Analyzing Middle School Students' Use of the ARTEMIS Digital Library

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Abstract

Research into student use of scaffolding features and representation issues encountered while using the ARTEMIS Digital Library is discussed. Research agenda, methods, preliminary findings, and future research directions are presented. Preliminary findings indicate that students exhibit some commonalities in their patterns of system and scaffolds use.

1. Introduction

Students using online resources often cannot balance learning to use the system with content understanding. The task then is to create tools that enable inquiry-based learning which are informed studies of children's use of digital environments and resources, as well as usability factors. Initial research into the scaffolding features of the web-based Artemis Digital Library research engine (http://webartemis.com:8080/artemis/index.adp), and our research questions and methods for addressing those questions is presented. This paper presents no conclusions, but rather focuses on questions that will be explored over the next twelve months.

2. Description of the Artemis Digital Library

The ARTEMIS Digital Library (ADL) web-based research engine provides access to the University of Michigan's Middle Years Digital Library (MYDL) collection. The collection now has approximately 4,800 age-appropriate web resources.

The Artemis research engine includes a variety of scaffolding features that make it more than a search engine. These scaffolds enable students to create a personal workspace that they return to each time they log on, thereby eliminating the need to start over each time; age appropriate representations of the resources to enable better information seeking; and a collaborative space for sharing ideas, comments, and resources. The three multipurpose scaffolds being examined in this research project include: **1.** Persistent workspace (space to save driving questions (DQ), comments, bookmarks, past searches, and past results), **2.** Website abstracts (age and topic specific descriptions of the resources), and **3.** Collaborative space (area to share Cool Sites, and to view and comment on other's Cool Sites and DQ's).

Approximately 65,000 log sessions from 2,000 student groups, comprised of two to three students each, have been collected over a seven month period. Outlined below are the methods used to begin analysis of the data.

3. Description of the Research

Log data gathered and analyzed in an earlier pilot study indicated some commonalities of use and representation obstacles while using the ADL. This research expands the sample set and further explores the results of the earlier study. The guiding research questions for this study are:

1. What strategies are the children engaging in to find information to answer their Driving Questions? Which scaffolds are being used and do they enable successful searching?
2. How does children's language relate to the language used to represent the documents in the system? Can children's language be used to represent documents within the collection? Will using student language within representations affect retrieval?

The two research questions and the plan to analyze the data collected to explore the questions is detailed briefly below.

4. Research Question 1

Children have information needs and information seeking strategies that differ from those of adults. Learning more about how they engage with systems can illuminate the cognitive processes in which they engage while seeking information. Modeling how children engage with systems may help us understand paths, processes, and obstacles they may encounter. Modeling children's engagement may provide insight into the need for additional scaffolds. Preliminary examination of the engagement patterns present in the log file data reveals that children exhibit some common activity patterns. These have been categorized into four categories as illustrated in Table 1.

Table 1: Activity Patterns, Scaffolds, and Use

Activity Patterns	Activities in Sequence	Scaffold Use
Exploration (3 activities)	View Shared DQ's View Shared Cool Sites Conduct First Initial Search	Each scaffold used between 1-2 times in beginning stages. Not used during intermediate sessions, but used 1-2 times at end of sessions.
Workspace Setup (4 activities)	Create DQ folders Create Past Searches folder Create Past Results folder Post DQ	Each scaffold used and repeated 1 to 3 times at the beginning of sessions. Not used during intermediate sessions, but may be used 1-2 times at end of sessions.
Beginning Search (4 activities)	Conduct Search View Abstract(s) View Website(s) Revise Search	Each repeated 3-4 times in an iterative sequence through majority of sessions.
Extended Search (4 activities)	Open Past Search folder(s) View Results from Past Searches View Abstract(s) View Website(s)	Each of these advanced scaffolds are used 1 to 2 times as the student learns more about the system features and the iterative nature of the search process.

After initial exploration and familiarization with the system, children begin using more of the scaffolds. As they become more proficient in their use, they begin using some of the more advanced scaffolds, such as the Past Search and Past Results folders. As we explore the data further, new activity patterns may be revealed.

One further potential means to interpret efficiency of the scaffolds may be to link teacher evaluation of student outcomes to the scaffolds used and the search history patterns. This analysis may also suggest further design and training issues.

5. Research Question 2

Question two examines one of the most problematic aspects of information seeking and retrieval, choosing words to search for the needed documents. Artemis provides user side scaffolds of representation, the DQ folders and spaces where users can save past searches and results. With the stored search words and driving questions it is possible to feed back into the system user side descriptors for documents, thereby increasing functionality and successful retrieval. This valuable resource can be used to enhance representations of the documents within the collection. The methods for examining this issue are detailed below.

1. Student search terms and the terms within the student groups' driving questions will be correlated. Student search terms will also be compared to the system side keywords and abstracts used in ADL.
2. Term frequency rates will be calculated and a list of frequently used terms will be compiled. The term frequency will be determined within the context of the subject topic for which the search is being conducted.
3. The list of compiled student terms will be used augment the indexing of the ADL resources. A sample of student searches will be re-conducted in order to evaluate the effect on retrieval.

Table 2 illustrates actual student search terms and system terms used in the document abstracts.

Table 2: Student terms versus system terms

Student's Driving Questions	Search terms used	System terms used
Is it true that Saturn is dense enough to float in a glass of water?	Saturn	saturn, planets "saturn", planets "moons" "saturn", density "volume", astronomy "stars & galaxies" "planets" "universe
What would happen if you put a furby in space?	space travel	astronomy "space exploration" "space shuttle" "orbits", astronomy "astronauts"
Do electro magnetic fields cause tumors in plants	electro magnetic fields, plants	biology, electromagnetism
Why do I have my mom's nose and my dad's hair?	genetics	genes, genetics "deoxyribonucleic acid -- dna"

6. Concluding remarks

The Artemis Digital Library provides us with a unique opportunity to study how sixth grade children make use of a scaffolded research environment. The data in the transaction logs are beginning to yield insights into scaffold use. Further analysis of the data over the next 12 months will enable us to develop better research engines to support student learning.