Principles of Project Design and Fabrication Taught as an Intensive Weekend Course

Ryan P. Clarke
458 Agricultural Hall
Stillwater, OK 74078
214-695-7901
ryan.clarke10@okstate.edu

Dr. Jon W. Ramsey
466 Agricultural Hall
Stillwater, OK 74078
405-744-4260
jon.ramsey@okstate.edu

Dr. Robert Terry Jr.
466 Agricultural Hall
Stillwater, OK 74078
405-744-8036
rob.terry@okstate.edu

Principles of Project Design and Fabrication Taught as an Intensive Weekend Course

Introduction/Need for Innovation or Idea

Metal fabrication projects provide excellent opportunities for teachers and students to take advantage of the three major aspects of school-based agricultural education (SBAE). Student-built projects designed and constructed as part the agricultural mechanics classroom and laboratory experience provided unique opportunity for students to apply knowledge and skills. The educational value of supervised agricultural experiences (SAE) has been well documented in agricultural education literature (Roberts & Harlin, 2007). Agricultural mechanics entrepreneurial SAEs require students to maintain a record of earning and expenditures for the business model of their choosing. Several states across the country use agricultural mechanics project shows allowing students to display their work and compete for awards and scholarships. These project also provide opportunities for students to establish a rapport with community members, local producers, and businesses by allowing them to construct high quality, unique projects while earning revenue for themselves and the program (Phipps, 1972).

According to Blackburn, Robinson, and Fields (2015), the national average of mechanized agricultural coursework in pre-service SBAE teacher certification degree programs is 4-6 hours. This amount of coursework is small given the high number of SBAE programs offering the Ag-Power and Technology career pathway (Rasty, Anderson, & Paulsen, 2017). With such limitations, teacher educators must use innovative approaches to prepare their students to effectively teach about and supervise agricultural mechanics projects. To better prepare teacher aspirants to deliver mechanized agriculture curriculum, the agricultural education program at Oklahoma State University developed a one-credit-hour, weekend course. The Design and Fabrication course provided an intensive learning experience designed to highlight the knowledge and skills needed to implement a project–based approach to instruction in the context of mechanized agriculture.

How it Works/Methodology/Program Phases/Steps

The Design and Fabrication course focused on concepts and skills needed to instruct pre-service teachers a method of teaching through student-built, mechanized agricultural projects. The course included aspects of design and planning, (including scale drawings, bill of materials, etc.) as well as leading and supervising the construction of an actual project. The one-credit-hour course promoted the use of Agricultural Mechanics Entrepreneur SAEs by emphasizing record keeping through the use of project-based learning.

The course, composed of 15 contact hours taught on a Friday evening and the following Saturday, was delivered in four primary segments of instruction. The first segment consisted of laboratory management, including laboratory safety, budgeting basics, and equipment selection. The second segment of instruction covered basics of project planning and drafting. The instructor demonstrated these skills and participants were given the opportunity to practice methods of scaled drawing and basic computer-aided design techniques. The development of this skillset is essential in the planning process of student project-based learning. The third segment highlighted the planning phase of the project. Once students were introduced and replicated the design of the

project to be constructed, they were shown how to access resources needed to plan details of the project including an itemized bill of materials. The final segment of instruction was used to construct the project. For this particular class, the project was a single-axle utility trailer. The instructional focus during this segment was not to improve students' skills, but to demonstrate and experience the project construction teaching method. At the conclusion of the course, each student developed a project record book that included a description of the project, accurate set of blueprints, an itemized budget, a bill of materials, safety and tool information, and photos of the construction process.

Results to Date/Implications

Eighteen students took the course during the spring 2017 semester. Feedback from students was positive and provided ideas for improvements to be made when course is offered in the future. The design of the course went beyond teaching students basic concepts of agricultural mechanics course work. Rather, it developed pre-service teachers' appreciation for well-rounded agricultural mechanics programs by providing an experience with the project construction teaching method.

Future Plans/Advice to Others

A goal of the agricultural education program Oklahoma State University is to continue to expand skillsets and abilities of pre-service SBAE teachers by providing them well-rounded and diversified education in technical agriculture and teaching methods. The program will continue to offer this and similar weekend courses on annual basis. Faculty recognize intensive, one-credit-hour, weekend courses can be used to introduce technical agriculture content, present innovative teaching methods, address new problems, issues and opportunities, and to provide other unique experiences not be included in the degree program. In doing so, teacher education faculty should partner with faculty from other disciplines and connect with experts in various fields of agriculture. Making extra efforts to promote courses offered in this way is important, especially if they are not listed in the course catalog.

Costs/Resources Needed

Specialized facilities were needed to teach the Project Design and Construction course. For a variety of reasons, the course was taught at a local high school rather than on campus. The high school facility had a classroom, meeting the needs for content instruction and application activities associated with design and planning. The laboratory had equipment and supplies needed to construct the project. The following equipment and tools were used: Miller 251 gas metal arc welder, oxy/fuel cutting and welding assembly, 14" abrasive chop saw, various right angle grinders, a cordless drill, and a standard socket/ratchet set. Blueprints and materials lists were based on those found in the *Red Wing Steel Works 6x10 Utility Trailer* instruction booklet. Costs associated for the course vary based on the project chosen. For the 6' by 10' utility trailer constructed in the spring 2017 course, total costs for materials was $1064.66. To compensate for costs associated with consumable materials and equipment wear, the Oklahoma State University agricultural education program paid the host SBAE program an additional $200.

References

Blackburn, J. J., Robinson, J. S., & Field, H. (2015). Preservice agriculture teachers' perceived level of readiness in an agricultural mechanics course. *Journal of Agricultural Education, 56*(1), 172-188. doi:10.5032/jae.2015.01172

Phipps, L. J. (1972). *Handbook on agricultural education in public schools.* Danville, IL: The Interstate Printers & Publishers, Inc.

Rasty, J., Anderson, R. G., & Paulsen, T.H. (2017) How the quantity of agricultural mechanics training received at the secondary level impact teacher perceived importance of agricultural mechanics skills. *Journal of Agricultural Education, 58*(1), 36-53.doi:10.5032/jae.2017.01036

Roberts, T. G., & Harlin, J. F. (2007). The project method in agricultural education: Then and now. *Journal of Agricultural Education, 48*(3), 46-56. doi:10.5032/jae.2007.03046