Chapter 13
The Use of Internet-based Instruction for the Development of Epistemological Beliefs: A Case Study in Taiwan

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Abstract Researchers have proposed that to foster epistemological development, students should engage in the discussion of controversial issues, conduct open-ended inquiry projects, discuss, and analyze ill-structured problems, work on group learning, peer interactions or so-called constructivist-based instructional activities. Clearly, the Internet-based learning environments contain rich information and a variety of perspectives and viewpoints for inquiry exploration or the debates of controversial issues. They also allow numerous ways of group learning and peer interactions, either synchronous or asynchronous. The purpose of this study was to investigate a group of Taiwanese high school students’ epistemological development by involving in some Internet-based inquiry learning activities in science. The students were asked to find more online information to explore scientific knowledge taught in science class further. Also, they were requested to search Internet information to resolve some controversial issues, and they were allowed some opportunities to participate in some online discussions and debates. Students’ standards of evaluating online information and their epistemological beliefs toward science were probed before and after the treatment instruction by using questionnaires. Through comparing the students’ responses, it was found that their judgmental standards of assessing online information became more sophisticated, and their epistemological beliefs toward science, in some aspects, were enhanced. Some of the findings were interpreted through a cultural lens. Future research issues were also discussed.

13.1 Introduction

Epistemology is the study of knowledge and knowing (Burr & Hofer, 2002; Hofer, 2001; Hofer & Pintrich, 1997). Research evidence has revealed that students’ epistemological beliefs, representing their views toward the nature of knowledge and knowing, play an important role in learning beliefs, learning strategies, and learning outcomes (Buehl & Alexander, 2001; Hofer & Pintrich, 1997; Duell & Schommer, 2001). For example, research has found that students with more
sophisticated or constructivist-aligned epistemological beliefs tended to have more meaningful learning strategies, better motivational approaches and task performances than those with more naïve, or dualist epistemological beliefs (e.g., Buehl & Alexander, 2005; Rodriguez & Cano, 2006; Paulsen & Feldman, 2005).

As the Internet is widely accessible to almost everyone, the usage of the Internet for instruction has been increasingly popular. Rather than using the Internet for totally online instruction, in current stage, one of the major utilizations for implementing Internet for instruction is to search online information to assist teaching and inquiry learning. As the Internet environments contain rich information with a variety of perspectives, some inquiry-oriented exploratory learning activities can be effectively conducted with the assistance of Internet resources. Hence, the present study was conducted to examine the effects of some Internet-based inquiry-oriented instructional activities on the development of students’ epistemological beliefs.

The conduct of this study is mainly based on the research work of Tsai (2004a). Tsai (2004a) has proposed that educators should not only perceive the Internet as a cognitive or metacognitive tool for instruction; rather, it should be regarded as an “epistemological” tool. To use the Internet as cognitive or metacognitive tool, students are asked or encouraged to obtain information, develop knowledge and skills, reorganize knowledge, make conceptual change, build connections between new knowledge and previous experiences and to learn how to learn via Internet-based environments. Consequently, some Internet-based systems have been developed, such as those focusing on visualization, virtual reality, peer collaboration and concept mapping. However, when the Internet is perceived as an epistemological tool, learners are encouraged to elaborate the following questions in great depth:

- Which information is more important than others?
- Which information or knowledge bits are more reliable and valid than others?
- What counts for “knowledge”?
- What is the nature of their knowledge (and learning)?
- How to resolve the conflicts between various perspectives of knowledge?
- How to effectively integrate all sorts of knowledge into a coherent or viable framework?

Tsai (2004a) believes that the rich and extended online resources on the Internet provide adequate opportunities for students to explore these epistemological questions further, as they may frequently experience different or even conflicting theoretical perspectives on the Internet. In addition, the Internet-based environments contain a variety of interactions, including information, peers, experts, and decontextualized individuals (Tsai, 2001a, b). These interactions will also help learners deeply contemplate these questions.

By using the Internet as an “epistemological” tool, students should make reflective judgments in Web navigation, informative decision-making in Web contexts, and meaningful interactions with Web materials, peers, and experts. As a result, the standards of evaluating online information are quite important. Educators have proposed the idea of “conceptual ecology” to interpret a student’s learning, and “epistemological commitments,” that is, the standards of assessing the merit of