Chapter 15
Adopting Digital Technologies in the Classroom:
The Impact of Use of Clickers on Cognitive Loads and Learning in China

Zhonggen Yu
School of Foreign Languages of Hohai University & School of English of Zhejiang Yuexiu University of Foreign Languages, China

Qianqian Xu
Zhejiang Yuexiu University of Foreign Languages, China

ABSTRACT

Clickers have been obtaining popularity in the West, although they are less popularized in the East. This chapter, by reviewing the studies on the impact of use of clickers on learning and cognitive loads, identifies the effectiveness of clickers, and the possible influence of the use of clickers on cognitive loads is also explored. This may pave a solid foundation for further popularization in the East. It is concluded that Clickers technology might be more suitable for large-enrollment classes in that it could provide students with opportunities of polling anonymously and quietly. Students might feel less nervous when answering questions anonymously.

INTRODUCTION

Technologies could be integrated into learning and teaching to improve the effectiveness. A number of researchers and institutions acknowledged the value of technology use in teaching and learning. For example, use of clickers showed large gains in learning outcomes (Caldwell, 2007 Mayer et al., 2009); Using clickers in the small-enrollment seminar-style biology courses was proved effective (Smith et al., 2011). Advanced technologies have been proved to provide learners and teachers with a convenient medium in learning and instruction. It has been widely acknowledged that technology is able to facilitate the process of learning, thus improving learning outcomes and releasing cognitive loads.

Personal hand-held responders, often called "clickers," are one of the latest technologies used for teaching (Beatty, 2004; Duncan, 2005). Clickers are a kind of technology easily applied in education (Bruff, 2009). Clickers are also called a Classroom Communication System, Student Response System, or Audience Response Technology, referring to inquiry-based teaching strategies coupled with a clicker technology system, a computer technology that enables instructors to raise questions and has students respond using hand-held devices (clickers). The questions and answers summarizing student responses can be displayed simultaneously on the multimedia projector (Han & Finkelstein, 2013). Clickers with a long history are widely used in many educational institutions in the United States. For example, at the University of Colorado, 19 departments, 80 courses, and over 10,000 clickers were applied during the spring semester 2007 (Keller et al., 2007).

BACKGROUND

Although many studies claimed the benefits of the use of clickers in classes (e.g. Caldwell, 2007; Mayer et al., 2009; Smith et al., 2011; Heward, 1994; Berry, 2009), some studies still denied benefits of use of clicker in classes. Especially in small-scale classes, some lecturers tended to complain that use of clickers in small-scale classes produced nothing beneficial for learning and teaching but too much interaction in class. Teachers and students, with clickers, spent too much time on interaction which could have been avoided in traditional classes. Instead of too much interaction, students could focus more on self-learning and self-pondering, which was more helpful to memorize and understand the new conceptions.

Too much interaction might consume excessive time and students immerged in peer discussion might also diminish their self understandings and perceptions about the issues. Especially for introverted students, who were not good at communication and discussion, peer discussion might be a nuance for them to join. Therefore, they may prefer thinking and learning by themselves to discussing with peers.

In small-scale class, lecturers frequently indicated they felt convenient to interact with students directly which did not need any computer technology involvement including clickers. Experienced lecturers could exactly judge whether most students perceived the issue or not and determined whether to continue to the next issue or repeat it and further explain it. Clickers promoted peer participation in class through anonymous voting. However, this device meanwhile frustrated the students who were active learners and thinkers and were ready to respond to teachers' questions without anonymity. On the contrary, they enjoyed the attention drawn through their active performance. With anonymous voting, their activeness was possibly weakened. It was also assumed that learning through clickers might not be helpful for long memory in that students' memory might have been distracted by discussion and voting. The final argument needed to be clarified was that whether use of clickers among non students was as beneficial as students, since non students might not be so regulated by the device and less interested in technology if they were frequently faced with technologies when working.

Generally, the literature falls into three categories: case studies that aim to offer "best practice" advice drawing on actual classroom experience,'' statistical analyses that demonstrate how the use of clickers improves class attendance or test and examination results, and those that explore how clickers improve student engagement in the learning process. The theme of this study is to review literature on the use of clickers, and to discuss the impact of use of clickers on cognitive loads and learning outcomes.

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