

Summer Drone Camp for Middle School Students: Recruitment Effort for SBAE

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Introduction/ need for innovation or idea

Secondary agricultural education programs rely on effective recruitment activities to build interest and increase student enrollment. This can be a challenge in diverse communities with little traditional production agriculture (Beryl et al., 2016; Myers et al., 2003). Schrum and Sumerfield (2018) write, “STEM is a curriculum based on the idea of educating students in these four specific disciplines using an interdisciplinary, hands-on approach that relates to real-world application.” (p.8). This was the primary purpose of Summer Drone Camp, where an interdisciplinary approach is fundamental to various agricultural subject matter areas within SBAE, such as animal science, natural resources, and agronomy (Swafford, 2017). Teachers are implementing drone technology to improve learning with a focus on STEM education (Petrinjak, 2016; Preble, 2015; Strimel et al., 2017) to multiple audiences (Phang, et al., 2022). Technology-driven learning has been promoted in the digital age, and teachers have been exploring the use of drone technology in education. As reflected in Carnahan et al., (2016), drones have been identified as a tool that can increase learning and teaching efficacy.

How it works/ methodology/ program phases/ steps

During the 2022 and 2023 Summers, the authors engaged 30 high school and 20 middle school students from across the county in three five-day, four hours per day, Drone Technology Summer Camps. The camps’ primary focus was on identifying and highlighting drone technology that could easily be mastered in five days. The camp introduced the students, through stations, to the DJI Tello EDU drone, Tello app, DJI Mini II Pro drone, DJI Fly app, and DroneBlocks®. The drones were used in a hands-on manner to explore Newton’s Laws of Force and Motion, the four forces of flight, Bernoulli’s Principle, control surfaces, and the three axes of flight. With five days to engage students in these concepts, instructors focused their efforts on preparing students for the FAA TRUST certification exam (mandatory for all recreation drone operators), stressing personal and equipment operation safety, and physically developing flight operation skills. Following the presentation of introductory information about the activity and dividing the students into small groups, instructors demonstrated the use of the Tello EDU drone. Students applied the theory of flight and piloting skills (e.g. lift, drag, pitch, yaw, etc.) during hands-on training. Outdoor learning centers were used as instructors subsequently tasked each group to fly missions consisting of flying box-shaped patterns, taking pictures, recording videos, and maneuvering physical obstacles using only their STEM knowledge and flight skills gained during camp. Instructors provided students with 90 minutes to code and test their programs before beginning our competitive obstacle course activity. At the conclusion of the activity, instructors led a discussion regarding how they could expand this STEM-focused activity in their educational, professional, and personal lives. Demonstrations of mapping drones presented local school agriculture facilities including the land laboratory, livestock projects, and greenhouse facilities used by agriculture science students.

How was the camp created?

We are deeply committed to drone technology and agriculture. Our extensive experience in the field has led us to develop a comprehensive curriculum on the subject, which we have taught in their courses as teachers and professors. We have also shared our knowledge through workshops about Drone Technology in various settings and published an article on the subject.

Our commitment is further demonstrated by our status as licensed FAA Part 107 commercial drone pilots. In collaboration with one of the authors, the County Superintendent of Public Instruction's office initiated the proposal to create an innovative, engaging summer Drone camp for the county's children. The author submitted a proposal that included a rationale, topics to be covered, educational targets, schedule, marketing plan, audience, staffing, and budget. This camp is funded by a grant through the County Superintendent of Public Instruction's office. The authors work with the Superintendent's office to create the budget, including wages, supplies, materials, and curriculum.

How are students invited to the camp?

We created flyers, along with the staff of the Superintendent's office. Emails announcing the Drone Camp were sent to all leadership of the school districts in the county, along with the Extension office. Principals, Parent Liaisons, Director of Communications, Guidance Counselors, and 4H Leaders resent those emails to parents of the children in the county. The flyers were placed in community gathering locations. Advertisements are also run in the local newspapers. Social Media posts were also utilized to spread the word about the drone camp. The Superintendent's office and authors also invited students through personal contacts. The comprehensive learning goals for the camp students include exploring Newton's Laws of Force and Motion, the four forces of flight, Bernoulli's Principle, control surfaces, the three axes of flight, and coding and programming. Each student passed the FAA' TRUST Certification Exam and leaves the camp with a certificate to fly a drone as a Recreational Pilot.

Results to date/ implications

Following the 2022 summer camp, expanding the camp to include more students, including a session for fifth through eighth graders, was initiated. Additional drones and additional battery packs and chargers were acquired. A reflection of the first camp led to stressing connectivity between the controllers and the drones. Moving the obstacle course indoors to minimize weather events (wind and ambient temperature) affecting the flight performance of the drones was adopted. On the final morning of camp, students demonstrated their drone piloting skills to an audience of parents, family, summer camp staff and the District Superintendent. Prior to the next Drone Camp, we intend to purchase 128 MB SD cards to enable students to capture photos and videos from the drones. The previous three Drone Camps have increased enrollment in the SBAE program from x to y, by 4% due to the nontraditional exposure to the program. Instead of a rabbit, hanging plant, or FFA Jacket these campers are introduced via engaging, interactive, hands-on, minds-on technology.

Costs/ resources needed

The resources needed to successfully carry out this program include two highly qualified instructors, support staff to complete registration, Inter-Governmental Agreements, catering, procurement, and payroll. Seven DJI Tello EDU drones and iPhones, 10 DJI Mini drones. One inch PVC Pipe to build an obstacle course, seven tape measurers, 20 pads of paper, pencils, hard hats, safety vests, a modern classroom with overhead projector, PC with internet connectivity, outdoor space free of obstacles, and the curriculum. The first camp's budget was \$3,500 and remained the same for the next two camps. Free apps that need to be downloaded and updated on the smartphone are Tello, DJI Fly, and DroneBlocks. There is no cost for the students to attend the camp. Each camper leaves the camp with their Recreation Drone Pilot Certificate, safety vest, hard hat, certificate of completion, and the confidence to fly drones safely.

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