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Edward W. Goshorn IV
University of Louisville, walker.goshorn@louisville.edu

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Does Using Clicker Questions Improve Students' Conceptual Understanding?

Edward W. Goshorn IV¹

¹University of Louisville, Louisville, KY

ABSTRACT

Active learning can be incorporated into STEM classrooms in multiple ways. With exploratory learning, students explore a novel activity before learning the concepts or procedures. With personal response devices (e.g., clickers), students respond to real-time questions posed during lecture. The current studies examined whether, and how, clicker question can be used as exploratory learning, to improve students' conceptual understanding and engagement over traditional instruction. Biology professors integrated clicker questions into a lecture, and either closed the clicker poll prior to (Restricted Clicker Experiment, N = 164) or after (Extended Clicker Experiment, N = 188) giving feedback to the class. Undergraduate biology students completed the clicker questions either before the corresponding content was taught (explore-first condition) or after (instruct-first conditions). Afterwards, students completed a survey and learning assessment. Exploratory learning did not improve student learning outcomes in either experiment. However, closing the clicker poll early (Restricted Clicker Experiment) led to lower perceptions of belonging and security in the explore-first condition than the instruct-first condition. In contrast, closing the clicker poll after feedback (Extended Clicker Experiment) improved student engagement on several measures in the explore-first condition. Using clickers as an exploratory learning tool can improve student engagement, if implemented in a way that removes uncertainty and encourages challenge during learning.

KEYWORDS: clicker questions, exploratory learning, active learning, clickers, personal response systems, personal response devices