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JOURNAL OF RESEARCH IN SCIENCE TEACHING VOL. 48, NO. 7, PP. 793-823 (2011)

Elementary Students' Views of Explanation, Argumentation, and Evidence, and Their Abilities to Construct Arguments Over the School Year

Katherine L. McNeill

Lynch School of Education, Boston College, 140 Commonwealth Avenue, Chestnut Hill, Massachusetts 02467

Received 5 July 2010; Accepted 13 June 2011

Abstract: Science includes more than just concepts and facts, but also encompasses scientific ways of thinking and reasoning. Students' cultural and linguistic backgrounds influence the knowledge they bring to the classroom, which impacts their degree of comfort with scientific practices. Consequently, the goal of this study was to investigate 5th grade students' views of explanation, argument, and evidence across three contexts—what scientists do, what happens in science classrooms, and what happens in everyday life. The study also focused on how students' abilities to engage in one practice, argumentation, changed over the school year. Multiple data sources were analyzed: pre- and post-student interviews, videotapes of classroom instruction, and student writing. The results from the beginning of the school year suggest that students' views of explanation, argument, and evidence, varied across the three contexts with students most likely to respond "I don't know" when talking about their science class-

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Keywords: critical thinking, inquiry, language of science and classrooms; sociocultural issues, student values

The National Research Council (Duschl, Schweingruber, & Shouse, 2007) report *Taking Science to School*, provides a new framework for proficiency in science that includes a focus on students being able to “generate and evaluate explanations” and “participate productively in scientific practices.” Science is a practice that includes more than just concepts and facts; it is a set of scientific ways of thinking and reasoning (Lehrer & Scamuffa, 2007).

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Keywords: critical thinking, inquiry, language of science and classrooms; sociocultural issues, student beliefs, values

The National Research Council (Duschl, Schweingruber, & Shouse, 2007) report, *Taking Science to School*, provides a new framework for proficiency in elementary science, which includes a focus on students being able to "generate and evaluate scientific evidence and explanations" and "participate productively in scientific practices and discourses" (p. 2). Science is a practice that includes more than just concepts and facts, but rather also encompasses scientific ways of thinking and reasoning (Lehrer & Schauble, 2006). In order to

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P 1: _19Elementary Students'
 P 2: 15Children's roles and use
 P 3: 16Children's Questions

About Science Fair: Preliminary Results of an Analysis of Digital Library Reference Questions

Marcia A. Mardis

Assistant Professor, Library and Information Science Program, 219 Kresge Library, Wayne State University, Detroit, MI, USA. mmardis@wayne.edu

In this study, the researcher used a data set that contained science-related questions from the Internet Public Library's Kidspace Ask A Question email reference form. The data showed that the majority of the questions were asked by middle school students in the United States who were preparing for science fair. A closer inspection of the question text showed that students are concerned about the process of assembling a project as well as the project's content. This finding suggests that digital libraries can support young science learners by developing a metadata vocabulary for process.

Overview

As students move from understanding science facts to applying them to practical situations, they seek support from multiple sources in their explorations. In a previous study of 3765 science questions posed to the Internet Public Library, nearly three-quarters of the questions came from middle school students, and 42% were about science fair (Mardis, 2006).

While students are clearly seeking answers to science questions through digital reference services, reference librarians remain uncertain as to whether this is an appropriate approach. In a study by Janes (2002), only 43% of reference librarians indicated that science questions would be well-served by digital reference service, and even fewer (28%) felt that digital reference services would be helpful to children.

Prior analysis on the questions contained in this data set determined popular subjects of the science questions, but did not focus on patterns and consistencies in the questions. This study is unique in that it goes beyond overall characterizations of questions and



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Prior analysis on the questions contained in this data set determined popular subjects of the science questions, but did not focus on patterns and consistencies in the questions. This study is unique in that it goes beyond overall characterizations of questions and questioners to examine the question content in an effort to devise taxonomic and descriptive schema that will inform collection and support service, particularly in a digital library context.

This study was undertaken to analyze the content of questions about science fair to better understand the needs of children for digital reference in an area that for many middle school children is one of high need for information. Results from the earlier IPL study led the researcher to look more deeply at the role of virtual reference in the

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