Title: SMART Boards Rock! Exploring the Impact of Technology on Second Grader’s Acquisition and Retention of Knowledge Regarding Rock Types

Edward Shaw and Rebecca Giles  
*University of South Alabama*  
*United States*  
*eshaw@southalabama.edu*  
*rgiles@southalabama.edu*

**Abstract:**

This study investigated the impact of SMART technologies on second graders’ learning related to rock types. Specifically, the effect of SMART technologies, both alone and in conjunction with examining real rocks, on second graders’ (*n= 103*) acquisition and retention of knowledge of igneous, sedimentary, and metamorphic rocks was explored. A quasi-experimental pretest-posttest-delayed post comparison group design with three treatment groups—SMART only, rocks only, SMART and rocks—was employed. Additionally, students were surveyed regarding their attitudes toward the various instructional methods. Data was collected using an 8-item content quiz and a 5-item attitude survey. Nine participants, selected as a representative sample, were interviewed to obtain further insight into survey responses. Findings raise questions regarding integration of technology, especially SMARTBoard instruction, into elementary-early childhood classrooms for improved science instruction.

**Problem**

Introduced in 1991, SMART Boards combine the functionality of a whiteboard, computer, and projector into a single system which uses touch control to perform all mouse and keyboard functions and allows users to write over applications, Web sites, and videos with digital ink. The large size and touch-sensitive display takes advantage of children’s natural, intuitive movements and responds to any maneuverable, firm surface, such as a finger, pen or pointer, to foster young learners’ independence in navigating the system. The interactive nature of the SMARTBoard offers many practical uses for providing the type of “hands-on” learning long advocated by constructivists teaching, while the large work area invites collaboration through social interaction and communication. With the presence of interactive whiteboards in elementary classrooms increasing daily, it is imperative that teachers not only be knowledgeable regarding the use of this 21st century instructional tool but also understand and its impact on student learning and attitudes.

**Research Questions**

1. What is the effect of instruction delivered via a SMARTBoard, both alone and in conjunction with examining rocks, on second graders’ acquisition and retention of knowledge of the three rock types?
2. What are second grader students’ attitudes towards rock types lessons taught using a SMARTBoard?

What was Done
Participants were 103 second graders from eight different classrooms at a single elementary school in southern Alabama. Intact classes were randomly assigned roles, with students for whom parental consent had been obtained serving as participants in the various groups. Two classes served as the control group (n=17), and two classes were assigned to each of treatment groups – SMARTBoard only (n=36), rocks only (n=23), SMARTBoard with rocks (n=27).

Students in the SMARTBoard and SMARTBoard with rocks groups received instruction using a Notebook 10 file available through SMART Exchange and adapted to emphasize the specific concepts being measured. In addition, the SMARTBoard with rocks and rocks only groups had access to a collection of rock samples containing examples of the three rock types—igneous, sedimentary, and metamorphic—being studied and hand lens.

Data were collected using an 8-item content quiz designed by the researchers. The quiz, based on the content standards from the Alabama Course of Study – Science (2005), used 5 multiple choice and 3 matching items to measure students’ knowledge gain and retention of concepts related to various rock types—igneous, sedimentary, and metamorphic. Students were awarded 1 point for each correct response for a highest possible score of 8 points. This quiz served as the pre-, post- and delayed posttest.

A quasi-experimental pretest-posttest-delayed post comparison group design with three treatment groups—SMARTBoard only, rocks only, SMARTBoard with rocks—was employed. The study was conducted over a 2 week period. The pretest was administered to all participants by their own classroom teachers on Monday. The SMARTBoard only group received instruction on Tuesday. The SMARTBoard with rocks treatment occurred on Wednesday, and the rocks only treatment occurred on Thursday. The instructional time for each treatment was approximately one hour. The first author/primary researcher delivered instruction to all three groups in an attempt to control for teacher affect.

The posttest was administered to all participants by their own classroom teachers about 20 minutes after they had received instruction. The delayed posttest was administered to all participants by their own classroom teachers one week from the following Monday, which was two weeks after the pretest. Following administration of the delayed post, the comparison group received instruction on rock types using the SMARTBoard with rocks method of delivery, and the researcher individually interviewed nine participants (3 from each treatment group) for approximately 10 minutes.

Data collected were entered into the SPSS program and a Mixed Methods ANOVA was run. Post hoc analysis was done using the LSD adjustments, and the responses from the attitude survey were summarized. SMARTBoard only and SMARTBoard with rocks only treatment did better on the posttest and delayed posttest than on the pretest. SMART technologies with rocks and the control did about the same on all three
tests. SMARTBoard only and rocks only scored significantly better than the combination of SMARTBoard with rocks. One possible explanation for this is the time factor. The SMARTBoard was presented first then the rocks. The limited time available may have prevented concepts related to the three different types of rocks to be fully developed in either format. The participants’ consensus, regardless of the treatment, was that they enjoyed their lesson on rocks.

**Relevance or Implications of Topic**

While it appears that the SMARTBoard can be an effective teaching strategy regarding content in science, the researchers are not advocating that the use of hands-on experiences be abandoned. In contrast, results suggest that further investigation of instructional methods using both technological resources and manipulative materials should be conducted, as the proliferation of technology into all educational arenas continues.