

INNOVATIVE IDEA

The Bucket Brigade

Kaitlin Goforth

Clemson University
Clemson, SC 29634
kegofor@g.clemson.edu

Katie Gilson

Pendleton High School
Riverside Middle School
7324 SC-187
Anderson, SC 29625
kgilson@anderson4.org

Phil Fravel

Clemson University
238 McAdams Hall
Clemson, SC 29634
fravel@clemson.edu

Catherine A. DiBenedetto

Clemson University
251 McAdams Hall
Clemson, SC 29634
864-656-0296
cdibene@clemson.edu

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High school agriscience programs focus on providing career exploration for students in grades nine through twelve where students are introduced to a variety of topics and skills associated with animal science, plant science, environmental and natural resources, agribusiness and mechanical systems. The agriscience curriculum is most effectively taught using experiential learning through hands-on instruction where inquiry is “something that students do, not something that is done to them” (NRC, 2000, p.2). As a result of the COVID -19 pandemic, students at Pendleton High School in South Carolina were offered the choice to attend their classes virtually or in person during the 2020-2021 academic year. Zoom was the remote instructional platform used for students to meet for class in their Introductory Agriscience and Technology course. Developing daily lessons for students to actively participate and engage in the agriscience curriculum became challenging. Collaborative discussions and brainstorming sessions between a Student Teacher, Cooperating Teacher and two University Supervisors at Clemson University resulted in the creation of The Bucket Brigade. This innovative idea addressed Research Priority 3, "*Sufficient Scientific and Professional Workforce that Addresses the Challenges of the 21st Century*" (Stripling & Ricketts, 2016, p.29).

How It Works

The Bucket Brigade was created to increase student participation and engagement for high school agriscience students (N = 12) in 9th and 10th grades at Pendleton High School in South Carolina who chose to attend school virtually. The Bucket Brigade provided each student with two pre-assigned five-gallon plastic buckets. One bucket remained at the school and the other was sent home with two weeks of laboratory instructional materials and supplies that aligned science, technology, engineering and math (STEM) concepts to enhance the curricular content being taught in the unit of instruction. Parent or guardians of the students were emailed instructions for picking up and returning the buckets from the school. The second bucket was left at the school to rotate materials and supplies for each unit of instruction. The buckets were sequentially numbered and lettered (A and B) and students were each assigned a number to correspond with their bucket.

In the agricultural mechanics unit of instruction students were taught basic measurement skills followed by how to construct a bluebird house. Supplies placed in the bucket included a measuring tape, claw hammer, nail set and a bag of 1.5-inch finishing nails, six precut boards, one third of a sheet of medium grit (100) sandpaper and a procedure and material list. Students logged on to the class Zoom link and the teacher demonstrated the skill of how to construct a bluebird house in a step-by-step process, just as if it were being taught in the classroom at the high school. The students then individually applied their knowledge by following the procedure list for each step to assemble the bluebird house using the materials and tools provided in their bucket. Although the boards were precut and drilled, the students were required to practice and record measurements and use the tools in the assembly process. The teacher facilitated and guided the process virtually. Students were required to maintain video connection with their cameras throughout the entire class/laboratory session.

Results and Implications

Prior to sending home buckets of supplies and materials the students were reluctant to actively participate in discussion, most did not maintain video connection and the method of

instruction heavily relied on lecture using PowerPoint presentations. Students were idle and lacked engagement. The Bucket Brigade program provided students who were learning in a virtual environment with the opportunity to fully engage tangibly in their agriscience course. Student motivation and engagement greatly increased because students were able to use the supplies and materials to actually assemble a bluebird house, rather than simply watch and listen to the teacher. We were delighted to see that student engagement in the virtual learning environment was enhanced when our innovative strategies were used to teach the curriculum. With adequate and creative planning techniques using a minimal budget, we found that inquiry/project-based, hands-on instruction can be delivered effectively to students who attended class/laboratory in a completely virtual learning environment.

Future Plans

Additional activities related to the high school agriscience curriculum are being reviewed for plans to “rotate the bucket” in other curricular topics that lend themselves to this innovative idea to provide more resources for students taking their Introductory Agriscience and Technology course in a virtual learning environment. A focus on STEM concepts in plant science and animal science are being explored. In the plant science unit of instruction, seed germination buckets will be constructed for students to conduct a ‘rag doll’ test, compare monocot and dicot seeds, and seed identification of agronomic and cultivated vegetable crops. Students will apply mathematical concepts when calculating percent germination rates and maintain data related to rate of growth with metric measurements. In the animal science unit of instruction, students will be given materials to construct a three-dimensional skeletal system of a horse and construct the various digestive systems and meat cuts of different livestock breeds.

Resources Needed

Resources included administrative approval to support the innovative idea and communication with parents for picking up and returning the buckets. Details for safety guidelines were provided and parental consent was also required. Preparation of curricular materials, development of an electronic interactive laboratory notebook/journal and copies of the procedures and materials handouts for each bucket activity were also developed and provided. The total cost of the supplies needed to fill 15 buckets for the bluebird house laboratory activity was under \$200. The detailed material list is provided in Table 1.

Table 1
List of Materials included in Bucket for Bluebird House Laboratory Activity

Item	Quantity	Cost	Per Bucket
5ft 1 x 6 Lumber	8	\$1.30/ ft	\$6.50
1 ½ in paddle bit	1	\$7.18 each	.48
1/16 bit	2	\$2.18 each	.29
Nail set	3	\$6.98 each	\$1.40
4d finishing nails	1 pound	\$5.28	.35
Sandpaper (Medium, 100 grit)	1 pack- 25sheets per pack	\$11.98	.16
Tape measure	15	\$5.48 each	\$5.48
Claw hammer	15	Donation	n/a
5-gallon plastic bucket	15	Donation	n/a
		Total	\$14.66

References

- National Research Council. (2000). *Inquiry and the National Science Education Standards: A guide for teaching and learning*. Washington, DC: National Academy Press.
- Stripling, T. C. & Ricketts, C. J. (2016). Research priority 3: Sufficient scientific and professional workforce that addresses the challenges of the 21st century. In T.G. Roberts, A. Harder, M.T. Brashears (Eds), *American Association for Agricultural Education national research agenda: 2016-2020*. Gainesville, FL: Department of Agricultural Education and Communication.