Regenerative Medicine Minnesota
Progress Report

Grant Title: Girls Explore STEM
Grant Number: RMM-2016-312ED-09R
Requester: Stephanie Zojonc
Project Timeline: June 1, 2016– May 30, 2017

Brief description of project:
The project consisted of several activities for female students promoting STEM careers and opportunities. Women are an underrepresented population within many STEM disciplines, and are therefore an important demographic of focus. The activities covered by the project included a one-week summer camp for middle school students, a one-day recruitment fair for high school students, and an evening panel event for college students. The summer camp, entitled "Girls Explore STEAM," enabled 19 middle school age female students to explore a wide range of topics and careers within STEM and the arts through hands-on activities, demonstrations, and interactions with industry professionals. The one-day recruitment event, called "Girls Explore STEM Day," brought in 121 female high school students, with a focus on providing hands-on activities for young women to experience and learn about STEM careers. They also had the opportunity to interact with both current undergraduate students and various industry professionals to better understand what kinds of careers and opportunities exist. The third event, a panel discussion titled "Women in STEM," provided an opportunity for undergraduate students to talk to a panel of industry professionals, faculty and current graduate students in a variety of STEM fields.

Where did this project take place?
The initiatives within the project took place on the campus of Minnesota State University, Mankato in Mankato, MN.

People impacted by project and where they are from:

Girls Explore STEAM summer camp had 19 participants (out of a possible 24) from the following communities: Elysian, Mankato, Lake Crystal, Courtland, Waterville, Waseca, St. Peter, and Eagle Lake. They represented the following school districts: Waterville-Elysian-Morristown (WEM), Mankato Public Schools, Lake Crystal Wellcome Memorial (LCWM), New Ulm Public Schools, Waseca Public Schools and Loyola Catholic Schools. Students in attendance were to be in grades 6-8 in the fall of 2016 and ranged from eleven to thirteen years of age.

The Girls Explore STEM Day had a maximum goal of 200 female high school students, with an actual attendance of 121. They represented the following schools: Belle Plaine High School, Brooklyn Middle School (Osseo, MN), Irondale High School (Osseo, MN), Loyola Catholic School (Mankato, MN), Mankato East High School, Dakota Meadows Middle School (Mankato, MN), River Bend Alternative Learning Center (New Ulm, MN). Students represented at the event ranged from thirteen to nineteen years of age. Students attending the event also came from a variety of ethnic backgrounds including African American and/or black, American Indian and/or Alaskan Native, Asian American and/or Pacific Islander, Hispanic and/or Latino, bi-racial or multi-racial, and white and/or Caucasian.

The Women in STEM panel discussion was hosted for undergraduate students from Minnesota State University, Mankato, and had a variety of undergraduate female students, staff and faculty attend. The

panel was comprised of female professionals from southern Minnesota businesses, as well as faculty and graduate students from Minnesota State University, Mankato.

What was the outcome of the project? (Did the project work the way you expected it to? What were the successes? What were the failures? How did it impact regenerative medicine in Minnesota?)

Because this was the second year for the summer camp, the successes and challenges of the pilot year were analyzed, and steps were taken to reduce those issues. Our marketing was more aggressive and directed at a larger region, but this did not result in a larger number of attendance. We did, however, unexpectedly have a number of participants withdraw just prior to the start of camp, which reduced our actual attendance numbers. Overall, the students who were able to attend were very enthusiastic and provided positive feedback regarding the majority of learning activities, with ratings of "learned a lot" or "learned some" as seen in Table 1 below. This was especially true for the microbiology activity and the mathematics activity. Two very exciting post-camp evaluation survey results were that 88.8% of campers indicated that they were considering STEM as part of their career or future, and that 83% would like to take more STEM classes. This can be seen in Table 2 below. We know that many of these students already had at least a slight interest in STEM through their pre-camp surveys, in which students provided answers like "I came here last year and it was really fun and I also have always been interested in math and science," "I love working in STEM," "It sounded like a fun new thing to try." Some students did not have that interest though, as was seen in responses like "my mom made me" and "dad."

Table 1: Girls Explore STEAM Summer Camp Evaluation data regarding learning activities and modules

How much did you learn about each of the following at camp?	**A lot**	**Some**	**A little**	**Very little**	**Not at all**
Working together in teams	9	9	0	0	0
Finding solutions to problems	8	7	2	0	0
STEM in general	14	3	1	0	0
Electrical Engineering and motors & robotics	10	6	2	1	0
Physiology & the senses	7	4	5	1	1
Regenerative medicine – frog eggs & cells	11	4	2	0	0
Microbiology	15	1	1	0	0
DNA	11	3	2	1	0
Fuel cells	8	3	5	2	0
Mathematics though puzzles and logic	14	3	0	1	0
Fluids – corn starch & "boat" activity	8	4	3	2	0
Engineering Design Process & manufacturing things	10	6	2	0	0
Physics – optics	6	4	2	4	0
Computer information Science	7	2	2	6	0
Astronomy	4	6	3	3	1
Careers in STEM	15	3	0	0	0

Table 2: Girls Explore STEAM Summer Camp evaluation data regarding STEM and career choices

	Yes	No	Not Sure
Do you know what engineers, scientists or mathematicians do?	16	2	0
After this week's camp, I would like to take more STEM classes.	15	0	3
After this week's camp, I am considering STEM as part of my career or future.	16	0	2

Overall, all of the activities presented at the camp allowed students to experience a wide variety of disciplines within STEM, ranging from microbiology to physics, astronomy, biology, engineering, and computer science. We did have an arrangement in place to bring in Dr. Randy Daughters to do two sessions on regenerative medicine frogs and other research animals. This was cut short during the camp due to unexpected circumstances. The students were able to experience one session with Dr. Daughters and fertilize frog eggs, learn about a variety of organisms used in regenerative medicine including axolotls. The students were very disappointed that they were not able to view the developing fertilized eggs later in the week due to Dr. Daughters absence, but understood that he was unable to return to camp. We were able to improvise additional activities to fill the time originally meant for his sessions, which the students also enjoyed. With so many presenters scheduled during the camp we will, in the future, always have secondary activities ready for students in the case of cancellations or emergencies. It was a really good lesson in our case and will better prepare us in the future. Due also to this change in our schedule the amount of regenerative medicine presented at our camp was reduced.

Some of our most popular and successful sessions included a logic based mathematic session, which was themed to be like an escape room where students completed mathematic puzzles that led them to additional puzzles that ultimately led to a prize. It was a great way to show them that math can be really exciting when put into practice. This is one session that can easily be modified from year to year with different challenges and used again, which we plan to do. As educators, we were excited and fascinated by watching students get so focused on a topic that, just prior to the session, they had described as something they "hate." In a way, they were "tricked" into enjoying math because it was presented in a fun setting and through a fun series of challenges.

A second session that was extremely successful was our microbiology session in which students did an activity often called "swab the world" in which they swab random items of their choice and attempt to grow the bacteria naturally found on those surfaces. They were amazed at which surfaces had the most microorganisms growing on them. Additionally they did handwashing tests to see which types of soap and lengths of scrubbing time killed the most bacteria. They were also surprised at what their results yielded. Students also commented on how "cool" it was to be in a real lab and wearing lab coats. The experience was more "authentic" to them by doing this.

Lastly, we had a very strong group of camp counselors this year that made very strong positive connections with the students. These college-aged women have an opportunity to make a huge impact on the campers. They made the students feel welcome, talked to them about their college experiences, waited with them if parents were running late, and genuinely showed that they cared about the campers. These types of personal connections are critical in ensuring a successful camp. Not only do the campers learn a lot from their counselors, but it also results in fewer behavioral issues that distract from everyone's opportunity to learn and experience the activities at camp.

The second event that was hosted with the grant was the Girls Explore STEM Day in October. During that event, students were invited to the Minnesota State University, Mankato campus to get a taste of what majoring in STEM at MSU is like. There was a keynote by a successful woman in a local STEM-based industry, a panel discussion with a group of current undergraduate women in STEM majors, hands-on activities run by many of the departments within the College of Science, Engineering and Technology (CSET), as well as the student groups affiliated with various CSET departments. The participants also got to interact with representatives from several local businesses, learn about applying to college, learn how to apply for financial aid and housing, and went on a tour of the university. For many of the women attending the event it was the first time they had ever stepped foot on a college campus, which can be

an important aspect of increasing access to higher education, particularly for underrepresented student populations. The presence of faculty, current undergraduate students, and local business representatives allowed the participating students, teachers and counselors to ask questions about various programs, experiences of those in the programs, and about the job market. The only drawback to the event was that the attendance was lower than we had hoped. There were a number of possible reasons for this, one being that one of the key university partners that helped organize the event preferred to recruit students from the metro region rather from southern and southcentral Minnesota. This was a point of contention within the planning committee, and may have resulted in a lower attendance due to the distance required to travel to event. Although schools were offered funding to use to transport students to the event, this was often not a sufficient solution to offset the distance required to attend the event. Because most metro regions schools are limited by the school district busing schedule (meaning groups cannot leave until buses arrive in the morning, and must return before buses leave in the afternoon), for many schools in the metro region it was logistically impossible to attend this event, regardless of who paid. In the future we will reevaluate our recruitment strategy in order to ensure a stronger attendance.

Our third event, the Women in STEM Panel, was a discussion-based event for undergraduate students that enabled them to ask the professional women, faculty and graduate students on the panel about their experiences as women in STEM fields. They covered topics such as their educational journeys, challenges within their respective disciplines, how to handle sexism and discrimination in the workplace, and how to advance in a STEM career as a woman. Many of the questions being asked were very direct and timely—related to the 2016 election, issues in the news, issues on campus, etc. As a committee organizing the event we felt it was also very important to offer these undergraduates a network of successful individuals they could reach out to if they have questions or concerns, as well as promoting an open dialogue for future conversations. We feel that we accomplished this for those who attended. One change in the future that would need to be addressed is scheduling at a time that is optimal for student attendance. The event was held in the early evening to accommodate the industry professionals' schedules, but that time frame turned out to be difficult for many students, particularly those enrolled in lab-based classes that meet in the evenings. More research would need to be completed in the future to see if there is a better time for this type of event, or if there are other possible solutions, such as having multiple events at different times.

Please list any of the following that have resulted from your Regenerative Medicine Minnesota grant funding: Publications and/or manuscripts submitted for publication, disclosures/patents, other grant applications and /or awards.

The project was highlighted in several television news segments and newspaper articles. On June 24th KEYC TV ran a spot on Girls Explore STEAM which can be seen by viewing: http://www.keyc.com/story/32303944/middle-school-girls-participate-in-steam-camp-at-msu. The Girls Explore STEM Day was covered by KEYC TV on October 25th, and can be seen at http://www.keyc.com/story/33480837/girls-explore-stem-at-minnesota-state-university-mankato. The Mankato Free Press also ran an article on the Girls Explore STEM Day on October 25th, and can be read at http://www.mankatofreepress.com/news/local_news/girls-encouraged-to-have-confidence-to-pursue-stem-careers/article_cfd18e86-9b02-11e6-84c9-33ff9dc9bf04.html. All three of these features highlight the successful events we were able to organize through use of the Regenerative Medicine Minnesota grant funding.

In addition to media coverage, the RMM grant has contributed to the growth, visibility, and overall success of the work done at MSU by the Minnesota Center for Engineering and Manufacturing Excellence (MNCEME). Due to the grant and subsequent success of projects like Girls Explore, in 2016 MNCEME was awarded a Verizon grant for use in hosting engineering and academic days similar to the Girls Explore Day for other underrepresented populations in STEM, such as Latinos and African Americans. These recruitment days have been in existence previously, but successes made possible by the RMM grant facilitated our receipt of the Verizon grant, which enabled us to make these events larger and more substantive than in previous years.

Finally, in part because of the accomplishments enabled by the 2016 RMM grant, we have been successful in being awarded a Regenerative Medicine MN 2017 Education grant, for use May 2017-May 2018. We have finalized program plans for the 2017 Girls Explore STEAM summer camp, and are currently in the process of reassessing and restructuring last year's STEM programs to ensure an even more successful use of this amazing resource in the upcoming year.

Responsible Spending:
The Grants and Contracts Division of the Minnesota State University, Mankato Business Services will be preparing and sending a financial report regarding the spending on this grant.