Chapter XXII

Creating a Constructed Response System to Support Active Learning

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Abstract

This chapter describes the design and development of a constructed response system. The classroom interaction system (CIS) is a retro-hybrid technology that recovers most of the benefits of traditional slates while overcoming many of their limitations. Using "neo-slates" (handheld computers), students create responses to instructor prompts and submit them wirelessly to the teacher. The teacher may then, anonymously, present enlarged versions of exemplary, alternative, or erroneous student-generated representations to the class to illuminate concepts, enhance discussions and support student learning. The teacher can also review the database of student responses to support assessment, reflection, and follow-up intervention. Continuing development plans are discussed.
Introduction

Evolution and Renewal of Classroom Technologies

It seems that almost as soon as a new technology emerges, its application and utility in education is explored. Likely technologies are typically applied tentatively at first, and then either gain acceptance, as teachers and students find them to be useful, easy to incorporate, and cost effective, or are rejected because they are ineffective, cumbersome (Cuban, 1986), or too expensive, relative to the benefits derived. Looking back at older, discarded, teaching technologies — both the ones that were successful but later replaced and those that were less successful and never embraced — and considering their potential for revival or repurposing in the context of modern computer technologies may provide us with new ideas to support learning in classrooms today.

Slates

Handheld slates were a common and useful technology in traditional classrooms in the 18th, 19th, and early 20th centuries. By having students hold up their work, teachers could quickly scan the room, and determine the level of student participation and understanding, and either adjust their lesson to meet class needs, identify and help students needing extra assistance, or motivate those who were not getting their work done. It is noteworthy that slates are still in common use in third world countries where the cost of paper is too high relative to the communities’ means (Government of Tamil Nadu, 2005).

Although it is likely teachers lamented the loss of handheld slates, the transition to paper and pencil represented a practical advance in technology. The benefits of paper and pencil over slates included increased drawing accuracy (i.e., resolution), expanded work area for more complex representations, and improved readability (i.e., contrast). Paper and pencil use also allowed teachers to improve assessment by supporting retention of student class work for parent review, student completion of homework and teacher review outside of class time, and the introduction of written tests.

Modern whiteboard materials, in concert with an increased interest in constructivism, have supported a resurgence of the use of handheld “slates” in classrooms. Newer handheld dry erase whiteboards are larger, less fragile, and support increased drawing accuracy and readability. From grade school to large university physics classes (Crouch & Mazur, 2001), handheld whiteboards are used as a tool to support students in creating graphical representations, to share their conceptual understandings, or demonstrate their problem-solving processes. Using this revived technology increases the proportion of students who are actively engaged in learning in the classroom, and enhances the quality of discussions.

Yet, representations created by students on handheld whiteboards are still fleeting, and modern sensibilities mean that the discomfort or angst experienced by some students...