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Pre-service Teacher Existing Ideas of Using Computer-Supported for Scientific Inquiry

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Abstract: The study aimed to examine physics pre-service teacher existing ideas of computer-supported for inquiry physics learning and learning. Methodology is qualitative research. The research will interpret physics pre-service teacher existing ideas of computer-supported for inquiry physics learning and learning through framework of Chinn & Malhotra (2002) epistemology and cognitive processes of scientific inquiry. Participants included 15 physics pre-service teachers who enrolled for teaching practices in schools for one year, in Thailand. The questionnaire of Using Computer-Supported for Scientific Inquiry (QCSI) and interviewing were tools for interpreting physics pre-service teacher existing ideas of computer-supported for scientific inquiry. The findings revealed that the most of participants perceived few aspects of cognitive process of scientific inquiry when they gave the ideas of using computer-supported for physics teaching. Only three of six aspects of epistemology of scientific inquiry were found from physics pre-service teachers' ideas. These included responses to anomalous data, purpose of research, and theory-data coordination.

Keywords: Computer-supported, physics, scientific inquiry, pre-service teacher

1. Introduction

Although there are many potential benefits to using inquiry in a science classroom, many research found that teachers face challenges in implementing inquiry (Abd-El-Khalick et al. 2004). Teachers have a number of barriers to implementing inquiry in the classroom. In order to provide powerful chance of scientific inquiry, teachers should gain knowledge and skills of providing scientific inquiry activities. The computer-supported is another solution of generating inquiry experiment and situation (Chen et.al. 2013). In recent years, a number of computer-supported inquiry-based science learning environments have been created and studied with aiming to facilitate the development of cognitive and metacognitive strategies in pupils (Minocha & Thomas, 2007). However, it seemed that teachers had some difficulty to provide computer-supported for science teaching and learning (Maishra & Koehler, 2006). In order to enhance teachers to develop their knowledge of computer-supported science inquiry shift from simple to authentic inquiry, examining of their existing ideas about this should be addressed. This study attends to this issue by examining physics pre-service teacher existing ideas of computer-supported for inquiry physics learning and learning. To clarify the continuum of scientific inquiry, the scientific reasoning is the central issue of distinguishing. This study will adopt Chinn & Malhotra (2002) epistemology and reasoning processes of authentic science as framework of clarifying pre-service teachers' existing ideas of computer-supported for scientific inquiry.

2. Methodology

Methodology is qualitative research. The research will interpret physics pre-service teacher existing ideas of computer-supported for inquiry physics learning and learning through framework of Chinn & Malhotra (2002) epistemology and cognitive processes of scientific inquiry.

2.1 Participants

Participants included 15 physics pre-service teachers who enrolled for teaching practices in schools for one year, in Thailand. These pre-services have planned to provide computer-supported for physics teaching and learning when they are teaching in schools.

2.2 Data collection

The questionnaire of Using Computer-Supported for Scientific Inquiry (QCSI) and interviewing were tools for interpreting physics pre-service teacher existing ideas of computer-supported for scientific inquiry. The QCSI provided three open-ended questions about computer-supported for scientific inquiry in order to probe their ideas of inquiry in aspects of epistemology and cognitive processes. Then, the interviewing was carried out in order to further probe what pre-service exactly mean or respond to the QCSI.

2.3 Data Analysis

Participants' responding was categorized into different existing ideas of computer-supported for scientific inquiry. Chinn & Malhotra (2002) epistemology and cognitive processes of scientific inquiry was referenced as expected ideas of providing computer-supported for scientific inquiry.

3. Findings and Discussion

Pre-service teachers' ideas seemed to lack of providing computer-supported for inquiry. However, some parts of their ideas could be counted into some aspects of cognitive processes and epistemology of scientific inquiry as follow:

3.1 Existing ideas about aspects of cognitive processes in using computer-supported for scientific inquiry

Table 1: Existing ideas about aspects of cognitive processes in using computer-supported for scientific inquiry

Aspects of cognitive processes	Frequency (N = 15)	Percents
Generating research questions	5	33.33
Designing studies	4	26.67
Making observations	9	60.00
Explaining results	2	13.33
Developing theories	0	0.00
Studying research reports	2	13.33

It found that the most of participants perceived few aspects of cognitive process of scientific inquiry as showed in Table 1. They aware of computer-supported could be organized for physics inquiry in some aspects. It is only simple scientific inquiry. Number of them perceived that computer-supported could help making observation. However, their making observation would be only counted for transforming observations. Cognitive processes of inquiry on aspects of making observations, explaining results, studying research reports and designing studies were mentioned in their explanation. Even though, their ideas could be interpreted into some aspects of cognitive process of scientific inquiry, they also misunderstood in some issues of scientific inquiry e.g. making observations, and explaining results.

For example, Prin pre-service teachers' ideas of computer-supported for physics learning could be interpreted his cognitive processes of inquiry in three aspects including making observations, explaining results, studying research reports. His idea about explaining results was provided only aspect of transforming observations which refer to one or more rounds of data transformation. However, some of them seemed to he have no ideas to use computer-supported for scientific inquiry. Bell pre-service teacher thought that cognitive process of inquiry could be read from sentences or pictures provided in the websites rather than constructing from human endeavors during inquiry tasks.

3.2 Existing ideas about aspects of epistemology in using computer-supported for scientific inquiry

The findings indicated that participants have some perceived about epistemology of scientific inquiry when they showed the ideas of providing computer-supported for physics teaching and learning. Only three of six aspects of epistemology of scientific inquiry were found from physics pre-service teachers' ideas. These included responses to anomalous data, purpose of research, and theory-data coordination as showed in Table 2.

Table 2: Existing ideas about aspects of epistemology in using computer-supported for scientific inquiry

Aspects of cognitive processes	Frequency (N = 15)	Percents
Purpose of research	7	46.67
Theory-data coordination	6	40.00
Theory-ladenness of methods	0	00.00
Responses to anomalous data	3	20.00
Nature of reasoning	0	0.00
Social construction of knowledge	0	0.00

For example, Lompad pre-service teacher's ideas reflected that he held idea of theory-data coordination. His explanation could be interpreted that he aware of giving students chance to generate scientific knowledge from data to theories. It showed existing idea about relationship of theories and data. Interestingly, epistemology of scientific inquiry in aspects of theory-ladenness of methods, nature of reasoning, social construction of knowledge seemed to has difficulty of organizing in Thai physics classroom. These three aspects related to argumentation in scientific classroom. This finding consistency to previous studies of Thai classroom (Ketsing& Roadrangka, 2010) that discussed that Thai science classroom needs to support argumentation in classroom.

4. Conclusion

It showed that most of physics pre-service teachers' existing ideas about computer-supported were provided for motivation of physics learning, scientific model, remote learning, simulation for abstract concepts or dangerous experiments, database, instructional media, and flipped learning. However, most of them lack of how to provide computer-supported in physics teaching as authentic inquiry. Few aspects of cognitive process of scientific inquiry had showed when they gave the ideas of using computer-supported for physics teaching. Only three of six aspects of epistemology of scientific inquiry were found from physics pre-service teachers' ideas. This suggests that epistemology and cognitive process of scientific inquiry should be concerned when teachers develop computer-supported for science learning.

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