from Chemistry, two from the College of Education and one each from Computer Science, Geosciences and Biology. In addition, there was a cross-disciplinary mini-grant funded. Furthermore, four peer-reviewed publications resulted from faculty activities supported by the UWise initiative.

1. Please provide a list of the mini-grants provided by your institution as part of its STEM Initiative for FY2013. You may use the following table or some alternate format, but please be sure to provide all of the information requested:

Table 20. 2013-2014 Faculty Mini-Grant Projects

Project Title	Faculty Investigators	Award Amount	Brief Description	Key Research/ Pedagogical Outcomes
Improving STEM	Jennifer Edelman	$6,000	During the Spring 2014 semester, 21 pre-service	No significant differences between the comparison and

content learning for teaching through mathematical discourse: Focus on undergraduate students in elementary education	elementary teachers participated in discourse-intensive methods of teaching mathematics course. The goal of this research project was to see which, if any, interventions encouraged meaningful discourse and peer-interaction during mathematical activities. Multiple interventions were used, including the use of manipulatives, children's literature, and problem-solving activities. Sessions in which no intervention was used and those in which interventions were present were video and audio recorded.	intervention conditions were found. During the comparison (non-intervention) condition, participants had a higher frequency count in the categories of mathematical representations and comparing the mathematical ideas/tasks to prior experiences. The remaining categories had higher frequency counts during the intervention condition, but these differences were not large enough to be significant. The largest difference between comparison and intervention conditions was the category of nominal responses. During the comparison condition, participants gave statements of agreement or disagreement without elaboration or explanation of their responses a total of nine times. In the intervention condition, the frequency of nominal responses dropped to five. This change in types of responses was not supported when the data were examined for building responses. In the comparison condition, six instances of a building response were noted, whereas in the intervention condition that number increased only to seven.

Designing and Developing Digital-based Learning Objectives for Diagnosing and Correcting Authentic P-5 Mathematical Errors	Rosalind Duplechain Danilo Baylen	$6,385	The project studied a class of pre-service teachers who were shown nine video clips online, following which the instructors tried to find answers to the questions about their level of preparation, the best-suited method of teaching and learning in terms of diagnosing and rectifying mathematical errors, the challenges faced when learning with the aid of technology and the advantages and disadvantages of using video-based resources in completing class projects.	The findings show that the digital resources used in this project eased the learning experience of pre-service teachers because of the visual aspect of the resources. The surveys conducted also answered the research questions about the level of usefulness of video-based learning in pedagogy and the ways in which it is useful in understanding the context of diagnosing and correcting mathematical errors when teaching pre-k to grade 5 learners.
Materials Chemistry	Sharmistha Basu-Dutt Doug Stuart Spencer Slattery	$7,000	Materials Chemistry is a new elective course appropriate for all Chemistry and selected science majors. The course uses basic concepts from organic, inorganic, and physical chemistry to describe the structure and properties of a variety of materials. Lectures, hands-on activities, and tours of local industries expose the student to the theoretical basis and practical applications in the field of materials.	All 17 students successfully completed the course and actively participated in activities. All students attended the four field trips and wrote about unique learning opportunities during the field trips. All 17 students also explored a current materials topic or conducted an independent materials project using peer reviewed articles and presented their findings via an oral presentation to the class.

Supplemen-tal Instruction in Organic Chemistry	Victoria Geisler Partha Ray David Boatright	$5,740	Supplemental Instruction (SI) was implemented in three sections of Organic Chemistry in the 2013-2014 academic year. SI is an academic support program where a trained peer tutor who has successfully taken the class before attends the lecture class and facilitates three out-of-class problem sessions per week. The SI leader functions as a role model and works to facilitate group interaction and provide study strategies for success rather than lecture. The SI leaders went through a training conducted by the EXCEL center.	A total of two hundred students were enrolled in these three sections and 78.5% of those students (157) participated in at least one session. A total of 109 SI sessions were offered and students participated in 907 hours of supplemental instruction, an average of over 5 hours for each participating student. The students who attended at least one session scored an average of half a letter grade (0.63 out of 4) better than those students that did not participate. In addition, students that participated in at least one session were more successful (A, B, C) than those that did not participate.
The Effects of Workshop Attendance in PHYS 2211/2212 on Student Achievemen t	Julie Talbot Neal Chesnut	$3,280	This study is designed to look at how workshop attendance affected student performance in the class, particularly the DFW rates, but also the students' final course grades. Students' conceptual understanding of the material was also evaluated in some of the courses by giving well-known Conceptual Inventories for both courses as both pre- and post-tests.	Students in PHYS 2211 who attended at least two-thirds of the workshops performed substantially better. The DFW rate is almost double for the students who did not attend workshops, compared with the ones who did. In PHYS 2212, the results were not as clear-cut. Since everyone in that course has already passed PHYS 2211, they are generally better prepared than students in 2211, and are aware of the course expectations.

Teaching more by Lecturing Less: Implementing Active-Learning Techniques in a Large, Lecture Course	Andrew Edelman	$2,700	Large, undergraduate lecture courses in the STEM disciplines have traditionally experienced poor student attendance as well as high D/F/withdraw (DFW) rates. As a result, these classes (sometimes categorized as "weed-out" courses) have been identified as a significant contributor to the loss of STEM majors (particularly for minority students) and the overall disinterest in STEM disciplines among college students. Moving these courses from instructor centered to learner centered through active-learning techniques has been shown to significantly improve student learning outcomes. The goal for this project was to develop active-learning materials and methods (peer discussion, clicker questions, and case studies) for two large, lecture courses (BIOL 2108 and BIOL 1010) and evaluate their impacts on student learning and attitudes.	My preliminary results support that STEM students can improve learning outcomes by engaging in active-learning techniques. Students in the BIOL 2108 course exhibited an increase in learning gains when using peer discussion on in-class concept questions compared to only the traditional instructor explanation method. Active-learning also improved student engagement. Both classes had low DFW rates and students exhibited positive attitudes towards active-learning techniques.

Flipping the Classroom in PHYS 2211	Julie Talbot	$4,000	The Flipped Classroom model was used in PHYS 2211 for the section that covered Newton's Laws. I looked at in-class exam scores and the gains on the Force and Motion Conceptual Evaluation (FMCE), a well-known, rigorously tested evaluation of basic mechanics concepts.	The gains on the Newton's Laws portion of the FMCE showed a slight, but not statistically significant improvement. The scores for the corresponding in-class exam were also very similar to previous semesters, with a p-value of 0.127. While the in-class exams scores in PHYS 2211 generally decline slightly as the semester goes on and the material gets more difficult, for this class, the exam scores improved steadily after the flipped classroom unit. The students seem to have learned better study habits as the course went on, since the average on Test 4 was 7.5 points higher than on Test 1, which was statistically significant at the p=0.01 level.
The Effects of Supplemental Instruction (SI) on Students' Achievement in College Algebra	Carrie Thielemier	$3,400	The purpose of this research project was to access whether attending SI increased a student's overall course performance. My primary research question was: *What is the effect of SI attendance on MATH 1111 students' course performance compared across level of risk for course failure?* To answer this question, I categorized each student's risk of course failure (high, moderate, or low risk), counted the number of SI sessions each student attended, and then compared course achievement of students at each risk level. SI sessions were held for 1 hour, three times a week. Sessions were not mandatory, but students	After analyzing data for MATH 1111, it appears that SI is an effective tool for those who are moderate to high risk students. Students who are low risk may not have to use the additional resources to succeed in the class. Students who are high risk may benefit more from one on one tutoring if they do not plan to attend so that they are more likely to receive a better than average grade. My end goal is for MATH 1111 instructors to have the ability to categorize students based on a variety of easily obtainable factors and what resources work best for each categorization. Giving a student this type of information within the first week of class will help them manage their time and

			were encouraged to attend. There were at least two SI leaders available for MATH 1111 each semester, either provided through the UWise mini-grant, or through the EXCEL Center. A student received credit for attending a one hour session only if they were present for 50 minutes.	understand with is expected for them to succeed. This may also encourage instructors to start incorporating these resources within their class so students have a much better chance of passing the class with a strong understanding of the topics covered.
Lecture Notes for MATH 1111	David Leach Carrie Thielemier	$3,000	The purpose of this project was to determine if students performed better on sections in MATH 1111 where lecture style notes were provided as opposed to sections where students were required to copy notes given during class. Our primary research question was: *Do students perform better on sections where they are given workbook style lecture notes compared to sections where they are not given workbook style lecture notes?* To answer this question, we categorized each section based on level of difficulty and length, where one was considered extremely easy, and 5 was considered extremely difficult. We then analyzed the questions on the final exam, and compared each student's score on the section with notes, to the sections without notes.	Based on the performance of the students on the final exam, and on their responses to the survey, it is safe to say that the workbook-style lecture notes were helpful to the students. The numerical results show a small improvement in student performance, and the survey results show that the students were enthusiastic about the notes and that they used them. Many students said that they liked the notes and would like to have them for more or all of the topics that were covered in the course. In the future we would like to develop more workbook-style notes for other topics in the course, and use them in more sections of MATH 1111.

Video Tutorials for CS 3151/CS 3152	Li Yang Anja Remshagen	$2,500	In order to determine if students have a better understanding of the material, concepts, and algorithms by using the flipped classroom, the class was split into two groups for one week. Group L was exposed to the traditional lecture model during that week and Group F to the flipped classroom. Both groups were taught exactly the same material. Group L met on a Monday for a traditional lecture that introduced the abstract data type priority queue, the heap data structure, its associated operations, and heap sort. The same material that was covered in the lecture was recorded through narrated slides. The recordings were assigned to Group F to watch before the class meeting on Wednesday. The recordings were not available to Group L. Group F worked through exercises in the class meeting on Wednesday. A pre- and post-test assessed the progress of each group.	Based on the one-week study, it does not seem that students are performing better on hand-written exercises in the flipped classroom compared to the traditional lecture model after a topic has been completely covered. In this study however, the final grades have been significantly better in the flipped classroom and no student withdrew from the class when compared with previous offerings of the class that applied the lecture model. There is some indication that the students perform better in the traditional classroom on less complex problems for which they have seen examples in class. They perform better on complex problems in the flipped classroom if those problems have been practiced in class.

Using Literature in Mathematics with Prospective Secondary Mathematics Teachers	Christopher C. Jett	$3,500	The purpose of this UWise project was to infuse literature into a mathematics content course for prospective secondary mathematics teachers. The goal was to expose pre-service teachers to ways to incorporate literature into their pedagogical practices to provide students with access to rigorous mathematics. In so doing, my other goal was for pre-service teachers to deepen their own conceptual understanding of mathematical ideas through literature and chart ways to use literature to influence their students' conceptual understanding of mathematical ideas.	The outcomes suggest that infusing literature creates a culture of exploring mathematics in an ingenious fashion and provides students with innovative ways to think and reason mathematically. A limitation of this work, however, was the small sample size used for this project. Given that we produce small numbers of secondary mathematics teachers here at the University of West Georgia annually, it will be difficult (to nearly impossible) to expand this work with our program and population. One area of cross-university collaboration would be to partner up with a colleague from another institution who is doing similar work to join forces to include a larger sample size. On another note, future research in this realm should explore the pedagogical practices of practicing secondary mathematics teachers who use literature in their instruction. There is much to learn from teachers who do this well at the secondary level as much is not documented in the research literature in this domain.

Incorporation of Small-Group Active-Learning Modules in an Introductory Geoscience Course: Impacts on Scientific Literacy and Student Performance	Christopher Berg	$5,600	In this study, students were encouraged to participate in small-group active-learning modules to supplement and build upon material presented in introductory physical geology course. These modules, which lasted for 1-2 hours, presented students with opportunities to conduct hands-on investigations using models, explore lecture concepts in the field on an on-campus walking tour, and work with analytical equipment not generally available to introductory students (petrographic microscopes, SEM). The effectiveness of these approaches at increasing student attainment of learning outcomes was assessed by pre- and post-tests administered at the module activity, as well as pre-test and post-tests for the course.	Across all 10 modules, the average increase in module pre-test and post-test scores was 31% (5.1/10 vs. 6.7/10). The modules had a significant influence on grade outcomes: students who participated in fewer than 5 modules scored more than half a grade-point lower (2.29) on average than students who participated in 5 or more modules during the semester (2.91).

Implementing Workshop Instruction in Introductory Physics	Ajith DeSilva Nick Sterling	$4,900	Workshops were optional and scheduled separately outside of the class. However, the instructor offered a small percentage of extra credit for those who participated. The facilitating of student-teacher interaction was a key element of this project. Student-led mentors were assigned for each group. They were responsible in simulating classroom discussion, answering questions, and helping students with problem solving. The student assistants were physics major students. Further, these student assistants gained extra experience in studio physics format that could help them to become STEM major teachers in the future. At the end of the semester, students in PHYS 1111 were asked to fill out a survey to evaluate the usefulness of workshops.	Overall, students rated the usefulness of the workshops very highly, citing how it helped hearing problems explained by other students and that the problems helped them better prepare for exams. The data clearly show that students in PHYS 1111 who attended at least 60% of the workshop sessions performed substantially better, and passed at a substantially higher rate than those who did not regularly attend workshops. The DFW rate in particular was more than three times higher (50% vs. 14%) for students who did not regularly attend workshops compared to those that did. In addition, average course grades were 1.5 letter grades higher for students who regularly attended workshops.

Authentic Research-Based Projects for Experimental Physics: Part 2	Ajith DeSilva	$2,500	The project was designed to accomplish the following goals and objectives: *Goal 1* Increase the conceptual understanding of Electricity and Magnetism concepts in participating students. *Objective 1* Increase the conceptual understanding of Electricity and Magnetism concepts in participating students measured by the pre and post-tests. *Goal 2* Increase the academic performance (final grade) of participating students. *Objective 2* Increase the academic performance of the participating students as measured by comparing with those who have not participated (to get reduced DFW rate for participating students as measured with non-participating students).	The average pre-test results is 19.9% for the entire class while with workshop average is 19.5% and without workshop average of 21.6%. The pre-test averages are below the national average, which is about 25%. However there is about 20% rise in post-test average for those who participated in the workshop while [the average] is only 6% for students without workshop. This is a clear improvement for those who participated. 14 students earned As in the course, and 12 of them had attended the workshop. A higher percentage of workshop attendees than non-attendees earned Bs as well. Importantly, the percentage of students earning a grade of D or F or withdrawing from the class was 5% for workshop attendees, while it is 50% without workshop. This is the most significant influence of the workshop that the reduced DFW rate for those who participated. This performance once again showed the impact created by the workshop is significant.

An integrated approach for student success in the freshman year	Farooq Khan	$6,000	A mini grant was funded in 2013-2014 to support innovations in CHEM 1211 and 1211L. There were two innovations implemented for the first time, namely, cyber-workshops in CHEM 1211 and an essay (which counted as 20% of the course grade in CHEM 1211L) supervised and graded by English faculty members. Two critical aspects, problem solving and writing, were thus addressed in these courses, which are taken concurrently by essentially all STEM majors as a part of a year-long sequence.	Feedback from the student leader who conducted the cyber-workshops was very positive. The sessions were well attended (a key criterion), and the students handled the technology very well. This innovation has thus been piloted satisfactory and can be expanded in CHEM 1211 and CHEM 1212 as well as other courses that have workshops. The average grades for these groups, UWise and non-UWise, are virtually identical (82.7 and 82.8 respectively). The collaboration between English and Chemistry faculty members in a Chemistry course was thus shown to be a feasible exercise, which can potentially be expanded to more sections of chemistry courses and possibly other courses in the sciences. This is a timely proof-of-concept for the QEP to be implemented in 2015, emphasizing writing in the core curriculum.

2. State the **funding rate** for mini-grants at your institution (i.e. number of grants funded vs. total number of proposals received)? Discuss how proposals were **judged and awarded**.

All proposals were reviewed by the UWise leadership team (Mruthinti, Sykes) using the RFP's scoring rubric (see *Table 21*). Of the eighteen grant proposals received, only fifteen were funded. One renewal grant was rejected for the failure to submit the progress report from previous year, another grant was rejected due to significant overlap in the budget requests from another funded program, and the third grant was rejected as the course associated with the mini-grant was scheduled to teach in summer summer 2013 instead of regular academic year as outlined in RFP. It is anticipated that several of the innovations such as SI and workshops will be expanded in other STEM courses, and in some instances institutionalized.

Table 21: Review Criteria for Awarding Mini-grant Proposals

Criteria	Possible Points
Identified need is challenging and compelling.	15
Potential of the project to impact instruction and student learning.	15
Goals are significant and relate to the UWise (BOR STEM Initiative) goals.	10
Research questions are clear and measureable.	10
Plan includes activities that are based on identified need and will lead to successful implementation of project.	30
Evaluation statement for this proposal is linked to the research questions.	10
Budget expenditures are reasonable, justified, and directly linked to proposed plan.	5
Plan for disseminating results	5
Total Possible Points	100

3. For any of the mini-grants listed, do you **have evaluation data or other evidence suggesting the efficacy of the projects**? Also, please discuss the broader impacts for these projects (i.e. changes to instructional approaches, changes to departmental policies, etc.).

Each mini-grant recipient completed a final research report that included results and conclusions. Each report was reviewed to determine effects on teaching and learning. As outlined in *Table 20* of mini-grant projects, most projects that focused on reducing DFW rates or increasing student achievement resulted in positive gains for students.

For example, in the project *Supplemental Instruction in Organic Chemistry* (CHEM 2411), students who attended at least one session of supplemental instruction (similar to workshops) scored more than half of a letter grade higher (0.63 on a 4 point scale) than those who did not participate.

Similarly, in the project *Workshop for Principles of Physics* (PHYS 2211) the percentage of students earning a grade of D, F or withdrawing from the class was almost double for the student who did not attend workshops compared with the ones who did (4.26% for workshop attendees, compared to 46.15% without workshop).

A project on the effects of Supplemental Instruction (SI) on students' achievement MATH 1111, College Algebra courses showed positive effects, particularly those who are moderate-to-high-risk students. This information becomes valuable for both students to prioritize and faculty to devote resources to minimize DFW rates.

Faculty members were also asked to complete a survey. The survey was sent to sixteen faculty members who participated in mini-grants. Fourteen faculty members responded to the survey. On the survey, the faculty members were asked to rate their level of agreement for a series of statements. Their responses are represented in *Table 22*. In the survey, faculty members responded that they were impressed with "*the positive impact it had on students' performance in the class*" and learning more about evidence based teaching practices. Another positive aspect of the faculty learning community mentioned was the collaboration with other faculty and seeing what other people were doing in their classes. Faculty members expressed some frustration with requiring IRB (Institutional Review Board) approval to collect data and the amount of time it took to obtain the approval. Several of the faculty mentioned additional

training on data collection and analysis and discussion of possible avenues for publishing results of their research. Many of the faculty members were thankful for the support received from the Center for Teaching and Learning, specifically the Director.

Table 22. 2013 Faculty Mini-Grant Post-Survey

Engaging in research on my mini-grant project…	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
Helped me become a more effective teacher	50 %	50 %	0 %	0 %	0 %
Increased my awareness of how to conduct research on my instructional practices	71 %	21 %	7 %	0 %	0 %
Increased my interest in researching my instructional practices	64 %	29 %	0 %	7 %	0 %
Changed the way I think about teaching	29 %	50 %	14 %	7 %	0 %
Changed the way I think about assessing student learning	29 %	50 %	14 %	7 %	0 %
Changed the way I engaged with students	21 %	50 %	14 %	14 %	0 %

Faculty members also indicated that they felt supported in their projects through the facilitation, but some said they could have used even more support. This support will be provided by the Director of UWG's new Center for Teaching and Learning, who will provide continuous support for mini-grant faculty using a Faculty Learning Community model.

B. Service Learning Opportunities (i.e. FOCUS-derived projects)

1. Briefly describe the **operation of your institution's service learning opportunity** or FOCUS-derived project for FY2014, including the following:

   a. Name of project(s) or other branding

UTeach: UTeach is an innovative and highly successfully teacher preparation program for students majoring in science and mathematics and the University of West Georgia is one of three UTeach institutions in the state selected to replicate the UTeach model. The national replication program was specifically created to attract the widest range of bright science and mathematics majors into secondary teaching careers, to prepare them with an advanced, field-intensive curriculum, and to promote field retention through induction support and ongoing professional development.

   b. Key Partners for your Project (i.e. Departments/Schools at your institution, participating P-12 schools/school districts, area businesses, etc.)

UWG College of Arts and Humanities

UWG College of Education

Center for Teaching and Learning

c. Data regarding participants (students taking part in project, number/classes of P-12 students engaged through project, number of teachers taking part, etc.)

FY14 UWise students were invited to participate in "service learning" through enrollment in UTeach courses that allowed students to "try out" teaching in actual K-12 classrooms. Two UWise students enrolled in the UTeach 2001 class. As discussed in FY13 annual report, this is a decline as compared to twenty UWise students who attended UTCH 2001 class in FY12. A key difference is the restructuring of XIDS 2002 course, coinciding with the revisions of the summer bridge program itself, as discussed below. The UWise summer bridge program was modified in FY13 from a "workshop" format to a credit-bearing, academic experience. These purposeful changes were the result of solid data that identified challenges associated with the potpourri of science and mathematics content in the XIDS course in Fall 2011.

However, the portion of the XIDS course that *was* successful (i.e., learning about K-12 teaching as a career) was not a good fit in the new credit-bearing mathematics course. Alternatively, faculty attempted to incorporate exposure to K-12 teaching through several guest lectures during the 2013 Summer Bridge evenings. Furthermore, XIDS 2001: *What do you know about STEM professions?* taught in Fall 2013 (Dr. F. Khan and Dr. S. Mruthinti, two concurrent sessions, n = 36) have been revised to explicitly incorporate a service learning component that was coordinated by Dr. Gail Marshall and Dr. Judy Cox (COE faculty members). Their service learning component is worth 10% of the grade.

c. Primary activities and their operation

UWise students who also participate in UTeach enroll in UTCH 2001, and possibly UTCH 2002, to "try out" K-12 science and mathematics teaching under the supervision and instruction of the UTeach Master Teachers.

d. Any outcomes data demonstrating the project's efficacy or effectiveness.

Two UWise students (from FY12 and FY13) have selected K-12 science and/or mathematics teaching as a viable career option. These students are enrolled in the advanced UTeach courses. Two FY14 UWise students are enrolled in the UTeach "try out" sequence (UTCH 2001 and 2002).

C. Institution-Specific Projects

1. **Identify your institution-specific project(s)** outlined in your proposal for FY2013 (i.e. 4-Year Undergraduate Research Experience, Academy for Future Teachers, MESA, summer bridge programs, peer learning communities, STEM tutoring/learning centers, etc.). Discuss any specific branding.

Summer Bridge Program: The UWise Summer Bridge Program is designed for incoming freshmen who intend to major in a STEM field. During the month long summer bridge program conducted from June 30- July 26, 2013, the thirty-six students who took part in the Summer Bridge program were registered for university credit bearing classes. All of the students were registered for XIDS 2100: Arts and Ideas: UWise, a three credit hour course on critical reading and writing (with a focus on STEM disciplines), which counts in area C1 or C2 of the core. All of the students were also registered for MATH 1111: College Algebra, a three credit hour course that allows the students better prepare for college level Math courses. The XIDS 2100 met for two and a half hours each morning, and MATH 1111 class met for two and a half hours each afternoon. Additionally, the students attended supervised study halls to work on homework assignments twice a week and English writing sessions twice a week. Lunchtime guest

lectures were scheduled to discuss topics such as learning skills, time-management, campus safety and alcohol awareness. The students also took part in weekend excursions to the Georgia Aquarium (Atlanta, GA) and Callaway Gardens (Pine Mountain, GA). The content in the XIDS 2100 class was connected to the weekend excursions. Students paid the tuition and fees for six credit hours in Summer 2013 and UWise provided all expenses associated with housing, meals and excursions; furthermore, the project paid students a stipend of $300 for their work in providing evaluation data to help answer questions about the effectiveness of the program.
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2. Provide data regarding the **level of participation** in each of these projects (i.e. number of faculty participants, number of student participants). Discuss their **scope** (i.e. oriented toward incoming freshmen, upperclassmen, STEM majors, education majors, all students, etc.)

FY14 faculty participants (n = 33). Please see Tables 1-8 for more information.

FY14 paid student participants, excluding participatory evaluation (n = 48). Please see Tables 9-15 for more information.

All students are STEM majors, with approximately 50% of student participants being freshmen.

3. Discuss the **activities and operation** of your institution-specific project(s), including any efforts to connect multiple projects for synergistic impacts.

The activities and operation of the institution-specific projects are described in detail in section 1 (A) of this annual report. UWise most obviously connects with UTeach for synergistic impact.

4. Provide any available **outcomes data demonstrating the efficacy or effectiveness of the project(s)**.

Outcomes data are clearly described in section 1 (B) of this annual report.

IV. Future Efforts

A. Please discuss **dissemination efforts** for best practices or research findings identified through participation in the USG STEM Initiative.

In addition to the presentation at the STEM conference at Georgia Southern University in March, 2014, students supported by UWise funds made a total of thirty-two presentations and poster sessions at various regional and national conferences. UWise faculty published three peer-reviewed publications involving undergraduate students and an additional two papers at various stages of publication in professional journals (*see details in section 1 A of this annual report*).

B. Please identify any **external grants** (e.g. NSF, Department of Education, private/foundation) for which you have applied based on support received for the STEM Initiative. Indicate whether any applications have been successful.

NSF – WIDER Planning Grant. UWise faculty received funding for the WISER grant from NSF, $ 250,000 (Dr. Farooq Khan, PI, S. Swamy Mruthinti, Dr. S. Sykes, Dr. Anne Gaquere-Parker and Dr. Cher Hendricks as Co-PIs), 9/15/2013 – 9/14/2015. The primary purpose of University of West Georgia's *Wider Implementation of STEM Educational Reforms* (WISER) grant builds on lessons learned from two years of

implementation with the USG STEM Initiative. WISER, a planning grant, is designed to examine ongoing teaching and learning practices and innovations, and find ways to increase the institution's commitment to supporting faculty members in the use of evidence-based teaching and learning practices. Building on the success of recent small-scale programs and initiatives to increase faculty use of these practices, the overarching goal of this project is to facilitate the creation of a shared vision across the STEM disciplines for using evidence-based teaching and learning practices to (a) improve student learning, (b) increase the number of majors, (c) increase retention and (d) increase timely graduation, and (2) to create a plan to institutionalize this vision. The NSF-WIDER grant builds upon the faculty development activities inherent in the mini-grants in the UWise Initiative.

STEM to STEAM grant. The UWise faculty received funding from an expansion of STEM and STEAM Initiative from the Complete College Georgia Innovation grant from Georgia Board of Regents, $ 25,000 (7/1/2013 – 6/30/2014). Dr. S. Swamy Mruthinti is the Lead of this Initiative and Dr. Rebecca Harrison, Dr. Farooq Khan, Dr. S. Sykes and four other English faculty are key personnel. The goal of the proposal is to replicate STEM-based ENGL 1101 and 1102 sections to a target group of incoming freshmen who have expressed interest in majoring in STEM disciplines, with the eventual goal of institutionalization. We believe that these will increase student success in the freshman year, an important component of efforts for Complete College Georgia. In addition, these efforts have the potential to spark and maintain student interest in their chosen disciplines. The expansion of STEM-based ENGL 1101 sections would entail the creation of multiple sections offering a variety of STEM-centered themes and that follow the same assignment trajectory aimed at fostering the analytical and writing skills common between the disciplines. Our experience has been that substantive collaborations between English and science faculty members have been very fruitful in designing these unique courses. Thus, we envision that selected faculty members from the sciences and English will work together to form in the development of the curriculum.

NSF Noyce Grant. The NSF Noyce grant for $1,198,667 runs from September, 2012, through August, 2017. The PI is Dr. Dianne Hoff, Dean of the College of Education. The co-PIs are Dr. Christopher Tabit, Chair of the Department of Biology, and Dr. Jill Drake, Professor of Mathematics Education. The Noyce project at the University of West Georgia (UWG) in partnership with the Carroll County School System and the Carrollton City Schools provides scholarships to thirty-two undergraduate students who pursue their professional teacher certification as juniors and seniors and complete their STEM baccalaureate degrees. In addition, the recruitment component of the UWG Noyce project gives merit-based stipends of $150 each to five hundred freshman and sophomore students to test-drive STEM teaching by enrolling in an introductory teaching course, participating in course-embedded early field experiences, and earning a B or better in the course. It also supports fifty internships, which enables freshman and sophomore students to work in STEM summer programs with in-service teachers and K-12 students. Finally, the UWG Noyce project affords Noyce Scholars induction workshops and mentoring during their first year of teaching. The UWG Noyce project employs the UTeach teacher preparation model. Students major in mathematics or a science discipline and earn their teaching credential through specially designed, inquiry-based education courses. The project contributes to new knowledge by exploring two broad questions: 1) What is the impact of student support systems on the teacher preparation experience for Noyce Scholars? and 2) What is the impact of participation as a Noyce Scholar on their teaching and on student learning? In order to answer these questions, long-term data about students are collected to assess supports that lead to graduation; pedagogical approaches for preparing STEM teachers; and the impact on P-12 student achievement. Some of the data from this project contribute to UTeach national data based on STEM teacher preparation methods. Noyce Scholars, therefore, not only

participate in research-based preparation for teaching themselves, they also are part of ongoing research that informs teacher preparation across the country.

SMART-STEM Grant to NSF S-STEM program (Re-submitted, Nov 2013)**.** This project, entitled "Scholarships to Motivate Academically Ready and Talented STEM Students" was resubmitted in August 2013, requested funding $603,137. The PI is Dr. S. Swamy Mruthinti and Co-PIs were Dr. Farooq Khan and Dr. Scott Gordon. This proposed project is designed to increase the number of low-income, underrepresented, and academically talented students entering the STEM workforce, by providing a total of one hundred scholarships (over a period of five years) supporting an average of $5,000 per student per year, based on financial need. The recruitment efforts will give preference to women opting for STEM fields, most particularly females who are underrepresented minorities. The goal is to provide financial assistance coupled with student support services to enable these students to graduate on time (in five years) so that they can enter the STEM workforce or proceed to graduate school. This grant was declined in early Spring, 2014 and it will be resubmitted after addressing the reviewers' comments at a future date.

C. Will your institution's STEM Initiative program for FY2015 involve **any notable changes** from your FY2014 program? If so, please explain any changes and the rationale for them.

There are no notable changes in FY15 from FY14, except for the fine-tuning of the program.