Andrews University

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A CRITIQUE OF KUBASKO'S STUDY ON REMOTE COMMUNICATION WITH SCIENTISTS

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by

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Kubasko, D., Jones, M. G., Tretter, T., & Andre, T. (2007). Is it live or is it Memorex? Students' synchronous and asynchronous communication with scientists. *International Journal of Science Education, 30*(4), 495-514. doi:10.1080/09500690701217220

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Introduction

My research is focused on the use of videoconferencing to enrich instruction in K12 classrooms. One way to use videoconferencing in the classroom is to access guest speakers, specialists and scientists to enhance the study of the topic at hand (McCombs, Ufnar, & Shepherd, 2007; Pachnowski, 2002). I selected the article critiqued in this paper for two reasons. It provides an alternate view, comparing synchronous and asynchronous communication with scientists; whereas most of the other articles on this topic research and evaluate only synchronous communication or videoconferencing. Thus this article provides a unique perspective on my research topic. Second, I selected this article because it is one of the few on this particular topic that gives evidence of fairly rigorous research. Pachnowski's oft quoted article describes how schools access scientists (2002), Ba and McCombs provide a general program evaluations (Ba & Keisch, 2004; McCombs et al., 2007); however Kubasko, Jones, Tretter, and Andre carefully examine the impact on student learning of a specific concept in two different technological scenarios (2007). The article by Kubasko et al. was a unique fit for this assignment because of its divergent view from other literature and its careful research design.

This critique consists of a summary and overview of the research question, literature, methods, and findings in the article. It continues with a critique of the strengths

and weaknesses of the article, and concludes with judgments on the article's contribution to the literature and usefulness for my own research.

Article Summary

This section examines the content of the article, beginning with the research question, purpose and background literature. The methods and findings of the article will be summarized, followed by a summary of the overall integration of the article.

Research Question and Purpose

Given the rising use of videoconferencing and Internet technologies in education, this study investigated "whether high school students' interactions with scientists using a real-time Internet connection were similar or different when compared with students who interacted with scientists via email" (Kubasko et al., 2007, p. 6). A social-constructivist framework was used in both methods of connecting students to the scientists. The goal was to determine if the "replays of scientists' experiments could be as effective as real-time, live experimentation" (Kubasko et al., 2007, p. 7). Research questions included comparing the students' methods of communication with the scientists, as well as comparing the method of experimentation (live vs. replay).

Background Literature

Kubasko et al. (2007) laid a rich foundation of background literature for this study. The authors began with an overview of research and reports on using inquiry and hands-on experimentation in science education to assist students in constructing meaning and how scientists and educators are using technology as the tool to conduct the scientific investigation. In the next section, the authors address the challenges of students learning science online, both synchronously and asynchronously, and the lack of research that

“examines the social dimensions of learning” via technology tools (Kubasko et al., 2007, p. 4). Kubasko et al. also explored the research on students using the Internet for inquiry based instruction and provided several examples of such instruction. Finally, to set the stage for the discussion comparison in the study, the authors explored research on Internet-mediated discussions suggested that asynchronous methods are more common and more likely to promote reflection and higher order thinking. This detailed review of the literature provided the background for the current study.

Methods

Kubasko et al. (2007) used an experimental method with students randomly assigned to classes that used the synchronous, live experimentation method and those that used the asynchronous method to interact with scientists while watching the replay of the experiments done by the scientists. The data collected included transcripts of the students’ interactions with scientists in both methods, pre and post knowledge assessments of the topic, and student newspaper articles written to share their experiences. The transcripts and newspaper articles were analyzed qualitatively and the knowledge assessments were analyzed using quantitative methods.

Findings

The findings for each separate analysis were shared. In the transcripts of the interactions with the scientists, Kubasko et al. (2007) found that while the students in the two groups asked a similar amount of questions, the synchronous students asked significantly more questions about the scientist (62% for synchronous students; 10% for the asynchronous students). In both groups, the drawings of viruses on the knowledge assessment showed a significant increase in understanding about the viruses. In the

student newspaper articles, students in the asynchronous group wrote longer stories and made almost twice as many comments about what they “learned or knew” (Kubasko et al., 2007, p. 15).

Discussion

In the discussion section, the authors reflected on the results of the study. Kubasko et al. (2007) suggested that this study is important because the live connection is more expensive to set up and maintain. If the replay experiment can be used effectively, it will be more cost effective for instruction. The authors concluded that the students communicating with the scientist via email asked more questions about the scientific investigation; whereas the students synchronously communicating with the scientist were “enchanted with what we call the ‘Actor Phenomenon.’ The scientist that appeared on the computer screen was at times more interesting and engaging for some students than the manipulation of viruses” (Kubasko et al., 2007, p. 16). The newspaper articles supported the outcome that the asynchronous group were more focused on the science content than the live group. However, all students changed their concept of viruses from two dimensional to three dimensional. Both methods were effective for altering their perceptions of the viruses. The authors suggest that future research should be done to determine “how students can benefit most from communicating with scientists” (Kubasko et al., 2007, p. 17).

Article Integration

Overall this article clearly integrated the background literature with the methods, findings, and implications. The article was easy to follow and consistently address the same topics throughout.

Research Critique

In the following critique, the strengths and weakness of this article will be addressed, followed by suggestions for improvement.

Strengths and Weaknesses

Overall this article had a very clear purpose and focused the reader on the procedures and background throughout the article. The underlying theory of social constructivist learning was indicated and the literature review section was clearly organized by topics. The literature review distinguishes between research and opinion articles or education reports and required science education standards. The literature review cites mostly research within five to six years of the current study, using past literature to provide a background for the current research.

The research design of this study was strong and a good example of an experimental study as described by Pyrczak (2003). Random sampling was used to assign students to classes, and four classes were randomly selected from the four high schools. Student participants were selected using random cluster sampling, and because the students were participating in class assignments, the participation rate was acceptably high. The sample was appropriately diverse, with half female and half male participants, and seven ethnicities represented. The author clearly delineated the relevant demographics of the sample. While the sample size of 85 is small, the inclusion of two high schools and two different classes seems appropriate given the scope of the study.

The instrumentation seemed appropriate, however sample questions were not included. The instrument was piloted and reviewed in a previous study, as well as reviewed in the current study; however, information relating to the validity and reliability of the instrument was not included in the article as suggested as essential by Suter (1997).

While this weakness is apparent in the article, the mixed methods data collection of observations, student writing, and the knowledge assessments gives weight to the research by using triangulation to confirm the results as suggested by O'Leary (2005).

In the analysis of the subjective data (the field notes, emails, and videotapes), the researchers reported using two observers code the transcripts. However, it was not clear if the observers coding was independent of each other; and the rate of agreement was not reported.

The experimental procedures for this study are one of its strengths. The groups were randomly selected, and individuals were randomly assigned to the groups. The treatments are described in detail and administered by the researchers. From the article, it seems that the conditions were similar in each group, other than the treatment. The experiments were conducted in a natural setting, the students' classrooms, therefore exhibiting adequate external validity. Overall, the experiments were properly and ethically conducted.

Suggestions for Improvement

The article introduction begins with a broad overview of how the Internet is used in science instruction. It would have been helpful to understand the specific problem and its significance sooner in the article. The problem and significance are explained clearly in the discussion section, however providing this sooner would have been helpful for the reader.

A definition of terms would have been helpful as well. Until reading through the specific research methodology, the reader isn't clear that the terms asynchronous and replay in the article are used to describe asynchronous email communication with the scientist coupled with a replay of the scientist' manipulation of the viruses.

Additional details about the Pre-Knowledge Questionnaire and the Post-Knowledge Questionnaire would have been helpful. Sample questions would help the reader understand the survey, and details about the validity and reliability of the instrument would have assured the reader about the data collection methods. Including the internal consistency and the interobserver reliability would strengthen this study.

The article makes an assumption that the students were prepared for the interactions in the same way and does not describe anything otherwise. However, in my experience, students participating in a live videoconference need additional instruction to prepare for the videoconference appropriately and to ask intelligent questions. Wenzloff (2003, March) describes a process whereby students generate and evaluate very specific questions before the videoconferencing. It is possible that if properly prepared for the videoconference, the synchronous students also could have focused more on the content. It is also possible that if the interactions were sustained over a longer period of time, the students would have had better questions and more content learning as described in Shaklee's doctoral study on elementary students interacting with scientists (1998).

This article was consistent throughout. The literature reviewed was consistent with the research purposes and questions and the results and findings were consistent with the implications and discussion. The article held together well and provided a good example of quality research in this field.

Conclusion

This study makes an important contribution to the research on videoconferencing and using technology to communicate with scientists. While the findings of Kubasko et al. are not as positive towards videoconferencing as some may prefer, the study places the use of videoconferencing in a wider perspective by showing its use compared to

asynchronous communication. The study seems to imply that videoconferencing may be useful for raising students' interest in the work of scientists and that it can make an impact on changing students perceptions of a scientific concept when coupled with a live science experiment. It suggests caution towards viewing videoconferencing as the best method in all situations, because the students were more reflective in the asynchronous environment.

This study is useful to my literature review because it provides a contradictory voice to the other studies supporting videoconferencing to interact with scientists (Ba & Keisch, 2004; McCombs et al., 2007; Shaklee, 1998). It makes my literature review stronger because it introduces another perspective and requires me to integrate these ideas. In addition, it provides another source of references to be examined carefully for references appropriate to my research study.

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