

**Creating Pathways to STEM for Females of Color**  
**“Girl Power GIS and other STEM”**  
**Incentive Engagement Grant**  
**Center for Engagement and Community Development**  
**2018**

**Description:**

This project, “**Girl Power GIS and other STEM**” is a vehicle for **Creating Pathways to STEM for Females of Color**. It focuses on introducing Geographic Information Systems as a possible career choice in Science, Technology, Engineering, and Math (STEM) to a population often omitted from exposure to STEM subjects, so do not see themselves in this career path. In the Southwest Region of Kansas, with Minority-majority population centers in rural settings, this project targets intergenerational female populations, from high school, community college and adult education settings. In an effort to help females of color view themselves as budding students of technology, geography, and spatial analysis, we offer four, intensely-organized and executed ArcGIS workshops. The culminating experience features a “Student Showcase” in which students present to their families, in a multi-lingual setting, the achievements of their weeks’ work. The final class will feature the students’ work along with admission information for Kansas State University and K-State Research and Extension. Follow-up mentoring will follow completion of the workshops.

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**Background and Relevance:** Southwest Kansas stands in a unique position. The 25-county region targeted has three populations centers, densely-settled rural counties and one frontier rural county, by U.S. Census Bureau classification, which are Minority-majority. The schools in these counties show demographics at 48% - 92% minority student populations from Hispanic, African, and Asian origins as compared to the Kansas average of 17%. Those demographics are changing with the addition of political refugees from Africa, South and Southeast Asia, the Middle East, and Caribbean. The immigrant families in these Southwest Kansas counties are living in poverty (68% to 97%), which negatively impacts student academic achievement and graduation rates (Bolton & Dick, 2017). We know that females are not satisfied with their current level of education and wish to pursue more education. Qualitatively, we found that females appeared to experience the most barriers to academic achievement. Some of those barriers include lack of school and family support for attending college or technical school, not being exposed to STEM (science, technology, engineering & math) subjects in their school career, and poor self-image for success in STEM subjects. A recent study (Bian, Leslie, & Cimpian, 2017) found that at a very young age (6-7 years old), females are less likely to see themselves in terms of “brilliance” and are less likely to choose for themselves career paths that require higher level thinking such as STEM-related subjects. In its report on “Women in STEM”, the U.S. Department of Commerce says that the lack of females in STEM-related jobs contributes to a “gap in innovation”. The report goes on to say that schools must look at *all* females as potential scientists and should educate them accordingly.

**“Girl Power GIS and other STEM”**

We propose to plant the seeds of change in how Minority females view themselves in a STEM-related subject: Geographical Information Systems in “Girl Power GIS and other STEM”. We will demonstrate how female minorities can see mapping and spatial analysis as relevant to their lives while offering hopes for their futures.

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**Vision:** Beginning in the late summer and early fall of 2018 and Spring semester of 2019, we will offer **eight-hours** of introductory activities centered on Geographical Information Systems, Spatial Analyses with peer support, and a six-month follow-up, we can see that female students of color are viewing themselves as academic achievers in STEM-related subjects that may include topics in Geography, specifically, spatial analysis. A short-term outcome could illustrate further interest in learning more about GIS or other STEM-related subjects. A long-term outcome would include subsequent enrollment in STEM-related classes while in high school, community college, or post adult education state-issued high school diploma graduation for the non-traditional students.

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**Process:** Minority females (Hispanic, Asian, Caribbean, and African American) are recruited from regional schools and adult education programs. We are targeting high school aged and students in community college as well as non-traditional aged females pursuing Kansas high school diplomas (GED) in adult education programs. We have identified two high school teachers, of mathematics and physics, who will collaborate with us to recruit students along with adult education instructors to recruit adults who have shown promise in STEM subjects. Two community colleges are on board to promote this project among their students as well. Research has shown that intergenerational relationships can have value. The younger generation strengthens the academic pursuit by modelling enthusiasm and self-assuredness. The older generation (in this case, 20s, 30s, and 40s) tends to model calm and life experiences while imparting the importance of *not* waiting to pursue high school (Hart,2012) .

**“Girl Power GIS and other STEM”** reaches out to an often ignored, certainly underrepresented population: female minorities. We cannot accept that this target population, females of color, will only work in the service industry and other jobs deemed “appropriate” to their gender and ethnicity/race. We can teach this target population to tell its story through visualization, mapping, and spatial analysis. The belief is that this model for outreach to underrepresented populations could build a new workforce that is competitive in the global market of STEM-related disciplines. Wouldn’t it be great to have this area of expertise grounded firmly in female populations of color?

**Goals and Objectives**

Hispanic and other females of color (minorities), tend NOT to see themselves as college bound even if they have 3.00 to 3.5 grade point average (gpa) or higher. We can plant the seeds of change through hand-on activities focusing on ArcGIS mapping, spatial analysis, and mentoring with a focus on higher education. After eight-hours of introductory activities centered on Geographical Information Systems, Spatial Analyses, peer support, and a six-month follow-up, we can see that female students of color are viewing themselves as academic achievers in STEM-related subjects that may include topics in geography, mathematics, and physics, and, spatial analysis. A long-term outcome would include subsequent enrollment in STEM-related classes while in high school, community college, or post adult education state-issued high school diploma graduation for the non-traditional students.

**Methodology:**

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In **“Girl Power GIS and other STEM**, we will provide **four** 2-hour, after school sessions to the females who are identified in this cohort. In the first session of introduction and trial application, we will gather to introduce areas in which GIS is used, such as Pokémon GO, Google Earth, and other every-day applications. Students will begin with simple map-making by mapping their yards or bedrooms from memory. In the second session, of reinforcement and further application, the students will continue to build upon and receive reinforcement from the introductory lesson and begin to explore mapping on their own and within the intergenerational peer group. The four-part series culminates with students presenting their outcomes to friends and family. At the last session, representatives of higher education can talk to the students and their families about access to education. This project targets 15 to 20 females, of color as a manageable size for the best teacher: student ratio. The age range, likely will be 14 to 40ish years of age, for that intergenerational learning environment. Finally, we will make this open to males, too.

The inputs for **“Girl Power GIS and other STEM”** include the human capital of Dr. Debra Bolton, Dr. John Harrington with collaborations of Dr. Jonathan Aguilar, Mr. Marc Cruz, physics teacher, and Mr. Biju Kalarikkal, mathematics teacher, our educational partners to assure success and replication of this project. Scalability to an expanded project, also, is an objective of **“Girl Power...”**.

**Results:**

Students illustrate the relevance of a STEM-related discipline, ArcGIS, as a tool that can be used throughout their educational careers

- Students demonstrate further interest in acquiring more knowledge about STEM and GIS
- Students enroll in STEM-related subjects in the subsequent semesters
- Our students who complete the three workshops invite other students to participate in future workshops

**Capacity Building:**

The immediate beneficiaries of **“Girl Power GIS and other STEM”** are the 15-20 students that we have recruited from high school, community college, and adult education centers. The impact to their families can be demonstrated at the culminating workshop/student showcase. The initial training in the four workshops will be followed by subsequent check-ups and mentoring sessions along with possible college visits in STEM-related fields as arranged through youth and adult development programs.

**Impact on Our collaborators** include Kansas Geographic Alliance (Advisors), Finney, Gray, and Ford counties 4-H Youth Development Bi-lingual/bi-cultural Clubs, Live Well Finney County Neighborhood Learning Centers (targeting Somali and Burmese students), Kansas State University Geography and GIS Department (GIS advisors), City of Garden City GIS staff, GIS instructors, Garden City Community College Adult Learning Center

The collaborators from secondary education want to see an increase in the number of their “minority” students going into STEM fields. The collaborators from post-secondary schools are looking for ways to recruit more “females of color”. The students who participate in this effort are the ultimate beneficiaries, along with their families and communities.