

**Benefits of Using Industry Based Online Modules for Teaching Small Engines**

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### **Introduction & Theoretical Framework**

Higher education programs that specialize in agricultural science teacher preparation have the challenging mandate of not only maintaining high standards in knowledge and development, but also of seeking and promoting innovative contemporary philosophies of teaching/learning strategies compatible with changing societal needs. The number of learners taking distance learning, blended, hybrid and distance learning courses has reached unprecedented levels (Johnson, Adams, Becker, Estrada & Freeman, 2014). A key concern for many post-secondary educators is whether their students are satisfied with their learning experience (Arbaugh, 2014; Strong, Irby, Wynn & Mclure, 2012). The contextual features of a hybrid course can provide the necessary environment to guide, and if necessary, correct actions to positively influence students' development of self-regulated learning skills (Chumbley, Haynes, Hainline & Sorenson, 2018) and using online learning objects, such as industry developed modules, can help address these concerns.

Learning objects originally developed for use in online learning environments can also be used to enhance face-to-face instruction (Nugent et al., 2016). Online learning objects (LOs) are small, stand-alone, mediated content resources that serving as building blocks to develop lessons, modules, or courses. While the definitions of learning objects vary, the literature showed that there generally are three common characteristics: they are digital, they support learning, and they are reusable (Moisey & Ally, 2007; Kay, 2014). LOs supporting face-to-face classes can serve many purposes: as background/review covering prerequisite course knowledge; to replace a lecture; to reinforce, laboratory presentations; and to serve as a review for an exam. The capability of LOs to support a variety of instructional contexts helps meet educational needs of the growing diversity of students in both K–12 and college settings.

The theoretical framework for this study is based on Bandura's (1986) social cognitive theory, particularly using self-efficacy as necessary for ability. With self-efficacy being closely related to ability, if a person has low efficacy or confidence in a task, then their performance in that task is expected to be low, and conversely, higher ability levels would tend to increase their motivation levels and as a result, their level of performance (Bandura, 1997).

### **Methodology**

The purpose of this study was to determine the impact of the Briggs & Stratton Master Service Technician (MST) online modules on student learning objectives in the [UNIVERSITY] small engines course. During the Summer I 2019, the researcher taught a five week small engines hybrid course. This consisted of two days a week a 5-hour lab, with remaining instruction taking place online using instructor developed materials and student completing the five online MST modules. The MST modules consist of 50 questions each, with multiple choice answers. These questions are taken from the Briggs & Stratton associated Small Engines book. A passing grade for each exam is a 75%. Students are allowed to take the exams no more than twice every 24 hours. Modules containing videos and book chapter links are provided to assist students in studying for each exam module.

To monitor the learning impact of the MST, students at the end of the course completed a researcher developed survey based off the [STATE] standards for the power & machinery course. These state guidelines are the minimum skills that high school students would have after

completing the course. The goal was to assess if the MST helped post-secondary students gain skills in the related areas and assess its value at both the post-secondary and secondary levels.

Students were asked, “Specifically after completing the MST, how did the modules affect your learning skills related to ...”. The class consisted of 18 students. They varied in grade level from Juniors (8) and seniors (10). All but two students completed all MST modules with a score of at least 75% (passing). The survey instrument was 25 questions on a 1-5-point Likert type scale of 1= no impact on skill development to 5=had a high impact on skill development. The survey was broken down into five categories: *employability skills*, *alternative energy sources*, *tool use*, *small engine maintenance & agricultural power systems*. When testing reliability, the Cronbach’s alpha coefficient was at a .79, which is acceptable for developing research (Nunnally & Bernstein, 1967).

### Findings

It was found the MST had the highest impact on skills related to maintaining small engines and the least impact on skills related to alternative energy sources in agriculture. The MST was found to have a positive impact on students learning “*Disassembling and reassembling small engines*” ( $m = 4.67$ ), “*Principles of Operation in Small Engines*” ( $m = 4.50$ ) and “*Troubleshooting Small Engines*” ( $m = 4.50$ ). Table one provides a breakdown of scores by learning category. The MST had the least impact on students learning “*Describing the role of ballasting and traction in farm tractors*” ( $m = 3.17$ ) and “*Selecting tractors based on application and power requirements*” ( $m = 3.61$ ). Table one provides a breakdown of scores by each category.

Table One

<i>Overall Impact Scores of the MST on Power and Machinery Learning Objectives</i>			
Category	<i>M</i>	<i>Mode</i>	<i>SD</i>
Using Alternative Energy Sources	3.73	4	1.05
Agricultural Power Systems	3.82	4	1.08
Employability	4.04	4	0.99
Using the Appropriate Tool	4.31	5	0.68
Maintaining Small Engines	4.50	5	0.61

### Conclusions and Recommendations

While inferences beyond this sample population should be taken with caution, this data does provide some insight to the benefits of supplementing instruction with the MST online modules. We found that the MST had a significant impact on students’ knowledge of maintaining small gas engines. It had a positive impact on tool use and employability scores as well. We also found areas where it was lacking. This research suggests that using the MST in the power & machinery course will require other tools to supplement teaching students about alternative energy sources and agricultural power systems. We did find that in relation to power systems, students felt the MST had a positive impact on learning skills related to exhaust system components ( $m = 4.44$ ) and “*applying the appropriate lubricant by a maintenance schedule*” ( $m = 4.11$ ). Teachers are encouraged to use the MST to supplement instruction in their agricultural mechanics courses. Further research is recommended to validate these results and further measure the impact of industry-based certifications in teacher education courses.

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