ORIGINAL RESEARCH

Using Flipped Classroom Components in Blended Courses to Maximize Student Learning

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Context: The flipped classroom is an educational approach that has become popular in higher education because it is student centered.

Objective: To provide a rationale for a specific way of approaching the flipped classroom using a blended course design and resources necessary to help instructors be successful.

Main Outcome Measure(s): Three class components are important to the flipped classroom: before-, during-, and after-classroom sessions. Each is important in helping instructors deliver content in ways that will engage students to use all levels of the Bloom taxonomy on a consistent basis. Implementing each component using a blended course delivery will allow faculty to meet the students where they are in their learning as well as maximize class time.

Conclusions: Athletic training educators can successfully use flipped classroom principles in blended courses to create student-centered classes. Educators should strategically think about the course objectives and activities for each of the 3 components. Being deliberate in this approach will ensure the educator is both an expert and a facilitator helping students achieve all levels of the Bloom taxonomy to maximize student learning.

Key Words: Active learning, formative assessment, blended learning

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INTRODUCTION

Like many allied health profession programs, athletic training programs have a significant amount of content and skills as part of the curriculum. Educators commonly deliver this material through lecture.[1] However, lecture establishes an instructor-centered classroom in which students are mainly passive learners.[2] According to the Bloom taxonomy,[3] which is used to assist educators in developing appropriate learning objectives for students, the lecture-only teaching approach will allow for student demonstration of solely lower levels of learning (eg, remember and understand). This is one of the reasons why lecture alone has been criticized by many as an ineffective way to help students acquire the knowledge and skills they need for the real world.[1,4]

The classroom lecture is grounded in the educational approach of the instructor serving as a "sage on the stage" imparting knowledge onto the students by only speaking and answering their questions.[5] Instructors tend to use this approach because this is how most were taught and very few have advanced training in pedagogy. However, when done in isolation this passive learning approach takes away from challenging students' thinking, guiding them to solving real-world problems, and encouraging direct application of material done in class.[6] It is important for educators to approach their teaching with the intent of students being active learners each day in class, which assists in their ability to demonstrate higher levels of the Bloom taxonomy (eg, application, evaluation).[3] When students are active learners there is a paradigm shift in the instructors' pedagogical approach from one of "sage on the stage" to more of a "guide on the side." As a result of this shift, students are able to explore content independently or within a group, with the instructor acting as a facilitator of learning.[7] As educators, we have the expertise and experiences that our students do not, but we must ensure they are able to apply content in order for them to be successful.

The flipped classroom is an instructional approach that includes 3 components of the class: before-, during-, and after-classroom sessions.[6] Students have their first exposure to course content during the before-class component through a variety of ways, such as viewing online video lectures, reading their textbook or supplemental materials, or performing a mini-assessment of the content before meeting face to face for the during class component. The during-class component is centered on active learning strategies. Because students have already been exposed to the content, it allows for easier application of content while the teacher is present as opposed to the students initially being introduced to the content through a face-to-face lecture. The final component of the flipped classroom is the after-class component, where some form of assessment of student learning occurs.

Although the flipped classroom has proven to be a beneficial instructional approach, there is one potential drawback.[8–11]

Experts on the flipped classroom indicate that the before component is to be assigned as homework to be completed by the student.[6] This may not be the most effective way to ensure student compliance, because students may not be motivated to consistently engage and complete homework in addition to attending classes 2 or 3 times a week. However, if instructors use a blended course design and use the 3 components of the flipped classroom it may address this drawback. Blended course design is herein defined as a class that meets both online and face to face (or in person). Using a traditional Tuesday/Thursday class format, Tuesday is the online class and during this time the before-class content is taught rather than requiring this for homework, and then Thursday is the face-to-face class. It is during the face-to-face class that the instructor and students participate in the during- and after-class components of the flipped classroom. Research has documented that students prefer blended learning environments compared with environments in which a course is taught completely face to face.[12] Using the flipped classroom components of before, during, and after class in a blended course design enables the instructor to merge the "sage on the stage" with the "guide on the side." The purpose of this manuscript is to provide an example of each component of the flipped classroom, including resources to better understand how this approach can be used in a blended course to maximize student learning.

BEFORE CLASS: THE ONLINE CLASS

The before-class component of the flipped classroom provides students with initial exposure to the content in an asynchronous online format. This component may include readings, lecture, and video materials as well as low-stakes assessments. Using the objectives for the topic lesson, the instructor chooses background reading materials to introduce the topic and provides context for the lesson. This is equivalent to the reading one would assign in a fully face-to-face traditional classroom using lecture alone. For the blended course design, in addition to the reading assignment, the instructor uses some form of video instruction or additional readings depending on the objectives. There are many tools to assist instructors in providing visual multimedia instruction, including lecture capture software such as Camtasia (TechSmith Corporation, Okemos, MI) and Brainshark (Waltham, MA) as well as established online educational resources such as YouTube clips (San Bruno, CA) or TED Talks (TED Conferences, LLC, New York, NY). Instructors should seek out the assistance of instructional designers on their campus if they are unfamiliar with these concepts.

One of the most commonly used forms of visual instruction is the lecture capture using software programs such as Camtasia or Snagit (TechSmith Corporation). These programs enable the instructor to record a video display (ie, PowerPoint, Microsoft, Redmond, WA) with audio output to deliver a multimedia presentation. It is important that the lecture captures are engaging, meaningful, and interactive for the

learner. This can be achieved using theoretical principles of multimedia learning developed by Richard Mayer.[13] One principle that is particularly useful is the segmenting principle for managing essential processing. This principle states that people learn better when a multimedia lesson is presented in learner-paced segments rather than as a continuous unit.[13] For example, lectures should be "chunked" into subtopics and presented in no longer than 10- to 15-minute segments. This will help reduce the level of distraction while improving the attention of the learner.

Two other principles discussed by Mayer[13] address the reduction of extraneous processing, which helps the learner focus their attention on the content being presented. The redundancy principle states that people learn better from images/graphics and narration than from images/graphics, narration, and on-screen text. Therefore, lecture slides should be designed to use relevant graphics with minimal text and the instructor should narrate and explain content. Additionally, the signaling principle suggests that people learn better when cues are added that emphasize the organization of key points in the material. Many lecture capture software programs have editing features (eg, zooming, highlighting, underlining, bolding). Taking advantage of these features will assist in helping the learner to understand what is important and valued as it relates to the content. The instructor can also signal the student to think about certain concepts by inserting questions and asking the students to pause the lecture and write down responses to questions.[13]

In addition to creating an appropriate online lecture, it is important for the instructor to engage the students through low-stakes assessments. The low-stakes assessments provide incentive for the student to complete the readings and watch the lecture captures during the online portion of the class. The assessments are low stakes because they contribute to a small percentage of students' overall grade to help with motivation as well as ensure students are prepared for the face-to-face class (ie, during class). A variety of formats can be used for the low-stakes assessments, including quizzes, short essay questions, tables, collages, etc. In sum, the before class allows students to be presented with content on their own time and at their own pace and ensures they are prepared and able to work with the material before they come to the face-to-face class.

DURING CLASS: FACE-TO-FACE CLASS

The face-to-face class allows the instructor to build upon the online before-class content, challenging students to demonstrate higher levels of learning (ie, application, evaluation, synthesis) during class through using active learning techniques while the instructor is present. Active learning is an umbrella term for pedagogies focusing on student activity and engagement in the learning process.[14] Many faculty members engage in active learning techniques occasionally for specific areas of content within a course, but it is not usually done on a consistent, strategically planned basis. The benefit of implementing the flipped classroom into one's teaching is to ensure every face-to-face session allows for planned, meaningful active learning.

Though a class with active learning is student driven, it is important for the instructor to have a structure so the students understand this is a learning environment and not an opportunity to merely converse in groups.[15] The instructor can begin class by asking students to anonymously indicate any unclear points they have related to the content from the online class. One way to do this is to have them write out and give to the instructor what muddiest points or burning questions they have related to the content.[16] This will allow the instructor to better understand areas that need clarification in a safe format because it is anonymous. After clearing up misconceptions, a check for understanding of course content can occur through the use of audience response systems (ie, clickers). The use of clickers in the classroom has been demonstrated to help with student concentration, 1-way communication between the instructor and student, and revealing student misunderstanding in a nonthreatening way.[17] There are several options for clickers; institutions may provide instructors with the opportunity to purchase them as part of one's course or have them available for loan. However, if this option does not exist there are free web tools that contain polling software to be used in courses with smartphones.[18,19] Based on student responses from the clicker questions and quick review of burning questions, the instructor can conduct a mini-lecture. If students perform well on the clicker questions and there are no muddiest points or burning questions, the instructor as the "sage on the stage" should draw from previous knowledge of common areas of misunderstanding and provide a mini-lecture on the concepts or topic areas. The next part of the class is the active learning strategy. It is important to not make the active learning strategy so complicated that students get caught up in trying to understand the directions of the strategy and lose focus on the content. Therefore, the instructor should choose 3 to 4 activities that can be used over and over again. This method eliminates the risk of losing the student in the process of the activity and helps students focus more on the content.

There are many active learning strategies for instructors to choose from, such as fishbowl, concept mapping, jigsaw, and note sharing, to name a few. One active learning strategy that the authors consistently use and that will be described in detail is the think-pair-share technique.[20] Think-pair-share begins by having the students, in groups, presented with a scenario. For example, using an evaluation of orthopaedic injury course as a possible scenario may be as follows: Upon evaluation you determine the patient has a positive valgus stress test at 0° when compared bilaterally. What are the possible mechanisms of injury for this to occur, what other structures may be injured as the result of this finding, and what special tests will you perform to assess all respective structures? In groups students work towards answering each of the targeted questions posed. They are permitted to use their notes from the online class, textbooks, and laptops to encourage evidence-based investigation and critical thinking. During this time the instructor patrols the room, guiding students by clarifying misconceptions, probing, and/or answering any questions they have related to their scenario. At the conclusion of a specified allotted time for this work, the groups are brought to the front of the room and share their results with the entire class. After this activity, the students are again asked if they have any muddiest points or burning questions. In a classroom where lecture is the sole teaching modality, the instructor relies on student questions or attendance at office hours to gauge learning. However, when the classroom is supported through active learning the instructor can monitor student learning more appropriately

and provide feedback when necessary to ensure students' learning needs are met.

AFTER CLASS: ASSESSMENT OF LEARNING

The last component of the flipped classroom is the after-class component and is used for assessment of student learning. Though it is called after class, the assessment does not have to occur outside of the classroom. The 2 types of assessment that instructors conduct with students regularly are formative and summative assessment. The most common form is summative assessment, which is carried out after learning has ended. Examples of summative assessment include exams, quizzes, papers, and presentations. Although summative assessment is important because it usually contributes to a final grade, educators should also consider using formative assessment. Formative assessment is when the instructor assesses student learning at any point during the learning process and can be informal and not graded. The flipped classroom lends itself well to the implementation of formative assessment techniques into a course. This type of assessment is important because it provides feedback as students are learning and also may enable instructors to adjust their teaching. There are a lot of formative assessment techniques instructors can use within their courses.[16] Several examples have been discussed earlier: clickers, muddiest points, and burning questions. Another formative assessment technique the instructor can use at the end of the face-to-face class is the idea spinner. The instructor creates either a virtual or physical spinner that has 4 quadrants. Each quadrant is labeled with an action verb from the Bloom taxonomy, such as *predict*, *summarize*, *evaluate*, and *explain*. A set of questions aligned with each verb is prepared in advance and a student spins the spinner and the instructor asks an individual or groups of students to reply to the question.

CONCLUSIONS

For many allied health professionals, including athletic trainers, active learning strategies help students engage in higher levels of learning such as application, analysis, and evaluation of knowledge and skills. Although the flipped classroom has been received favorably, one of the drawbacks is that it requires students to do a significant amount of work as homework. However, when the principles of the flipped classroom are used in a blended course design, educators deliver online instruction (before class) followed by face-to-face class application of material (during class) and assessment (after class).

Athletic training educators can successfully adapt the flipped classroom in a blended course to create student-centered, active-learning classes. Using the 3 components of the flipped classroom in a deliberate and strategic way, the educator can apply all levels of the Bloom taxonomy, encouraging higher levels of learning. During this time the instructor shifts his or her role from that of "sage on the stage" and becomes more of a "guide on the side" as the students are actively learning the material and being assessed in both formative and summative ways to maximize the learning experience.

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