Science Students' Document Literacy Skills

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Introduction

Science students are expected to interpret, reason, and construct charts, graphs, and flow charts in many of their science courses. These are cognitively complex skills, involving interactions among three factors: the cognitive skills of the student, the properties of the graphical representation, and the task demands (Peebles & Cheng, 2003). In most science courses, students are exposed to a variety of graphical representations, but are rarely explicitly taught the underlying structure of such representations.

The recent advances in graphical technologies have stimulated interest in external cognition (Scaife & Rogers, 1996). Moreover, several instruments (ALLS, IALS, TOWES) measuring document literacy (*i.e*., the knowledge and skills required by adults to locate and use information from complex documents containing graphical representations such as tables, maps, diagrams, and flow charts) have been developed.

Methodology

As part of a larger study, investigating students' co-construction of conceptual understanding of mechanics, we explored students' document literacy.

Subjects

Forty-one students (between the ages of 17 and 19) at an urban CEGEP, volunteered to take a document literacy test. Of these, 31 completed the test.

Measures

Twenty tasks (5 questions assessing each of four levels) were taken from the TOWES (TOWES, 2004). Their written responses were then compared to the answer key provided by TOWES. Students were required to score at least 80% in order to be categorized as achieving each level.

Results and Discussion

Most of the science students had surprisingly low levels of document literacy (see Table 1). More than 90% of the students were only at level 2, indicating that they could only deal with graphical representations which were clear, simple, and/or explicitly described. Although these students have adapted their literacy skills to everyday life, they have great difficulty with many of the reading tasks found in university science courses or in jobs requiring science degrees. Interviews with the students suggest that many students have only a superficial understanding of tables and graphs. Moreover, many have difficulty following directions.

Table1. Documentary Literacy for College Science Students

Lev	N	Task Characteristics
1	19	locating a single piece of information by matching the information required with information presented in an identical form; entering a specific piece of information into a given form; locating multiple pieces of information by repeating a limited search. In all tasks there is no ambiguity and students are not required to make any inferences.
2	10	locating and entering information by comparing the information given and the information required; locating a single piece of information by matching ambiguous information or eliminating distractors; locating multiple pieces of information and making some limited analysis; locating one piece of information using low level inference. . In all tasks students are required to use work with multiple pieces of information and go slightly beyond what is given.
3	1	comparing and analyzing information from multiple searches from multiple document types; integrating information from different parts of a document or from different document types.
4	1	integrating and synthesizing information using high-level inferences; locating information in one format and reorganizing it in another format satisfying several conditions

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