Innovative Idea Poster

Developing a LOCAL STEM Project for High School Teachers and Students

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Need for Innovation

Land-grant universities have served as a collaborative model of applied research, demonstration work, and integrated education to help the farming communities solve real-world problems since the Morrill Act was passed in 1862 (APLU, 2012). The model continues to be relevant today although the face of the nation's workforce, agriculture, and education are different. K-12 teachers have not been an active community partner in the model despite the important role they had on students' literacy and career interest (NRC, 2009). Therefore, this NIFA grant funded project, **L**and-grant **O**utreach for **C**ommunity-based **A**gricultural **L**earning for **S**cience, **T**echnology, **E**ngineering and **M**athematics Education (LOCAL STEM) developed a localized land-grant model that included high school teachers as local partners. The project leveraged existing capacities of the land-grant university system including a research farm, the county Extension, and university K-12 outreach program by providing a year-long professional development program and developing a continued relationship between the local partners to advance STEM integration through agriculture, food, and natural resources (AFNR) context.

How It Works

The LOCAL STEM project recruited high school agriculture, science, and mathematics teachers from three high schools within 21 miles from Pinney Purdue Agricultural Center (PPAC). Teachers participated in a year-long teacher professional development (TPD) program to increase their integrated STEM teaching capacity. The program included a one-week immersive learning professional development at PPAC and a nine-month professional learning community (PLC). The TPD training was delivered by Purdue faculty members and the farm scientists in the disciplines of agricultural STEM education, physics, chemistry, and engineering. Teachers learned about horticultural and agronomic research studies conducted on the farm as well as educational research from the pedagogical experts. In addition, teachers reviewed a hydroponics curriculum developed by the faculty members as an example of an integration of biology, physics, chemistry, and engineering units in agricultural context. The integrated and immersive learning experiences helped the teachers see the potential of making career and community connections for their students. This one-week training was the first opportunity that helped build and strengthen the relationships between the local partners.

After the training at PPAC, the participant teachers formed a collaborative team and participated in PLC to co-develop an integrated STEM through AFNR lesson plan to solve a design challenge of extending a growing season. The nine-month PLC was structured to help teachers work collaboratively and to continually receive interactive supports from the faculty members and the Extension specialists. Simultaneously, the participant teachers have access to resources and consultation at the local research farm. These lesson plans focused on increasing students' integrated STEM through AFNR content knowledge, agricultural literacy, career interests, and 21st century skills. In addition, the integrated STEM through AFNR lesson plans will be shared with the community at the STEM showcase event towards the end of the year-long TPD program.

Results to Date

There were 12 local high school teachers from agriculture, science, and mathematics disciplines who participated in the program. They utilized the research farm as a local resource to develop integrated STEM through AFNR learning experiences for students. Teachers and high school students participated in the farm activities where they networked with local scientists, agricultural professionals, and Extension educators. An agriculture teacher conducted a field trip to help his students learn about the horticultural research studies. In addition, after the research data were collected, produce was no longer needed on the farm. The students then helped harvest tomatoes and donated them to a local food pantry. They also picked pumpkins and sold as a school fundraiser at the local farmers' market for the students to be able to attend the National FFA Convention. Teams of teachers from each school participated in online meetings PLC with STEM education specialists and scientists for the support in the development of integrated agricultural STEM curriculum, ideas about agricultural techniques, and teaching strategies. To date, 19 lesson plans were developed and the teachers reported 351 students participated in the lesson plans. Five integrated STEM projects were developed by 114 students. Fifty-one students participated in five immersive learning experiences at the research farm. Teachers reported 89 students had an increase in agricultural STEM literacy and 52 students were interested in agricultural STEM careers. The developed localized model consisted of the college of agriculture K-12 outreach program, local high school teachers trained in the TPD program, research and consultation from the county Extension specialists, and the experiences and resources offered by the research farm. These elements worked together to contribute to the agricultural STEM literacy and career interests among high school students. The local resources connection allowed the discovery components to occur at the local level without having the participant schools travel to the main campus located further away.

Future Plans/Advice to Others

The success of this model depends on the willingness and the cooperation of the local scientists and the teachers with regular follow-ups. The LOCAL STEM project team recommends setting up checkpoints to monitor implementation and progress. Teachers from the first cohort will serve as leaders for a new cohort of teachers in the second year because they hold similar experiences and can relate to each other. We also learned that teachers need to be interested, committed, and willing to collaborate with other teachers. Moreover, the school principal needs to be supportive of the project and helps teachers navigate the project when other school-related priorities arise (e.g., curriculum mapping). Regarding the team, the local lead teacher needs to be enthusiastic about the project, facilitate communications among the team, and encourage his/her colleagues to work together on the project.

Costs and Resources Needed

The five-day workshop with the total of 40 hours cost approximately $3,000. The cost included transportation, food, and lodging. The team of pedagogical specialists served as facilitators of the workshop. Each teacher received the stipend of $1,000 and $200 for supplies to participate in the curriculum development process at their school. This project is based upon the work supported by the USDA-NIFA PD-STEP grant.

References

Association of Public and Land-grant Universities. (2012). *The land-grant tradition.* Retrieved from http://www.aplu.org/library/the-land-grant-tradition/file

National Research Council. (2009). *Transforming agricultural education for a changing world*. Washington, DC: National Academies Press.