Colloquium

The correlation between epistemological beliefs and preferences toward Internet-based learning environments

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Introduction

Educators have concluded that learners' epistemological beliefs (i.e. views about the nature of knowledge and learning) may affect their learning approaches, reasoning modes and decisions when processing or acquiring information (Hofer, 2001; Hofer & Pintrich, 1997). The findings in this field, in general, support that students having constructivist-orientated epistemological beliefs (highlighting the process of knowledge construction and interpretation) tend to utilise better cognitive strategies and attain higher learning outcomes than those holding more shallow views about the nature of knowledge and learning (such as emphasising memorisation). In addition, researchers have also found that students' epistemological beliefs are related to their preferences toward certain learning environments. For instance, Tsai (2000) has revealed that students who are epistemologically constructivist-orientated show stronger preferences toward the learning environments where they can explore prior knowledge, as well as conduct group work and open-ended tasks. Now the Internet may provide unique environments to facilitate a variety of students' instructional activities, such as (remotely) cooperative and inquiry learning. Gathering questionnaire data from 324 high school students in Taiwan the main purpose of this study was to explore the correlation between student epistemological beliefs and preferences toward Internet learning environments.

Method

Subjects

A total of 324 students in Taiwan participated in this study. These students came from five different high schools in Taiwan. Although the subjects should be viewed as a convenient sample, they were across different demographic and academic backgrounds. All of the students completed two questionnaires; one explored their epistemological beliefs, while the other one investigated their preferences towards Internet-based learning environments.

Instruments

To assess students' epistemological beliefs, this study utilized the questionnaire developed by Chan and Sachs (2001). The questionnaire, probing students' epistemological beliefs about (implicit) learning, included nine items, each with three options: two corresponding to a shallow view about learning, while one reflected a deep and constructivist view. The following was a sample item on the questionnaire.

When you are learning something new, the most important thing to do is:

a. *to figure out how it fits or doesn't fit with what you already know;*
b. *to get all of the facts you can about it;*
c. *to write down what you have learned so you won't forget it.*

Students' responses were scored 1 point if the answers responded to a constructivist position (eg, the 'a' option in the sample item), while those reflecting a shallow view of learning were given 0 points (eg, the 'b' and 'c' options in the sample item). By examining the reliability across all items, it was found that only six items showed adequate internal consistency in assessing students' epistemological beliefs about learning. The KR20 coefficient was 0.58 for the six items (though not high, still acceptable), similar to that reported by Chan and Sachs (2001) for the original questionnaire. Through using the questionnaire, this study acquired an Epistemological Belief Score (EBS) for each student, and a higher average score on the questionnaire (finally six items) indicated a stronger agreement toward constructivist-orientated epistemological beliefs.

To investigate students' preferences toward the Internet-based learning environments, the Preferences for Internet Learning Environment Survey (PILES), developed by Chuang and Tsai (in press), was administered. PILES was mainly modified from the Constructivist Multimedia Learning Environment Survey conducted by Maor (2000). PILES consisted of six scales (five items for each scale), presented with bipolar agree/disagree statements in a five-point Likert scale, including the following six scales, with a sample item provided:

1. Social negotiation scale: In the Internet-based learning environments, I prefer that I can ask other students to explain their ideas.
2. Inquiry learning scale: In the Internet-based learning environments, I prefer that I can carry out investigations to test my own ideas.
3. Reflective thinking scale: In the Internet-based learning environments, I prefer that I can think deeply about my own understanding.
4. Relevancy scale: When navigating in the Internet-based learning environments, I prefer that they present information that is relevant to me.
5. Ease of use scale: When navigating in the Internet-based learning environments, I prefer that they are easy to navigate.
6. Challenging scale: When navigating in the Internet-based learning environments, I prefer that they are challenging to use.

The reliability for each scale was high (alpha ranging from 0.85 to 0.93), suggesting that PILES had sufficient reliability to assess students' preferences toward Internet

learning environments. Students having higher average scores on a particular scale showed stronger preferences for the particular feature of the Internet-based learning environments.

Results

Table 1 shows the descriptive data for each scale or score gathered from 324 high school students in Taiwan. Students' Epistemological Belief Score (EBS), on average, was 0.68 in the range of 0 to 1; however, students expressed great variations on EBS (SD = 0.25). In each scale of PILES, students, in general, showed stronger preferences toward the Internet-based learning environments (an average score of 3.89 and above in the 1–5 Likert scale). Table 2 shows the correlations between students' EBS and their responses on the PILES. The results indicated that students' EBS was significantly correlated with two PILES scales: the inquiry learning scale and the reflective thinking scale (p < 0.01 and p < 0.05 respectively). In other words, students holding more constructivist-orientated epistemological beliefs tended to prefer the Internet-based learning environments where they could engage in inquiry learning and reflective thinking. These two scales, clearly, involve students' metacognitive activities, as they encourage students to examine and monitor their own ideas. Among the six scales of PILES, these two scales are related to higher-order or metacognitive thinking, while the other four scales are more likely to explore the content and technical aspects of the Internet learning envi-

Table 1: The descriptive data of students' EBS and PILES scales

	Mean	SD	Range
Epistemological belief score (EBS)	0.68	0.25	0.0–1.0
Student negotiation (SN)	3.89	0.64	2.2–5.0
Inquiry learning (IL)	4.02	0.63	2.4–5.0
Reflective thinking (RT)	4.14	0.65	1.4–5.0
Relevance (RE)	4.20	0.70	1.0–5.0
Ease of use (EU)	4.18	0.80	1.0–5.0
Challenge (CH)	3.99	0.63	2.6–5.0

Table 2: The relationships among EBS and PILES scales

	EBS	SN	IL	RT	RE	EU	CH
EBS	**1**	**0.04**	**0.16****	**0.12***	**0.03**	**0.09**	**0.02**
SN		1	0.41***	0.48***	0.48***	0.28***	0.47***
IL			1	0.69***	0.62***	0.44***	0.68***
RT				1	0.75***	0.52***	0.72***
RE					1	0.60***	0.67***
EU						1	0.49***
CH							1

***p < 0.001, **p < 0.01, *p < 0.05.

ronments (such as the ease of use and relevancy of the Internet learning environments). Hence, students' epistemological beliefs were more probably related to their preferences for higher-order metacognitive activities in the Internet learning environments, but not significantly correlated with the preferences for the content and technical issues.

Discussion

In conclusion, the findings derived from this study indicated that there was an interplay between students' epistemological beliefs and their preferences toward some metacognitive features of the Internet learning environments. The findings also concur with those revealed by previous studies that epistemological beliefs are essential components for processing metacognitive activities (Schommer, 1997; Tsai, 1998, 2001). As the Internet-based learning environments may contain a variety of information, knowledge and perspectives, the use of metacognition may be very important to judge the merits of the information and to cope with reflective thinking. Therefore, educators may need to be aware of students' epistemological beliefs when implementing some metacognitive activities of the Internet-based instruction, and the constructivist-orientated epistemological beliefs may facilitate the utilisation of these activities.

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