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Using the *AGsploration: the Science of Maryland Agriculture* Curriculum as a Tool to Increase Youth Appreciation and Understanding of Agriculture and Science

April Hall Barczewski
University of Maryland Extension
4-H Youth Development
adhall@umd.edu

Sheryl Bennett
University of Maryland Extension
4-H Youth Development
sherylb@umd.edu

David Gordon
University of Maryland Extension
4-H Youth Development and Agriculture
dgordon3@umd.edu

Thomas Hutson
University of Maryland Extension
4-H Youth Development
thutson@umd.edu

Sara Meagher BhaduriHauck
University of Maryland Extension
Agriculture and Natural Resources
sbh@umd.edu

Abstract: *AGsploration: The Science of Maryland Agriculture* is a 24-lesson, peer-reviewed curriculum that includes experiential hands-on activities and built-in pre-/post-evaluation tools. Lesson topics include production agriculture, the environment and nutrition with emphasis on how science relates to each topic. Student pre-/post-evaluation data reflects participation in AGsploration positively affects students' attitudes about agriculture and science. Separate evaluations were developed to survey two groups of trained teen teachers about the curriculum immediately following their training, 1-2 years after using the curriculum and another 3-4 years post involvement. The results demonstrated that teen teachers were an effective way to disseminate the curriculum and these same teens increased their agriculture knowledge, life skills and interest in agriculture science education and careers. A similar evaluation was conducted with adult educators following a training session and another 1-2 years after actively using the curriculum. This data suggests that the curriculum is well received and valued.

Introduction

Although agriculture remains one of the top industries in Maryland, farmers account for only about 0.12% of the state's population of nearly six million people (U.S. Census Bureau, 2016; National Agriculture Statistics Service, 2012). Maryland ranks 6th highest in the nation for population density (U.S. Census Bureau, 2016) and mainly consists of residents several generations removed from agriculture and farm life. This increasing disconnect between consumers and producers poses a significant challenge to maintaining agriculture as a profitable and vibrant industry in Maryland.

Whether or not related to widespread urbanization, many organizations are also noticing and focusing on a decline in science literacy. In a 2006 survey conducted by the Business Roundtable it was discovered that 86% of US voters believe that the United States must increase the number of workers with a background in science and mathematics (2006). The National Academy of Sciences has also created goals for STEM education which includes a goal, "To increase STEM literacy for students, including those who do not pursue STEM related careers…" (2011). Consequently, the national 4-H program has instituted a focus on improving science, technology, engineering and math (STEM) education to address this need. Locally, the Maryland Department of Education has also recognized the need to develop and support STEM learning opportunities, developing a Governor's task force to focus on STEM.

To address the dual goals of improving agriculture literacy and STEM skills, University of Maryland Extension created *AGsploration: the Science of Maryland Agriculture* in 2010. At its root, AGsploration is a 24-lesson, peer-reviewed curriculum targeted at middle school youth. Each lesson includes experiential hands-on activities and built-in evaluation tools and was developed to support state teaching standards. Lesson topics include production agriculture, the environment and nutrition with strong emphasis on how science relates to each topic.

The goals of AGsploration are threefold:

1. To increase appreciation and knowledge of Maryland agriculture;
2. To increase youth interest in pursuing post-secondary degrees and careers in agriculture and science-related fields;
3. To partner with other organizations to integrate AGsploration into the Maryland school system.

Methods

The AGsploration team has used a variety of methods to reach its stated goals and to disseminate the message of AGsploration.

- *Direct teaching of youth:* University of Maryland Extension faculty and staff teach AGsploration lessons at school and afterschool programs, community fairs, 4-H camps and other venues.
- *Summer science programs:* 6 summer science programs were conducted at several sites throughout the state. Youth participated in AGsploration lessons and attended field trips to local farms to reinforce classroom learning.
- *Teen teacher trainings:* Two Teen Teacher Institutes have been held to train older youth how to teach AGsploration. Each teen teacher was provided with 30 hours of instruction with the expectation that each would teach 30 hours of AGsploration content.
- *Adult teacher trainings:* Approximately 30 training events have been held to teach adult educators how to use AGsploration. Those trained include public, private, and homeschool teachers as well as Extension personnel, afterschool providers, and other youth program providers.
- *Online dissemination:* The AGsploration curriculum is available online, free of charge, for anyone to download. The AGsploration website also provides supplemental videos and interactive learning modules to supplement the curriculum.

As of submission of this article, AGsploration has reached more than 23,170 participants. In addition, 408 adults and teens have been trained to teach AGsploration and the curriculum has been downloaded by 516 people in 35 different states and four U.S. territories.

From the inception of AGsploration in 2010 through 2013, the basis for the AGsploration program – the curriculum – was pilot-tested by a team of public school teachers and Extension educators. Feedback collected from educators has been used to make improvements to the curriculum.

Each lesson in the AGsploration curriculum is equipped with its own unique pre-/post-evaluation. Each evaluation begins by collecting the same demographic information and then asks students to agree or disagree, on a four-point Likert scale, with several statements designed to capture attitudes about agriculture and science. The final section of the evaluation asks students to rate their knowledge of topics covered by the lesson on a 5-point Likert scale. Students completed the pre-evaluation prior to beginning the lesson and completed the post-evaluation at the conclusion of the lesson. The evaluation protocol was approved by the Institutional Review Board.

Separate evaluations were also developed to survey two groups of trained teen teachers about the curriculum. Evaluations were done immediately following their training, 1-2 years after actively using the curriculum and another 3-4 years after being involved. A similar evaluation was also conducted with adult educators following a training session and another 1-2 years after actively using the curriculum. These evaluation protocols were also IRB approved.

Results and Discussion

Direct teaching of youth

Over the three-year pilot-testing period 2,492 pre-/post-evaluations were collected and analyzed. The diverse demographic of students completing evaluations demonstrates that the results are representative of Maryland's diverse population.

Evaluation data reflects participation in AGsploration positively affects students' attitudes about agriculture and science. After completing the lesson:

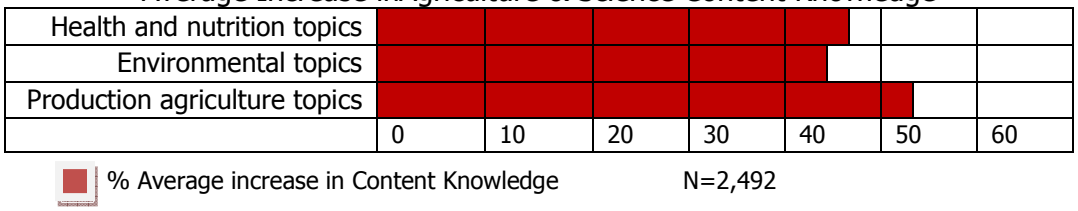
- One-fifth of students (22%) reported improving their science skills.
- One-third of students (33%) better understood the relationship between agriculture and science.
- One in four students (28%) were able to make a stronger connection between science and their everyday lives.
- One-third of students (32%) gained a better understanding of the importance of agriculture in their lives.
- One in four students (28%) students reported an increased interest in pursuing an agricultural science career.

These are impressive results considering that they were reported by participants after only experiencing one lesson from the curriculum.

Improvement in content knowledge was determined by percentage of students reporting an increase in content knowledge between their pre- and post-evaluations.

Table 1

Average Increase inAgriculture & Science Content Knowledge



Short-term evaluation data demonstrates the AGsploration program increases participants' interest in STEM, enhances their attitudes about STEM, their STEM competencies and promotes educational and career aspirations in STEM fields. A long-term evaluation plan has been developed in which cohorts of middle-school aged students receive instruction from the AGsploration curriculum and then are asked to respond to one question each year until the time they graduate from high school.

Teen Teacher Trainings

The following data was collected from a follow-up survey administered to teens one year after being trained to teach the AGsploration curriculum.

- 75% indicated an increase in communication and teaching skills.
- 50% indicated having greater self-confidence.
- 37.5% indicated increasing their own agriculture knowledge
- 25% indicated increasing their leadership skills.

This same group of teens was then surveyed 3-4 years after having been trained and actively teaching the curriculum. The survey responses indicated that:

- 60% increased their relationship building skills.
- 80% increased their teaching ability.
- 80% increased confidence in teaching agriculture.
- 80% increased communication skills.
- 100% indicated that they were able to help participants better understand agriculture science.
- 80% indicated that they received or are pursuing degrees in agriculture science.

As demonstrated in these results teen teachers were an effective way to disseminate the AGsploration curriculum. While teaching this curriculum these same teens also increased their agriculture knowledge, their own life skills and their interest in agriculture science education and careers.

Adult Teacher Trainings

Following an extensive one day training on teaching the curriculum program participants reported the following:

- 67% indicated they increased their knowledge of agriculture.
- 67% indicated an increase in their readiness to teach agriculture.
- 97% agreed that agriculture was a good way to teach STEM.
- 100% indicated an intent to use the AGsploration curriculum.

The following data was collected from a follow-up survey of these trained teachers 1-2 years following their initial training. The following was found:

- 82% indicated an improvement in their ability to teach agriculture.
- 55% indicated an improvement in their attitudes towards using agriculture to teach STEM skills.
- 36% indicated an improvement in their students' knowledge of agriculture after experiencing a lesson.
- 73% intend to use the curriculum on an ongoing basis.

This data suggests that the curriculum is well received and valued by professional educators.

Future Direction

Evaluation data presented above – received through the pilot testing period and gleaned from trained adult and teen teacher feedback – has been utilized to make revisions to the AGsploration curriculum. All 24 lessons were thoroughly revised and are an official publication by the University of Maryland Extension.

To increase the breadth and diversity of teaching resources, the AGsploration team is working to create a series of videos and interactive games that complement the existing curriculum. These digital materials will include videos for instructors that demonstrate how to complete the hands-on activities; videos for students that show interviews and commentaries by farmers and scientists to enhance the career connections made in each lesson; and online student activities that will provide opportunities for extension of each lesson. There are currently six videos available; an additional six videos and four web-based interactive activities will be launched by the end of 2017.

The entire suite of AGsploration resources – including all 24 lessons and the existing digital media – is available for free download on the team's website at: www.extension.umd.edu/agsploration.

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