PERCEPTION OF PRESERVICE SCIENCE TEACHERS IN THE CONSTRUCTIVIST SCIENCE LEARNING ENVIRONMENT

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Abstract. Science learning was affected by various kinds of sources which students perceived and participated in classroom. The purpose of this study aims to investigate the science learning environment of preservice science teachers from Thailand and Czech Republic. Data were collected from 72 Czech and 37 Thai preservice science teachers by the six-element of CLES questionnaire. Findings revealed that preservice science teachers from Czech and Thai contexts had different level of constructivist science learning environment which is concerned classroom learning environments, and knowledge base for applying constructivist teaching into classroom. This may have implications for enhancing constructivist teaching in school context.

Keywords: learning environment; constructivist; CLES; national study

Introduction

Teacher is the professional decision making in classroom activities, a key success to effective in science teaching and learning. Teacher preparation program is a part of performing competence teachers into changing sociocultural of various school contexts. In addition, school practicum seems to preservice teachers in which a place of implementation their authority of experience in decision making, controlling students' behavior, creating flexible instructional activities, developing constructivist learning environments, and shaping in their professional experiences. The most preservice teachers have been subjected to the authority of reason and the authority of position and are influenced by these authorities that tell them what to do and what to believe (Prachagool et al., 2016). Teacher preparation program need to prepare teacher candidates for changes in modern society and knowledge-based society.

The challenge for teacher preparation program is to help new teachers recognize and identify the place and function of the authority of experience. They have

to learn creating classroom environments which it meets the real need of students, current of instructional reform, and nature of 21st century learning. Decision making to constructivist learning environments cannot be ignored in the program because they have to bring it to professional experiences and consider as well as pedagogical, psychological, and philosophical implementations. Due to, constructivist view is powerful knowledge about natural world, understand how it changes and live with others critically (Duit & Treagust, 1995). In response to this challenge helping preservice teacher to understanding and offering the guidelines for teacher education by their university course work and practicum in school (Clift & Brady, 2005; Grisham et al., 2000). The goal is to have the teacher candidates not only see the relevance and importance of their studies, but also reflect critically since those studies have immediate causal effect on their present pedagogical and managerial contexts as professional teachers (Gruenewald, 2003). The changing world is now making science classroom and learning environment seem to be differenced. Preservice teachers must be adapted to have suitable ways that promotes constructivist learners.

Science learning aims to help students understand about theoretical and practical ways which scientists do, experiment, explore, explain, conclude, and present (Osborne, 2011). The process of science what students should be (a) asking questions and defining problems, what happens and what exists, why does it happen, and how do we know; these questions are starting point investigate and explore of what they want to know; (b) models should be developed to reflect of what they know and understand about natural world. It should be simplified to others when students communicate science; (c) planning and carrying out investigations are need to science learning. The successful in science is not only academic aspect, but also planning to investigate is a starting point of view in all scientists to explain their discoveries; (d) analyzing and interpreting data are crucial process formulating to science communication. Bias is prohibited for science experiment and discovery; (e) using mathematical tools for explaining, predicting, estimating, and presenting; (f) Constructing explanations are significance to science educators, it must be skilled disseminating science to classroom. Communicating through various kinds of methods such as website, journal, seminar, conference, symposium, and etc.; (g) engaging in argument from evidence, explanation in some phenomena may be error or incomplete, argumentation by explicit evidence help to make a decision to information as well; and h) obtaining, evaluating and communicating information cannot be cut from constructivist science. Literacy seems to important because it make science had voice to connect with people (Norris & Phillips, 2003; Tenopir & King, 2004).

The science classroom environment, that is, students expose in science hours are scaffolding their knowledge and understanding, making positive towards science, engaging them to the lesson. This study need to investigate perception of preservice

teachers in constructivist learning science environment by employing CLES survey with preservice teachers from Thailand and Czech Republic. The research findings help us to prepare professional teachers through the program which constructivist science learning environment should be included and developed.

Methodology

The participants were preservice science teachers from Mahasarakham University (Thailand) and Palacký University in Olomouc (Czech Republic). They were asked for perception about constructivist learning science environment. The study revised the Constructivist Learning Environment Survey (CLES), is being used to study teachers and students perceptions about classroom learning environments. The CLES were adapted from Taylor & Fraser (1991) and Taylor et al. (1997), which the questionnaires are for assessing students' perception of their constructivist-based learning environment in order to reshape teachers' practices. The CLES consists of five six-item scales, namely, *Personal Relevance, Uncertainty, Critical Voice, Shared Control and Student Negotiation* and will be used in the study. The five elements of CLES could be explained as below.

Personal Relevance (PR) focuses on the connectedness of school where science in students' eyed are based on out-of-school experiences. The everyday use of students' experiences is a meaningful context for the development of students' scientific and mathematical knowledge.

Uncertainty (UN) refers to the extent to which opportunities are provided for students to experience scientific knowledge as arising from theory-dependent inquiry involving human experience and values, and as evolving, non-foundational, and culturally and socially determined.

Critical Voice (CV) examines the extent to which a social climate has been established where students feel that it is beneficial to question the teacher's pedagogical plans and methods and to express their learning concerns about any issues.

Shared Control (SC) is concerned with students being invited to share with the teacher control of the learning environment, including the articulation of learning goals, the design and arrangement of learning activities, and the determination and application of assessment criteria.

Student Negotiation (SN) is a scale for assessing the extent to which opportunities exist for students to explain and justify to other students' newly developing ideas, to listen attentively and reflect on the viability of other students' ideas and, subsequently, and to reflect self-critically on the viability of their own ideas.

Data were collected through the academic collaboration between Czech and Thai colleagues. Seventy two Czech and 37 Thai preservice science teachers participated in the constructivist science learning environment study. Data were analyzed by descriptive statistics, mean and standard deviation. Data were shown for presenting how preservice teachers perceived constructivist science learning environ-

ment in their different opinions by indicating into 5 levels of mean for interpreting: highest (4.51-5.00), high (3.51-4.50), medium (2.51-3.50), low (1.51-2.50), and lowest (1.00-1.50). Then data were manipulated and described in terms of level of constructivist science learning environment. ANOVA and independent t-test were used for testing hypothesis.

Findings

Constructivist science learning environment was investigated through the collaboration of Czech and Thai study. The exploration can be summarized in Table 1 to supporting how constructivist science learning environment occurred in the different contexts.

Table 1. Level of perception in the constructivist science learning environment between Czech Republic (n=72) and Thailand (n=37)

Country	Elements	Mean	SD	Level of perception
Czech Republic	Personal Relevance Scale	1.51	0.81	Low
	Uncertainty	2.17	1.16	Low
	Critical Voice	1.59	0.66	Low
	Shared Control	3.61	0.69	Medium
	Student Negotiation	2.48	0.98	Low
Thailand	Personal Relevance Scale	3.57	0.83	High
	Uncertainty	3.58	0.80	High
	Critical Voice	3.52	0.76	High
	Shared Control	2.55	0.88	Medium
	Student Negotiation	3.86	0.81	High

CLES elements were shown in the Table 1 indicated that two cohort of preservice science teachers from Czech Republic and Thailand had different level of perception in the constructivist science learning environment. Mean score of Czech preservice science teachers had low-medium level. Personal relevance scale, critical voice, uncertainty, and student negotiation were low, but shared control was medium. While Thai preservice science teachers showed their level in medium-high level. Shared control was medium whereas critical voice, personal relevance scale, uncertainty, and student negotiation were high. To test the differences of perception in constructivist science learning environment between national study, independent t-test was employed for testing hypothesis (Table 2).

Table 2. Testing the perception differences of preservice science teachers by national comparison

Country	Mean	SD	df	t	p
Czech Republic	2.27	1.16	71	28.44	.000
Thailand	3.42	0.93	36		

Table 2 indicated that two national preservice teachers had difference perception at .05 level of statistical significance. Thai preservice teachers had higher mean score than those Czech preservice teachers. Mean score was 3.42 of Thai preservice science teachers and 2.27 of Czech preservice science teachers. Then, Data were also analyzed by ANOVA for testing the differences of five elements of constructivist science learning environment (Table 3). Both Czech and Thai preservice science teachers had differences of elements at .05 level of statistical significance.

Table 3. Testing the variances of elements

Country	Sources of variances	SS	df	MS	F	p
Czech Republic	Between groups	1257.252	4	314.313	407.115	.000
	Within groups	1663.769	2155	.772		
	Total	2921.020	2159			
Thailand	Between groups	222.231	4	55.558	83.020	.000
	Within groups	739.477	1105	.669		
	Total	961.708	1109			

Table 3 showed that six elements of constructivist science learning environment study in both Czech and Thai preservice science teachers were no similarity at .05 level of significantly statistics. To understanding how elements were differenced, Post hoc test was employed for analyzing. Scheffe' procedure was used for correction alpha for pair-wise or simple comparison of means (Table 4).

Table 4. Pair-wise elements of CLES (means no differences)

Country	Element				
Czech	PR	CV	UN	SC	SN
Thailand	PR	UN	CV	SC	SN