Flip the Script! Implementing Team-Based Learning in a Post–Secondary Agricultural Mechanics Course

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Introduction

A variety of instructional approaches exist that could be implemented to provide students with the opportunity to develop and refine higher-order thinking skills (Allen, Donham, & Bernhardt, 2011; Hanson, 2006). Of all the instructional strategies available to teachers, Team-Based Learning (TBL) may provide the best framework for cognitive development, as well as building critical thinking skills (Michealsen & Sweet, 2012).

Team-Based Learning (TBL) is a student–centered instructional approach that shifts instruction away from a traditional lecture based format (Nieder, Parmalee, Stolfi, & Hudes, 2005; Artz, Jacobs, & Boessen, 2016). In a TBL formatted course, students take on the responsibility of learning conceptual knowledge outside of class time, and spend more time applying that knowledge in class (Michaelsen, Knight, & Fink, 2004). Essentially, TBL is formatted to provide students with both conceptual and procedural knowledge (Michaelsen & Sweet, 2008). TBL follows the framework of a flipped classroom where students acquire the conceptual knowledge before class, allowing class time to be utilized for application of knowledge (Wallace, Walker, & Braseby, 2014).

In a TBL course the instructor's primary role shifts from dispensing content/information to facilitating the overall instructional process. The students move from being passive learners to taking on the responsibility of learning conceptual knowledge before class, so that they will be a valuable team member for in-class work (Michaelsen & Sweet, 2008). For TBL to implemented properly there are four essential elements to consider: (a) Groups-formation/management of teams, (b) Accountability-students must be held responsible for the effort given on individual and team work, (c) Feedback- Students must receive frequent/timely feedback, and (d) Assignment design–Team work must promote both learning and team development (Michaelsen & Sweet, 2008). If TBL is implemented properly classroom experiences/environment can be much more enjoyable for both student and instructor (Sibley & Ostafichuk, 2013).

How it Works

At the beginning of the course students will be broken into groups or teams that are permanent for the remainder of the course. These teams are designed to put all students on equal playing grounds and reduce preexisting relationships (Michaelsen & Sweet, 2008). Typically, a TBL course is broken down into 5-7 modules that usually require 2 weeks or longer to complete (Michaelsen, Davidson, & Major, 2014). The material taught from these modules build from simple concepts to more complex skills (Michaelsen, Knight, & Fink, 2004). At the beginning of each new structured module the students complete pre-class tasks (i.e., reading). Once the class has begun, students will be assessed individually over the material that they completed before class for content knowledge retention using an IRAT (Individual Readiness Assurance Test) and also in teams when they take their TRAT (Team Readiness Assurance Test). After the IRAT and TRATs the remaining in class period can be devoted to a short summary of the content covered to make sure all questions are being answered. The remaining portion of the class (application portion) is devoted to the students completing application exercises in teams. The application exercises are designed off the premise known as the 4's. These include: (a) significant problem, (b) same problem, (c) specific choice, and (d) simultaneous reporting. Each team completes the

same application exercises that present all 4's within a class period (Michaelsen et al., 2004; Sibley & Ostafichuk, 2013; Michaelsen, Davidson, & Major, 2014). This allows the students to apply the course content to real-world problems (Michaelsen, et al., 2004).

Results to Date/Implications

A TBL formatted course was piloted in an agricultural mechanics independent study course during the fall 2017 semester with a group of three students. The students completed six modules covering small gas engines, each taking a week to complete. The modules consisted of safety, 4-cycle theory & fuel systems, tool and parts ID, ignition/electrical systems, cooling/lubrication & governor system, and finally troubleshooting. The students completed a reading over each module before class, and took their IRAT and TRATs in class. This particular part of the course was taught in sequential order by engine system. The modules were in sequential order by engine break down to try and help the students understand how each of the systems works together. Most of the time of this course was dedicated to the application exercise (disassembly/ reassembly of the small engine). The final module, troubleshooting, was used as their final individual/team problem solving exercise. The students in this course averaged 82.1% on all IRAT's and averaged 97.5% on all TRAT's.

Future plans/Advice to others

Future plans include implementing TBL in a regularly scheduled agricultural mechanics course at Louisiana State University. The current agricultural mechanics course at Louisiana State University will be redesigned into TBL consisting of three units: Small Gas Engines, Agricultural Structures, and Electricity. It is advised that teams be purposefully divided based on some criteria to allow for equality amongst members. For functionality and practicality, teams should be contained to six members. It is also advised that before teams take their TRAT's a review of material and content be covered to ensure mastery and proper application.

Costs/resources needed

The main cost attributed to implementing TBL is the scoring system for the IRAT/TRATs. Traditionally, IF-AT (Immediate Feedback Assessment Technique) "scratch off" forms are used to give immediate feedback to students on their IRAT/TRATs. Using the IF-AT forms allows for real time feedback on their answers and allows them to receive partial credit. This real time feedback, also allows the students to appeal any questions which they have failed. However, the IF-AT cards do have some limitations. When ordering the IF-AT forms your must order consist of a minimum of 500 IF-AT forms, which costs $115.00 for 25 questions/4 answer choices per card. A computer based alternative, GradeCam, however could be more cost effective. GradeCam works on the same premise as IF-AT forms, but the students don't have the opportunity to receive partial credit for wrong answers. GradeCam still provides immediate feedback on wrong answers, and the students can appeal wrong answers. GradeCam cost's is free for an unlimited number of students, as long as the IRAT and TRAT's are limited to 10 questions.

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