

Improved performance in and preference for using think-pair-share in a flipped classroom

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1 | WHAT PROBLEMS WERE ADDRESSED?

Medical students have become increasingly apathetic to passive lecture-based teaching methods. We addressed this issue through the generation of an active learning pedagogy in biochemistry composed of a flipped classroom module integrated with think-pair-share (TPS)¹ and an audience response system.

2 | WHAT WAS TRIED?

A series of traditional lectures mapping to the United States Medical Licensing Examination Step 1 Content Outline was screencasted using Camtasia® (TechSmith, Okemos, MI, USA) and published on Canvas®. Students watched the videos prior to the flipped session. Attendance was optional and the annotated slides were made available after the session. During class the students answered relevant multiple-choice questions via the Poll Everywhere (PE) audience response system. After the individual PE responses were recorded, the same question was posed again, and after 'thinking, pairing and sharing' with their peers, a second individual response was recorded. Afterwards, the individual and post-collaborative responses were revealed and a full class discussion was initiated for each question. The average correct response score was determined for each question by assigning incorrect and correct answer values of either 0 or 1, respectively. Lastly, students participated in an Institutional Review Board-approved survey of the pedagogy.

A total of 42 PE questions were presented during the flipped-TPS sessions. A total of 39 questions yielded higher average scores (up to 40% increase) after peer consultation and 27/39 were statistically significant ($P < .05$) as determined by a paired-samples

t-test. For TPS, an ideal question is one displaying statistically significant improvement in performance after peer consultation, as it represents a point in the session where collective, active learning exhibits its greatest impact. A major benefit of using PE in this context is the display of immediate poll results, which allows instructors to gauge knowledge gaps and institute just-in-time teaching (JiTT). Unsurprisingly, we found that the statistically significant questions were application-based questions that required higher-level thinking skills as per Bloom's taxonomy. Indeed, we found that the majority of the statistically insignificant questions had high baseline pre-test scores and could be labelled as first-order recall questions. Questions that do not yield statistically significant differences are also important for the learner and the facilitator because they can instil a sense of confidence in the learner, especially when placed at the beginning of a session. In this regard, proper sequencing of questions based upon their assignment in Bloom's taxonomy can generate an optimal learning session.

3 | WHAT LESSONS WERE LEARNED?

Using descriptive analysis, 76% of survey respondents (213 total responses) felt that our flipped-TPS pedagogy was conducive to their learning and 86% reported that attending flipped-TPS classes was a good use of their time. In conclusion, we demonstrate that medical students at our institution feel that active learning in the context of a flipped setting integrated with TPS is an effective learning tool, and through this pedagogy of collective learning they also experience improvements in assessment performance on PE questions. Such a pedagogy is readily transferable to other disciplines and promises to be an attractive substitute for passive, lecture-based learning.

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