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Project Title: WISE GEMS: Women In Science Empowering Girls Engaged in Math and Science

Institution/System Name: University of West Alabama

Innovation Category: Research and Regional Stewardship > Civic Engagement
Student Success > College Readiness

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Project Description: Women In Sciences Empowering Girls Engaged in Mathematics and Sciences (WISE GEMS) is an organization led by female faculty members in the College of Natural Sciences and Mathematics (NSM), conceived and initiated by Dr. Venkat Sharma, Dean of the College. This project recruits undergraduate NSM student volunteers to give presentations and conduct hands-on learning activities about Science, Technology, Engineering and Mathematics (STEM) topics at local K-12 schools. The project goals are: 1) to engage local girls and boys in STEM activities; 2) to prompt UWA students and faculty to get involved in the local community; and 3) for NSM students to learn how to teach fundamental STEM concepts.

Obstacle Addressed: Rural west Alabama's Sumter County schools are characterized by a high percentage of students on the free lunch program, low expenditure per student, and low test scores. What's more, 98% of students attending schools in the UWA service area are predominantly minority living below the poverty level. The majority of these students progressing to higher education is often first generation college students and is frequently unprepared academically and socially. The myriad of tasks and course work quickly become a huge obstacle to higher education. The major problem for our area is twofold: low numbers of minority students – especially females – entering STEM professions and inadequate STEM preparation provided to elementary and secondary students in our area. These two problems, shared by much of the nation, are not independent of each other. By providing activities that motivate young learners to embrace science and mathematics from an early age, students will be more likely to pursue higher education and careers in these areas. To encourage UWA students majoring in STEM subjects to graduate and enter STEM careers, WISE GEMS recruits undergraduate NSM student leaders to give presentations and conduct hands-on participatory activities on STEM topics at local schools. The students effectively teach and learn from each other.

Theory of Action: WISE GEMS bases its outreach activities on the theory of early intervention. By offering hands-on and discovery enrichment activities to children of young age, their fears and resistance of science and mathematics become less problematic for student and teacher. Simultaneously, putting college students in environments that strengthen their teaching experiences helps them understand more effective ways of approaching learners while giving them a sense of security in their own knowledge.

History of Development: The WISE GEMS project began when Dr. Venkat Sharma, Dean of Natural Science and Mathematics, became dean of the College of Natural Sciences and Mathematics in the Fall of 2009. He discussed with the female faculty members of NSM his aim of getting more girls interested in science and mathematics. The idea of organizing WISE GEMS was born merging the concept of teaching experience for UWA science and mathematics majors with the need to inspire elementary and middle school students at an early age. Dr. Heather McDonald was appointed chair of the group and submitted a Service Learning grant to UWA that would become the first source of funding for the project, receiving \$1,000 for outreach activities and support. All funding for WISE GEMS has been through grant support.

Objectives: The objectives of the WISE GEMS Project are: 1) increase the awareness of UWA students of the needs of the community; 2) engage local girls and boys in STEM enrichment activities through monthly meetings; 3) enable college-age STEM to become role models for minority female middle school students; and 4) affirm the important role of women in STEM fields past, present and future.

Outcomes: During the first two years of the project, 32 UWA students (18 female) and almost 500 local school children participated in WISE GEMS educational and outreach activities. A survey of UWA students who participated in WISE GEMS activities generated the following results:

- 92% felt the project was very positive
- 100% thought the community service-learning component of the project enhanced knowledge while providing a service opportunity.
- a majority felt that the project improved their communication, problem solving and critical thinking skills

Surveys of the school children participating indicated very positive results with 95% indicating a desire to take science and mathematics courses in high school. Of the participating youth, 60% attended more than one activity, and 24% attended all activities. Each student participating in two or more activities will be tracked to determine the number of science and mathematics courses completed in high school and the number who enter college in science or mathematics fields.

Challenges/Problems Encountered: Organizing this project can be challenging for a number of reasons. For example, time constraints of faculty and students are a big challenge. It can be challenging to find a time that everyone can meet for planning purposes for a group project. In addition, faculty members have a limited amount of time to participate in extra projects. Students are offered bonus points as an incentive for their participation. Also, ordering supplies for the enrichment activity and coordinating with local middle schools is difficult. The WISE GEMS program receives approximately \$1,000 annually through a UWA service learning grant. External funding sources are being sought in order to expand the program to include a summer camp and after school programs. Replicating the WISE GEMS program in its current form will likely require a minimum of \$1,000 in annual funding.

Success of Project: The WISE GEMS model follows a simple pattern allowing a broad array of students to experience STEM activities and encourages a discovery based learning environment. The success of the project is two-fold; middle school students learn science and math while future science and math professionals increase knowledge and skills. Though WISE GEMS aims specifically at increasing the participation of girls in STEM, the effectiveness of the program can be seen in both genders. UWA STEM students teach local elementary students to enjoy science and math, while enriching the teaching experiences of UWA students. Its success can be seen in its outcomes.

Evaluation Approach: Pre- and post-project surveys have been made available online for student volunteers. Survey results are compiled and reviewed by the WISE GEMS faculty and modifications to the project for the following year are implemented. An annual report of the project is sent to the Dean

of NSM, the Provost, and the President of UWA. At the end of the year, the UWA students give their presentation to the UWA faculty. Feedback is also solicited from the middle school science and math teachers. The middle school students are tracked through high school to determine the number taking advanced science and mathematics courses and entering college in related fields of study. The program has not been in place long enough to analyze this data.

Potential for Replication: The potential for replication is excellent. The program can be easily replicated in other colleges and universities serving rural and disadvantaged regions. Successful replication should address three specific factors in implementing a similar program. One, securing stable and ongoing external funding for the project is critical. Two, faculty, student, administration, and community support are required. Another key component of the project requires having a gifted organizer. Coordinating people, equipment and supplies while working to achieve objectives in a timely manner can be a daunting task.

Resources:

- Venkat Sharma, Dean of Natural Sciences and Mathematics (vsharma@uwa.edu); (202-652-3412)
- <http://www.uwa.edu/wisegems>

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