

Pre-service Teachers' Conceptions of Teaching using Mobile Devices

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Abstract: This study explored the pre-service teachers' conceptions of teaching using mobile devices. Forty-seven pre-service teachers who had experiences in designing lesson plans and teaching materials (i.e. eBooks and APPs) with the use of mobile devices (i.e. smart phones and tablet PC) participated in the present study. The result showed that four qualitatively different conceptions of teaching using mobile devices, including "technology support," "knowledge transmission," "learning facilitation," and "supporting student learning" were identified.

Keywords: Conceptions of teaching; mobile devices

1. Introduction

Since they may play an important role in students' learning, conceptions of teaching have been investigated for decades (Gow & Kember, 1993). According to Kember (1997) and Lee and Tsai (2011), conceptions of teaching are related to teachers' ideas or the understanding they have experienced during the process of instruction. Kember (1997) reviewed thirteen studies in regard of conceptions of teaching, and classified the findings into five major categories, consisting of "imparting information," "transmitting structured knowledge," "student-teacher interaction," "facilitating understanding, and "conceptual change/intellectual development." Furthermore, Kember (1997) utilized two broad orientations (i.e. "teacher-centered/content-oriented" conceptions and "student-centered/learning-oriented" conceptions) to further classify these five categories of conceptions. In general, it is noted that individuals with teacher-centered/content-oriented conceptions tend to focus on the transfer of knowledge and content, whereas those with student-centered/learning-oriented conceptions are likely to place more emphasis on students' learning. As a result, Kember(1997) indicated that "imparting information" conceptions are considered to be more teacher-centered or content-oriented, while "conceptual change/intellectual development" conceptions are viewed as more student-centered or learning-oriented.

On the basis of the conclusion revealed by Kember (1997), a number of scholars (e.g. Boulton-Lewis *et al.*, 2001; Cheng, *et al.*, 2009; Koballa, *et al.*, 2000; Lee & Tsai, 2011) have similarly implemented these two broad orientations. For example, Lee and Tsai (2011) applied similar categories, namely "traditional" conceptions and "constructivist" conceptions, to understand teachers' conceptions of teaching. Likewise, traditional conceptions refer to teacher-centered conceptions focusing on the delivery of knowledge and content, while constructivist conceptions suggest student-centered conceptions emphasizing the importance of helping learners construct knowledge. In sum, the application of such broad orientations may hence be seen as useful analytical tools for exploring instructors' conceptions of teaching.

Besides, some studies have asserted that conceptions of teaching can be context-dependent (Gao, Watkins, 2002; Lee & Tsai, 2011; Roberts, 2003; Tsai, 2002). That is, perspectives on conceptions of teaching may vary within different learning contexts, such as subjects, curriculums, levels of schooling, and learning environments. Without doubts, the rapid development of technology,

like wireless network, tablets, and mobile devices, has provided unique opportunities for both instruction and learning in recent years. In fact, some pioneer studies have probed individuals' conceptions of technology-based learning and teaching. For instance, Roberts (2003) investigated teachers' conceptions on using Web for teaching. Khan (2015) conducted a study inquiring instructors' conceptions regarding information and communication technologies (ICT)-enhanced teaching. In a similar fashion, Hsieh and Tsai (2017) studied learners' conceptions on mobile learning.

Moreover, it is worth mentioning that a research methodology, called phenomenographic method, is often applied to explore teachers' conceptions of and approaches to learning and teaching in a variety of contexts (Ellis, Steed, & Applebee, 2006; Hsieh & Tsai, 2017; Khan, 2015; Prosser, Trigwell, & Taylor, 1994; Roberts, 2003). As Åkerlind (2005) stated, the phenomenographic method, through which researchers can identify qualitatively different categories of conceptions, is frequently utilized to understand the perspectives on people's experiences. For example, Roberts (2003) used the phenomenographic method to examine university teachers' conceptions of teaching and conceptions of using Web for teaching, identifying different categories between the contexts. On the one hand, it was found that instructors held conceptions of teaching in six qualitatively different and hierarchically related categories, comprising "imparting information," "transmitting structured information," "tutor-student interaction," "learning facilitation," "intellectual development," and "conceptual change." On the other hand, participants revealed conceptions of using Web for teaching in four qualitatively different and hierarchically related categories, involving "inanimate object subject focus," "tutor-student interaction," "learning facilitation," and "intellectual development."

Recently, the Ministry of Education in Taiwan has promoted mobile learning programs in order to foster blended learning activities. As a matter of fact, research has demonstrated the significance of technology integration in mobile learning (Hwang, & Wu, 2014) and explored in-service teachers' conceptions of mobile learning (Hsieh & Tsai, 2017). However, pre-service teachers' conceptions of teaching using mobile devices remain unknown. Since information and communication technology, such as wireless network, has been widely recognized as a useful tool to integrate mobile learning activities into the curriculum, it becomes important to probe individuals' perceptions on the implementation of instruction with mobile devices during the time that pre-service teachers are trained. Therefore, the current research aimed to examine pre-service teachers' conceptions of teaching with the use of mobile devices.

2. Method

2.1. Participants

Forty-seven pre-service teachers (15 males and 32 females) with an average age of 22.38 participated in the present research. They were enrolled in a course which aimed to help pre-service teachers construct lesson plans and teaching materials (i.e. eBooks and APPs) with the use of mobile devices (i.e. smart phones and tablet PC). The main purpose of the course was to help not only instructors organize the teaching material, but also students learn within classroom settings and out of classes. At the end of the course, participants need to demonstrate in class so as to receive suggestions from peers in order to enhance their teaching performance. Afterwards, they were interviewed in regard of their teaching experiences with the use of mobile devices.

2.2. Data Collection and Analysis

To explore pre-service teachers' conceptions of teaching using mobile devices, each participant was individually interviewed by a trained researcher. The interview questions, modified from Lee and Tsai (2011) and Tsai (2002), are presented below:

- Based on your experience, what is teaching using mobile devices?
- What makes the most successful teaching using mobile devices?
- Could you describe what the ideal teaching using mobile devices would look like? Why?

The phenomenographic method was utilized to analyze the participants' interview responses. At first, the interview verbatim transcripts were reviewed by the researcher. Meaningful sentences and

main ideas indicating participants' conceptions were examined, and similarities and differences were then scrutinized. In this way, the hierarchically related categories of teachers' conceptions of teaching using mobile devices could be identified in the current study.

Similar to other studies investigating individuals' conceptions in different contexts (Hsieh & Tsai, 2017; Yang & Tsai, 2010), the current research found that some participants had mixed views of conceptions. To further clarify these conceptions, each participant's conceptions were sorted into two levels (i.e. main level and achieved level) in order to represent his or her views on teaching using mobile devices. That is, the most frequent ideas revealed by each teacher was identified as his or her main level of conceptions, while the views indicated at the highest hierarchical order was seen as his or her achieved level of conceptions. To validate the finding, 22 interview manuscripts were randomly selected and classified by another experienced scholar using the same coding scheme. The result showed 81% and 86% agreement regarding main conceptions and achieved conceptions, respectively. The remaining dissented data was discussed and classified by both researchers at last.

3. Results

Through phenomenographic analysis, four different conceptions of teaching using mobile devices, including "technology support," "knowledge transmission," "learning facilitation," and "supporting student to learn," were revealed. As shown in Table 1, the categories ranging from A (technology support) to D (supporting student to learn) represented hierarchically different conceptions of teaching using mobile devices. Similar to the research conducted by Tsai (2002) and Lee and Tsai (2011), two orientations (i.e. traditional and constructivist) were further applied to classify teachers' conceptions of teaching using mobile devices. As mentioned earlier, traditional orientation incorporated teacher-centered conceptions viewing instruction using mobile devices as a way to transfer knowledge; on the contrary, constructivist orientation involved student-centered conceptions seeing teaching with the use of mobile devices as an alternative to help students construct knowledge. As a consequence, it was suggested that traditional-oriented conceptions include category A (technology support) and category B (knowledge transmission), whereas constructivist-oriented conceptions consist of category C (learning facilitation) and category D (supporting student learning).

Table 1: The categories of teachers' conceptions of teaching using mobile devices

Categories		Description
A.	Technology support	The teacher-centered conception considering teaching with mobile devices a support to the present teaching materials
B.	Knowledge transmission	The traditional-oriented conception viewing teaching with mobile devices as a way to transmit knowledge everywhere and every time
C.	Learning facilitation	The student-centered conception seeing teaching with mobile devices as an alternative to facilitate students' understanding
D.	Supporting student to learn	The constructivist-oriented conception regarding teaching with mobile devices as a method to help student learn actively.

Table 2 illustrated the distribution of participants' conceptions of teaching using mobile devices. As for the main level of conceptions, 81% (n = 38) of the interview responses were classified as traditional and 19% (n = 9) as constructivist. In contrast, 43% (n = 20) of the responses were classified as traditional and 56% (n = 27) as constructivist in the achieved level of conceptions. It should be noted that the conceptions in the main level represent participants' dominant ideas. Thus, it may be inferred that most pre-service teachers have viewed teaching with the use of mobile devices in a traditional way. In contrast, the conceptions in the achieved level imply individuals' potential ideas.

Therefore, it may be encouraging that pre-service teachers still have the potential to improve their instruction in a more constructivist way.

Table 2: The distribution of categories regarding conceptions of teaching using mobile devices

Orientations	Category	Main	Achieved
Traditional	A	17 (36%)	8 (17%)
	B	21 (45%)	12 (26%)
Constructivist	C	5 (11%)	13 (26%)
	D	4 (9%)	14 (30%)
	Total	47 (100%)	47 (100%)

4. Discussion and Conclusion

This study was intended to explore pre-service teachers' conceptions of teaching using mobile devices. Four qualitatively different and hierarchically related conceptions, namely "technology support," "knowledge transmission," "learning facilitation," and "supporting student to learn" were revealed with the implementation of phenomenographic analysis. Moreover, the result indicates that more than half of the participants have held traditional conceptions (i.e., technology support or knowledge transmission) in the main level. Meanwhile, it is found that more than half of the teachers have embraced constructivist conceptions (i.e., learning facilitation or supporting student to learn) in the achieved level. As a result, it may be proposed that although most pre-service teachers see mobile devices as technology gadgets to transmit knowledge, they are aware of the fact that teaching using mobile devices can facilitate and support students' understanding, and thus make them become active learners. The finding is consistent with the claim asserted by constructivist theory, suggesting that educational technology or Web-based learning activities may provide opportunities for learners to construct knowledge by themselves (Tsai, 2001). It is indeed important for teachers to form such conceptions of teaching, so that they can potentially enhance their instruction and assist students to learn in a more active way with the use of educational technology.

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References

- Åkerlind, G. (2005). Variation and commonality in phenomenographic research methods. *Higher Education Research & Development*, 24(4), 321–334.
- Ellis, R. A., Steed, A. F., & Applebee, A. C. (2006). Teacher conceptions of blended learning, blended teaching and associations with approaches to design. *Australian Journal of Educational Technology*, 22(3), 312-335.
- Gao, L. B., & Watkins, D. (2002). Conceptions of teaching held by school science teachers in P. R. China: Identifying and crosscultural comparisons. *International Journal of Science Education*, 24(1), 61-79.
- Gow, L., & Kember, D. (1993). Conceptions of teaching and their relationship to student learning. *British Journal of Educational Psychology*, 63(1), 20-23.
- Hsieh, W. M., & Tsai, C. C. (2017). Taiwanese high school teachers' conceptions of mobile learning. *Computers & Education*, 115, 82-95.
- Kember, D. (1997). A reconceptualization of the research into university academics' conceptions of teaching. *Learning and Instruction*, 7(3), 255-275.
- Khan, S. H. (2015). Emerging conceptions of ICT-enhanced teaching: Australian TAFE context. *Instructional Science*, 43(6), 683-708.

- Lee, M. H., & Tsai, C. C. (2011). Teachers' scientific epistemological views, conceptions of teaching science and their approaches to teaching science: an exploratory study of in-service science teachers in Taiwan. In Brownlee, J., Schraw, G., & Berthelsen, D. (Eds.), *Personal Epistemology and Teacher Education*, (pp. 246-262). London: Routledge.
- Prosser, M., Trigwell, K., & Taylor, P. (1994). A phenomenographic study of academics' conceptions of science learning and teaching. *Learning and Instruction*, 4(3), 217-231.
- Roberts, G. (2003). Teaching using the Web: Conceptions and approaches from a phenomenographic perspective. *Instructional Science*, 31(1-2), 127-150.
- Tsai, C-C (2001) The interpretation construction design model for teaching science and its applications to Internet-based instruction in Taiwan. *International Journal of Educational Development*, 21(5), 401-15.
- Tsai, C. C. (2002). Nested epistemologies: Science teachers' beliefs of teaching, learning and science. *International Journal of Science Education*, 24(8), 771-783.