The Role of Epistemic Thinking in Online Learning

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Abstract

Recent studies have begun to show that epistemic thinking, thinking about knowledge and knowing, may play an important role in online learning processes such as searching, evaluating, and integrating multiple online sources. The purpose of this study is to characterize the epistemic thinking of elementary school students as they study online. This goal is achieved by using the Epistemic Understanding Questionnaire (Kuhn et al., 2000), and thinking aloud during two open-ended online tasks, followed by retrospective interviews (Hofer, 2004). The participants of this study are 42 Israeli sixth graders.
Preliminary results show that epistemic thinking is related to performance of key online learning strategies such as evaluation, integration, and construction and justification of arguments based on multiple online sources. The study analyzes the interplay between epistemic metacognition and strategic performance.

Keywords: personal epistemology, epistemic thinking, metacognition, online learning, Internet.

Background

The information age is characterized by an exponential increase in the amount of available information, and by a rise in the accessibility of this information through the help of sophisticated information tools. Many educators point out that one of the goals of the educational system in the information age should be to prepare students for taking an independent and responsible role in the information society. Furthermore, they claim that this goal will be achieved only if students acquire the skills necessary for coping critically and effectively with large amounts of information from a wide range of sources (See, for example, ALA, 2000; Salomon, 2000.)

Yet, multiple studies show that students encounter considerable difficulties when attempting to learn from online resources (e.g. Brem et al., 2001; Salomon, 2000; Wallace et al., 2000; Rouet, 2006). For example, students do not tend to view online resources critically, and when they do try to apply evaluation criteria they often fail (Brem et al., 2001). Another problem is that many students assume that the answer to their question is "out there" in one website, and are not inclined to integrate resources in order to construct an answer (Soloway & Wallace, 1997; Rouet, 2006).

There are multiple reasons for these difficulties, requiring further study of online learning processes. One aspect of online learning that has so far been little examined is how students' personal epistemic thinking comes into play when learning online. Hofer (2004) showed that college students make epistemic judgments when learning online. Hofer's findings point to the possibility that epistemic judgments may have an important role in shaping online learning

processes. For example, if knowledge is perceived as simple and finite, online searching may be brief and perfunctory, and students may not find it necessary to pursue further evidence or to integrate information from multiple resources (Ibid. p. 53).

Several recent studies have begun to explore the role of epistemic thinking during online learning, and demonstrate the relationship between epistemic thinking and online learning processes (e.g., Bråten et al., 2005; Stahl et al., 2006; Mason & Boldrin, 2007; Kienhues et. al, In press).

This study follows Deanna Kuhn's theoretical framework for understanding and analyzing epistemic thinking (Kuhn, 2001; Kuhn et. al, 2000; Kuhn & Weinstock, 2002). Additionally, this study relates to the epistemic dimensions suggested by Hofer & Pintrich (1997).

We view epistemic thinking as having metacognitive aspects (Kuhn, 1999, 2001; King and Kitchener, 2002; Hofer 2004). Kuhn (2001) sees epistemic metaknowing as multi-componential: It has a Meta-Declarative component that includes beliefs about knowledge and knowing, and a Meta-Procedural component that includes metatask and metastrategic understanding and management of the tasks and the strategies one has available (Ibid, p. 6).

The study of personal epistemology has traditionally focused on high school students, college students, and adults. Epistemic thinking in elementary school has so far received relatively little empirical attention. However, several studies show that elementary school students can develop sophisticated epistemic views (Kuhn et. al, 2000; Smith et. al, 2000; Walton, 2000; Mansfield & Clinchy, 2002; Elder, 2002). And that elementary and middle school students' epistemic thinking is related to their achievements (Conley et. al, 2004; Mason & Scirica, 2006).

An understanding of the epistemic nature of online learning processes may provide us with better tools for comprehending the decisions students make while learning online. It may also enable a better basis for creating curricula that suitably address students' difficulties and encourage the development of online learning strategies. Online learning has become a part of the school curriculum from elementary school onwards. Therefore this study focuses on elementary school students and their online learning behavior.

Purpose of the Study

The purpose of this study is to characterize the epistemological thinking of elementary school students as they study online.

Specific research questions are:
1. What characterizes the epistemic thinking of young students as they learn online?
2. Is the epistemic thinking of young students, as they learn online, related to their online learning strategies?

Methods

Participants. The participants in the study were 42 Israeli sixth graders, half boys and half girls.

Research Tools

The research tools included:
1. Computer Use Questionnaire - This questionnaire collected information regarding the students' computer use background and Internet self-efficacy.

2. Prior Knowledge Questionnaire - Students replied in writing to open-ended questions regarding the task topics.
3. Epistemological Understanding Questionnaire (Kuhn et al., 2000)
4. Two online learning tasks regarding controversial topics - Students were asked to think-aloud as they performed two online learning tasks:
    a. A 20 minute open-ended search regarding the dilemma "Is chocolate healthy?"
    b. Reading 3 pre-selected websites that present contradictory positions regarding the dilemma "Do the fish farms in the Eilat gulf harm the coral reefs?".
        After the students finished each task they were asked to present and explain their opinion regarding the controversy.
5. Retrospective interviews - Each task was immediately followed-up by an epistemic interview concerning the task context.

Procedure
Questionnaires were answered in writing at school. 3-4 weeks later we conducted the tasks and interviews in the students' homes. Each task took place in a separate session. Think alouds and interviews were recorded and fully transcribed. Screen capture movies (Camtasia) recorded the students searching and reading patterns. Data analysis is currently in progress.

Coding of epistemic levels is based on the 3 major levels described by Kuhn (Kuhn & Weinstock, 2002): Absolutism, Multiplism, and Evaluativism. Coding of argumentation levels is based on combining elements from several coding schemes (Zohar & Nemet, 2002; Kuhn & Udell, 2003). Additional categories are formed following the Grounded Theory approach. At least 25% of the protocols are coded by two judges for inter-rater reliability.

Preliminary Results
Analysis of the results is currently in progress. However, preliminary results show that epistemic thinking is indeed related to students' online learning strategies:
For example, Evaluativists were more sensitive than Absolutists to website POVs (Point-of-Views), made more links between sources, and between source information and content. Evaluativists were less likely to think that an answer can be found in a single website, and were more aware of possible differences between websites.
After reading, when the students were asked to form an opinion regarding the Fish Farms controversy, Evaluativists were much more likely to present a two-sided argument. Evaluativists also presented more reasons in support of their claims, and based these reasons on more websites than the Absolutists.

Theoretical and Educational Implications
The study shows that there is a clear relationship between epistemic thinking and online learning strategies of Sixth graders as they study with multiple online sources. It appears that students with naïve Absolutist epistemologies find it much more difficult to perform tasks such as evaluating, integrating and justifying knowledge online. These difficulties may arise because multiple and conflicting websites challenge naïve beliefs and representations of knowledge and knowing.

This study suggests that in order to effectively teach online learning strategies it is necessary to design tasks that take into account students' epistemic positions and address them. For example, if students' believe that the structure of knowledge is simple and that there is only one right answer to a dilemma, they may not be inclined to seek out multiple websites and compare and

integrate their accounts. Further research is necessary in order to determine how to design tasks and learning interventions that will address these issues.

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