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Effects of Epistemological and Pedagogical Beliefs on the Instructional Practices of Teachers: A Chinese Perspective

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Relationships Between Epistemological Beliefs, Conceptions of Teaching and Learning and Instructional Practices of Teachers: A Chinese Perspective

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Abstract: This study examines how the beliefs of Chinese in-service teachers regarding knowledge and knowledge acquisition influence their instructional classroom practices in junior secondary schools directly or indirectly through their conceptions of teaching and learning. The results indicate that the factor of learning effort/process is highly valued by Chinese in-service teachers in their epistemological beliefs, and that the constructivist approach is the dominant conception on teaching and learning for junior secondary school teachers.. In addition, the constructivist conception of teaching and learning is found to be positively related to three types of classroom instructional practices, whereas the traditional conception about teaching and learning is found to be only significantly and negatively linked to standard contemporary practices.

Introduction

A substantial number of studies have investigated the beliefs of students regarding the nature of knowledge, as well as the beliefs of pre-service teachers in relation to the nature of knowledge, teaching, and learning. Such beliefs regarding the nature of knowledge are often referred to as epistemological beliefs. In addition, teachers' instructional practices are believed to be shaped or determined by their conceptions about teaching and student learning which should be driven by their epistemological beliefs (Chan & Elliot, 2004, p.817). Therefore, teachers' beliefs could provide a window for understanding their instructional practices. In the Chinese context, educational reforms emphasizing the adoption of progressive or constructivist education beliefs have increased as a result of China's response to globalization and the demands of

information society (Sang et al., 2012). However, although a number of studies on teachers' beliefs and instructional practices have been conducted in the West, a dearth of empirical studies in the Asian context particularly in China exists. The current paper intends to fill this gap. The central objective of this paper is to explore the relationships between epistemological beliefs and pedagogical beliefs, in terms of conceptions of teaching and learning, and instructional practices of teachers in China. The findings can provide implications for teacher education and improvement of instructional practices as well as the potential success of curriculum reform in China.

From a cultural perspective, teaching could be considered a cultural activity, and thinking on teaching and learning could be shaped by culturally shared educational beliefs. Several studies have demonstrated the differences between American and Chinese teachers in their beliefs about teaching and learning (Correa et al., 2008; Sang et al., 2012). Hofer (2008) advocates cross-cultural studies on epistemological beliefs from the Western to Asian contexts, and calls for more in-depth "within-country explanations" (Niu & Andrews, 2012). The present study, to some extent, is an example of "within-country explanations" and provides further understanding of teachers' beliefs and practices from a Chinese perspective with a different culture compared to Western countries.

The current paper first provides a literature review on the epistemological and pedagogical beliefs as well as the instructional practices of teachers, followed by a brief discussion of the context of study in China. The method and instruments of data collection are then described and the findings presented and discussed.

Epistemological Beliefs and Conceptions of Teaching and Learning

Epistemological beliefs of teachers are influential factors in shaping their conceptions of teaching and learning. These beliefs, in turn, affect their instructional practices in classroom. Research on epistemological and pedagogical beliefs has burgeoned over the past two decades. Epistemological belief is the belief regarding the nature of knowledge, the nature of knowledge acquisition (Hofer & Pintrich, 1997; Schommer, 1994), and the modes of knowing (Kang & Wallace, 2004, p. 142). Different epistemological and pedagogical beliefs may affect people's learning strategies or approaches, process of shaping conceptions, problem solving, and academic performances (Cano, 2005; Chan & Elliott, 2004; Chan, 2010; Cheng, Chan, Tang, & Cheng, 2009; King & Kitchener, 1994). Schommer (1994) defines personal epistemology as a five-dimensional belief system: *structure, certainty, source of knowledge, control, and speed of knowledge acquisition*. Schommer (1990, 1994) also proposes a five-factor structural framework of epistemological beliefs composed of five factors, namely, fixed/innate ability, quick learning, omniscient authority, certain knowledge, and simple knowledge. A scale was also developed by Schommer (1990) to examine the epistemological beliefs of U.S. undergraduates, and four of the five previously proposed factors, except for omniscient authority were finally identified. Based on learners' scores on the four factors of epistemological beliefs, Schommer (1994) divides the learners into two categories, naïve and sophisticated. Naïve learners believe that knowledge is certain and unchanged, that knowledge is mainly transferred by authority and expert figures, that the ability of a person is fixed and inborn, and that learning effort does not change the results. In contrast, sophisticated learners believe that knowledge is continuously evolving and self-constructed, that authority can be questioned or criticized, that the ability of a person is not inborn and fixed, and that knowledge acquisition is a process that requires effort (Cheng, Chan, Tang, & Cheng, 2009; Schommer, 1994).

Undergraduates in the United States and Hong Kong exhibit similarities and differences in the factor structure of their epistemological beliefs. In addition to the dimensions of epistemological beliefs, past studies have suggested that cultural context could shape personal epistemology, and that concerns about cultural bias in instrumentation for studying personal epistemology exist. As Palmer and Marra (2008, p. 329) indicate, "measures which tap into beliefs about the role of authority in transmitting knowledge appear to be particularly sensitive to cultural effects." Chan and Elliott (2002, 2004) have administered the epistemological belief scale developed by Schommer (1990) to teacher education students (pre-service teachers) in a higher education institution to examine the development of epistemological beliefs of Hong Kong pre-service teachers. Their study supports the multidimensional framework of epistemological beliefs but identifies four factors, namely, innate/fixed ability, learning effort/process, authority/expert knowledge, and certainty knowledge, which are slightly different with the four factors found by Schommer (1990). Consistent with the factor structure of epistemological beliefs of Schommer (1990), two factors, innate/fixed ability and certainty knowledge, were also extracted in the Chinese context. However, authority/expert knowledge, which was identified in the Chinese context, was not extracted in Schommer's (1990) study. Authority/expert knowledge is the people's belief of whether knowledge is derived from authority/expert figures or independently constructed by individuals, as well as whether the authority/expert can be questioned, doubted, or criticized (Cheng, Chan, Tang, & Cheng, 2009). In addition, learning effort as identified in Chan and Elliott (2002, 2004)'s studies is also different from the findings of Schommer (1990).

Conceptions of teaching and learning reflect pedagogical beliefs and are categorized into knowledge transmission or knowledge construction. Although the reality might be complex and multifaceted, teachers with teacher-centered and content-oriented perspectives tend to adopt didactic teaching practices. In contrast, teachers with student-centered and learning-oriented perspectives tend to adopt constructivistic teaching practices (Chai & Khine, 2008, p. 290). In the Asian context, in which the influence of Confucian heritage culture exists, findings on epistemological beliefs and instructional practices of teachers are mixed. According to Lim and Chan (2007), pre-service teachers in Singapore are inclined toward didactic teaching practices. Other studies have revealed that pre-service teachers are inclined toward relativistic epistemology and a constructivist view of teaching (Chai & Khine, 2008; Chai, Teo, & Lee, 2009). A comparative study of Singaporean and Taiwanese pre-service teachers indicates that both are "inclined towards constructivistic teaching and less inclined towards traditional teaching" (Chai, Hong,& Teo, 2009, p. 124).

Epistemological belief dimensions adapted from Chan & Elliott (2002, 2004), such as innate/fixed ability, authority/expert knowledge, and certainty knowledge, positively and significantly correlate with the traditional conception about teaching and learning in Hong Kong, which could also be influenced by Chinese cultural heritage. In contrast, learning effort/process is relatively strong, but correlates negatively with the constructivist conception (Chan & Elliott, 2004, pp. 828–829). Their study reports that pre-service teachers tend to hold relativistic epistemology; however, they do not support a traditional or constructivist conception of teaching. From a Confucian and cultural perspective, Yang, Zheng, and Li (2006, p. 350) argue that Chinese learners tend to subscribe to the view that knowledge comes from authorities and experts, and that knowledge is tentative, uncertain, and changeable. However, most of these studies in Singapore and Hong Kong focus on the epistemological beliefs and teaching and learning conceptions of the pre-service teachers instead of those beliefs of their in-service counterparts. Our study, which is based on Chan and Elliott's (2004) study, is targeted toward

the epistemological beliefs and teaching and learning conceptions of in-service teachers in China, and aims to explore their relationships with instructional practices.

Instructional Practices of Teachers

Debates continue on the elements that constitute good instructional practices. Despite more recently, teacher-directed instruction has been re-emphasized (Kirschner, Sweller, & Clark, 2006), constructivist teaching and learning approaches has been advocated in western countries, such as the United States. The advocacy encourages student learning by providing students with opportunities and choices to solve "real world" problems in a freely dialogic environments as well as stimulating students to decipher the meanings of the tasks for themselves (Newmann, 1996; Wahlstrom & Louis, 2008, p.465). Wahlstrom and Louis (2008) have identified two main areas of convergence: (1) flexible grouping, as articulated by Gamoran (1987) and Cohen (1994), which highlights ability grouping and opportunities for cooperative learning of students; and (2) contemporary practice, which emphasizes the teachers' role in directing students' attention toward learning goals, providing students with plenty of choices as well as motivating them to think (Reosenhine, 1995, Wahlstrom & Louis, 2008, p.465)). Standard contemporary practice focuses on problem-based and learner-centered instruction in the U.S. context. Flexible grouping practice emphasizes the organization of the classroom to differentiate instruction according to purpose, and implies the use of different variables to form groups. In addition, Wahlstrom and Louis (2008, p. 466) refer to focused instruction that combines the merits of teacher-guided learning activities and an exploration approach. Focused instruction is a "meta-instructional strategy," which is "an approach to implementing most instructional techniques or methods" (Leithwood et al., 2010, p. 614). It highlights higher order thinking and the adoption of specific activities to maintain student engagement (Printy, 2010, p. 114). Despite efforts toward educational reforms, professional development, and university–school partnerships, teachers have yet to transform their classrooms from traditional, teacher-centered environments into more constructivist environments that help facilitate autonomous student learning. Teachers need to acquire a new set of beliefs and practices to facilitate transformation toward constructivist teaching and learning (Richardson & Placier, 2001, p. 914). It is therefore important to investigate how teachers' epistemological beliefs and conceptions about teaching and learning are related to their instructional practices which is the main purpose of this study.

Context of Curriculum Change: Toward Constructivist Teaching and Learning in China

East Asian countries, including China, have implemented curriculum and educational reforms since the new millennium (Lee, 2011). Curriculum reform in China began in 2001. The reforms involve changes in curriculum standards, textbooks, teaching methods, and assessment systems, as described in the Curriculum Reform Guidelines for Basic Education (Experimental Draft) (Ministry of Education, 2001; Yin & Lee, 2012). These reforms include the following:

- Changing the emphasis in past curricula from simple knowledge transmission, and stressing the learning process
- Changing the discipline-centered curriculum structure, and transforming it into an integrated structure adaptable to the various needs of pupils in different regions

- Renewing the "difficult, complicated, prejudiced, and out-dated" curriculum content, and strengthening the relevance of curricula to students' lives, society, and the development of science and technology
- Changing the emphasis of teaching and curriculum implementation from rote-and-drill to active learning and inquiry ability
- Changing the emphasis of curriculum assessment on selection functions, and stressing the function of assessment in promoting the development of students, teachers, and schools
- Replacing centralized curriculum management with a three-tier system of national, local, and school curriculum management to ensure the adaptability of the curricula to local areas, schools, and students

According to Zhong (2006, p. 374), one of the key advocates in China's curriculum reform, the new curriculum paradigmatic change entails a transformation from "scientific discipline-centered curriculum" to "society construction-centered curriculum," whereas the teaching paradigm must shift from a "transmission-centered teaching" to "inquiry-centered teaching." He also argues that social constructivism, which underpins China's curriculum reform, "has combined the two mechanisms of reflection and construction, which is consistent with Marxism's epistemology" (Zhong, 2006, p. 377). For classroom teaching, it encompasses not only cooperative and reflective learning, but also emphasizes an integration of cognitive, social, and ethical practices.

A recent study on curriculum reform in Chinese primary mathematics classrooms has revealed that the reform classrooms were found to implement more high cognitive level tasks than the non-reform classrooms. In addition, the study also indicates that the implementation of the new curriculum leads to positive changes in classroom practices (Li & Ni, 2011, p.71). Another study on China's secondary education reform reveals that teachers have adopted several teaching methods as teaching strategies, including teacher talk, individualized learning, questioning, class discussions, and occasionally employed group work, experiment/demonstration, and student presentations (Joong, Xiong, Li, & Pan, 2006). Nonetheless, in a number of non-reformed classrooms, teachers adopt teacher-centered instructions and heavily rely on textbooks. This situation raises the question as to whether instructional practices in China are linked with the epistemological beliefs and conceptions of teaching and learning of teachers.

Previous studies likewise indicate the existence of a significant relationship between teachers' epistemological beliefs and their propensity toward adopting specific instructional practices (Epler, 2011, p. 5). Hofer (2001) proposes a working model, hypothesizing that the epistemological theories of teachers would directly influence their classroom tasks and pedagogical practices that influence students' epistemological theories in terms of beliefs about knowledge, knowing, and student learning. Despite studies on the epistemological beliefs of students, few have focused on the epistemological beliefs of teachers. Moreover, studies clarifying the relationship among methods, types of instruction, and personal epistemology are scarce (Hofer, 2001, p. 372). As Hofer (2010, p. 181) states "what we need more of is an understanding of how these beliefs translate into actual teaching practices." Overall, this study intends to address this gap by examining the relationship between in-service teachers' epistemological beliefs, conceptions of teaching and learning, and instructional practices in the Chinese mainland, where a dearth of empirical studies on this topic exists. A hypothetical model is shown in Figure 1, which proposes that epistemological and pedagogical beliefs of teachers can directly or indirectly affect their instructional practices. The results will shed light on how teachers' conceptions of teaching and learning , whether traditional or constructivist, influence their preference for instructional practices.

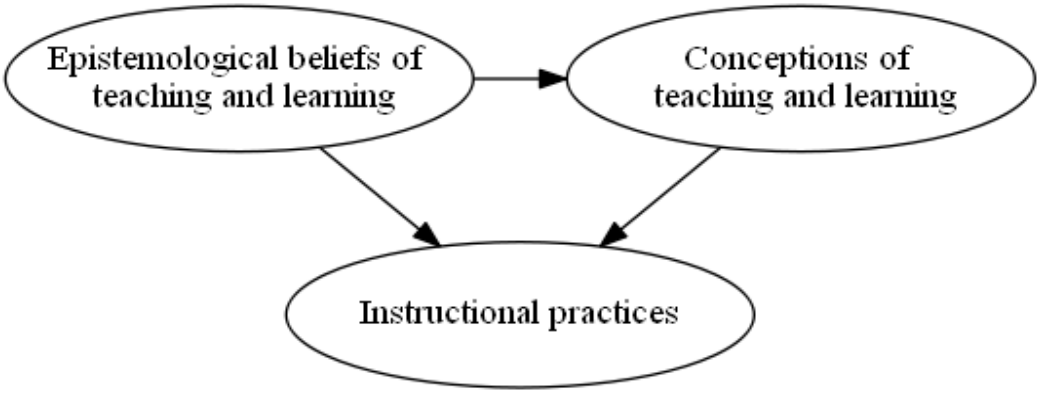

Figure 1:Proposed research model

Method

Participants

The participants in this study comprised 1008 junior secondary school teachers, teaching Grades 7–9 students from three Chinese cities [i.e., Beijing (27%), Qingdao (51%) of coastal Shandong Province, and Guilin of inland Guangxi Province (22%)]. The sample consisted of 258 males (26%) and 746 females (74%). Four teachers did not reveal their gender.

Measures

Corresponding to the three main constructs in this study, namely epistemological beliefs, pedagogical beliefs in terms of conceptions of teaching and learning, and instructional practices, three instruments are selected for assessing teachers' perceptions of these three constructs.

Epistemological Beliefs

This study is based on Schommer's (1998) conceptualization of epistemological beliefs and Chan and Elliot's (2000) work. The Epistemological Beliefs Questionnaire (EBQ) adapted from Schommer (1998) and validated by Chan and Elliot (2000, 2004) in the Hong Kong context is chosen for this study because the Hong Kong Special Administrative Region is part of Mainland China and to some extent, the validated items reflect the broad cultural context of China.

The EBQ measured the teachers' epistemological beliefs. The revised EBQ comprises 30 items that measure four dimensions, namely, innate/fixed ability (13 items), learning effort/process (6 items), authority/expert knowledge (6 items), and certainty knowledge (5 items). Innate/fixed ability measures the teachers' beliefs regarding whether people's ability is innate and fixed or changeable. Learning effort/process measures teachers' beliefs of hard work and effort in drilling. The items measuring authority/expert knowledge evaluate the teachers' belief on whether knowledge is transmitted by authority figures and experts or obtained through individual justification and reasoning. Certainty knowledge measures teachers' belief on whether knowledge is certain, permanent, and unchanged or tentative and ever-changing. The teachers

were asked to rate teach item along a five-point scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Conceptions of Teaching and Learning

Similar to the EBQ, The Teaching and Learning Conceptions Questionnaire (TLCQ) developed by Chan and Elliot (2004) was used to measure teachers' conceptions about teaching and learning. TLCQ comprises 30 items that measure two different conceptions of teaching and learning of teachers. The first is traditional conception, which views teaching as a non-problematic transfer of knowledge and considers learning as the absorption of this process (Chan & Elliot, 2004). The second is constructivist conception, which stresses that teaching is not about transmitting knowledge but facilitating the learning process (Chan & Elliot, 2004, p.821). Teachers rated the items along a five-point scale ranging from strongly disagree to strongly agree.

Instructional Practices

Based on an extensive literature review and studies related to instructional leadership and leadership for learning, Leithwood et al. (2010) advocate three overlapping orientations to instruction, namely, "focused instruction," "grouping practices," and "standard contemporary practice"; and the adoption of focused instruction that seems "productive whatever the goals of the curriculum" (pp. 613–614). Such a trend of emphasis on instructional leadership and leadership for learning is also applicable in China under the promotion of quality-oriented education in which attention is given to understanding classroom activities and teachers' professional development (Cravens, Chu, & Zhao, 2011).

The instrument by Wahlstrom and Louis (2008) is used to measure teachers' instructional practices in the classroom. The instrument which is composed of 15 items evaluates three distinct instructional teaching practices of teachers: standard contemporary practice (7 items), focused instruction (6 items), and flexible grouping practices (3 items). According to Wahlstrom and Louis (2008), standard contemporary practices reflect the learner-centered teaching practice and the kind of instruction that emphasizes student learning. Focused instruction emphasizes teachers' responsibility for managing time in the classroom, as well as their commitment to maintaining student engagement with very specific learning activities. Flexible grouping practices reflect the kind of instructional practices, which are more responsive to students at different levels and emphasize a cooperative rather than an individualized learning environment. All these items were rated by the teachers according to their endorsement of the statement on a six-point scale ranging from 1 to 6.

Data Analysis

Structural equation modeling (SEM) analysis was employed to investigate how well the hypothesized model (see Figure 1) fits the data. Before performing SEM analysis, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used respectively to validate the instruments in the Chinese context. The entire sample was randomly split into two separate samples. One sample was used in the EFA analysis, and another in the CFA analysis. After the instruments were adequately validated, SEM analysis was conducted to investigate the relationship between teachers' epistemological beliefs, teaching and learning conceptions, and instructional practices. The computer program LISREL 8.70 (Jöreskog & Sörborm, 2004) was employed for the SEM analysis.

Results

Validation of the Instruments

Epistemological Beliefs

EFA was adopted to explore the factor structure of EBQ (Chan & Elliot, 2004) in a Chinese setting. The results of EFA using principal component method with varimax rotation indicated that the four original factors were clearly extracted with each of their eigenvalues greater than 1.0. Nineteen items were retained after the analysis to measure the four factors which explained 68% of the total variances. CFA was conducted for another sample to evaluate how well the explored four-factor structure fits the data. The item, "Scientists will ultimately get to the truth if they keep searching for it," was finally deleted because it had a very low factor loading. A second CFA analysis was conducted on the remaining 18 items and the goodness of fit indices which are shown in Table 1 indicates that the explored four-factor measurement model fits the data adequately. The standardized factor loadings for the items of EBQ from CFA analysis as well as the reliabilities of the four subscales are presented in Table 2.

In this study, we used the Chan and Elliott (2004) scale consisting of six items to measure the factor authority/expert knowledge. Two items (Items 21 and 22) came from the Schommer (1998, pp. 561–562, Items 7 and 46) instrument, which measured the subfactor, "avoid criticizing authority (CRIT)." Nonetheless, the analysis revealed that the three original items could not be loaded on the original factor authority/expert knowledge (Chan & Elliott, 2004, p. 824). The three remaining items (See Table 2) were then re-categorized as the subscale of criticizing authority to reflect the doubt or questioning of expert knowledge based on the original conceptualization of Schommer (1998).

Measurement Model	χ^2	*df*	RMSEA	NFI	NNFI	CFI	IFI	RFI
Epistemological Beliefs	648.71**	129	0.087	0.93	0.94	0.95	0.95	0.92
Conceptions of Teaching and Learning	1569.34**	298	0.090	0.96	0.96	0.96	0.96	0.95
Instructional Practices	332.80**	51	0.10	0.96	0.95	0.96	0.96	0.94

Note: ** $p<0.01$

Table 1: Goodness-of-fit indices of CFA analyses for the questionnaires

	Item	Factor loading
	Innate/Fixed Ability (a=0.93)[a]	
1.	There is not much you can do to make yourself smarter as your ability is fixed at birth.	0.82
2.	Our abilities to learn are fixed at birth.	0.90
3.	One's innate ability limits what one can do.	0.84
4.	Some people are born good learners, others are just stuck with limited abilities.	0.73
5.	Some children are born incapable of learning well in certain subjects.	0.71
6.	The ability to learn is innate/inborn.	0.74
7.	Students who begin school with "average" ability remain "average" throughout school.	0.73
8.	The really smart students do not have to work hard to do well in school.	0.67
	Learning Effort/Process (a=0.79)[a]	
1.	How much you get from your learning depends mostly on your effort	0.75
2.	Getting ahead takes a lot of work.	0.76
3.	If one tries hard enough, then one will understand the course material.	0.74
	Criticizing Authority (originally named as Authority/Expert Knowledge)(a=0.81)[a]	
1.	Sometimes I do not believe the facts in textbooks written by authorities.	0.82
2.	Even advice from experts should often be questioned.	0.84
3.	I often wonder how much experts really know.	0.66
	Certainty Knowledge (a=0.81)[a]	
1.	If scientists try hard enough, they can find the truth to almost anything.	0.70
2.	Anyone can figure out difficult concepts if one works hard enough.	0.70
3.	I believe there should exist a teaching method applicable to all learning situations.	0.81
4.	Scientific knowledge is certain and does not change.	0.76

Note: [a] Reliability is Cronbach's alpha coefficient.

Table 2: Standardized factor loadings for the EBQ items

Conceptions of Teaching and Learning

EFA using principal component method with varimax rotation was adopted to explore the factor structure of the TLCQ (Chan & Elliot, 2004) in a Chinese setting. The two original factors with eigenvalues greater than 1.0 were clearly extracted and measured by 26 items. The two factors explain 67% of the total variances. The constructivist conception factor was measured by 12 items, whereas the traditional conception factor was measured by 14 items. The CFA was conducted on a separate sample to examine the construct validity of the TCLQ. The goodness-of-fit indices of the CFA analysis indicate that the two-factor structure model adequately fits the data (see Table 1). Table 3 presents the standardized factor loadings for the TLCQ items from the CFA analysis and the reliabilities for the subscales.

	Item	Factor loading
	Constructivist Conception (a=0.96)[a]	
1.	It is important that a teacher understands the feelings of the students.	0.78
2.	Good teachers always encourage students to think for answers themselves.	0.82
3.	Learning means students have ample opportunities to explore, discuss and express their ideas.	0.80
4.	In good classrooms, there is a democratic and free atmosphere that stimulates students to think and interact.	0.85
5.	Every child is unique or special and deserves an education tailored to his or her particular needs.	0.70
6.	Effective teaching encourages more discussion and hands on activities for students.	0.85
7.	The focus of teaching is to help students construct knowledge from their learning experience instead of knowledge communication.	0.80
8.	Instruction should be flexible enough to accommodate individual differences among students.	0.88
9.	Different objectives and expectations in learning should be applied to different students.	0.90
10.	Students should be given many opportunities to express their ideas.	0.83
11.	The ideas of students are important and should be carefully considered.	0.82
12.	Good teachers always make their students feel important.	0.74
	Traditional Conception (a=0.95)[a]	
1.	The traditional/lecture method for teaching is best because it covers more information/knowledge.	0.76
2.	It is best if teachers exercise as much authority as possible in the classroom.	0.83
3.	Good teaching occurs when there is mostly teacher talk in the classroom.	0.81
4.	Learning mainly involves absorbing as much information as possible.	0.60
5.	Students have to be called on all the time to keep them under control.	0.77
6.	Teaching is to provide students with accurate and complete knowledge rather than encourage them to discover it.	0.77
7.	A teacher's task is to correct learning misconceptions of students right away instead of verify them for themselves.	0.82
8.	No learning can take place unless students are controlled.	0.73
9.	Teachers should have control over what students do all the time.	0.83
10.	Learning to teach simply means practicing the ideas from lecturers without questioning them.	0.86
11.	I have really learned something when I can remember it later.	0.83
12.	Teaching is simply telling, presenting or explaining the subject matter.	0.79
13.	The major role of a teacher is to transmit knowledge to students.	0.74
14.	Learning occurs primarily from drilling and practice.	0.59

Note: [a] Reliability is Cronbach's alpha coefficient.

Table 3: Standardized factor loadings for the TLCQ items

Instructional Practices

The three original factors were clearly extracted from the EFA analysis. Of the 15 items, 13 items were retained to measure the three factors. The three factors account for 73% of the total variances. The CFA results for another sample indicate that a statistically significant correlation between the error variances of the following items exists: "Teachers should prompt students to explain and justify their ideas to others (teachers and peers)" and "Students learn best when they are actively involved in exploring ideas, inventing, and trying out their own approaches to problem-solving." Based on the item content and factor loading, the former item was dropped from the final analysis. Another CFA was conducted to evaluate the construct validity of the scale, which comprised the remaining 12 items. The goodness-of-fit indices of CFA analysis indicate that the three-factor measurement model adequately fits the data (see Table 1). The standardized factor loadings for these items and the reliabilities of the subscales are listed in Table 4.

	Item	Factor loading
	Standard Contemporary Practice (a=0.92)[a]	
1.	Students learn best when they are actively involved in exploring ideas, inventing, and trying out their own approaches to problem-solving.	0.84
2.	In order to learn complex material, students need information presented to them in several different ways.	0.87
3.	If students can't apply what they learn to the real world, they don't really understand it.	0.84
4.	It is important that students study real life problems that they are likely to encounter outside of the classroom.	0.80
5.	I regularly incorporate student interests into lessons.	0.80
6.	Students should help establish criteria on which their work will be assessed.	0.69
	Focused Instruction (a=0.70)[a]	
1.	I am able to monitor the progress of all my students to my satisfaction.	0.70
2.	I maintain a rapid pace of instruction in my classes.	0.67
3.	Disruptions of instructional time are minimized.	0.47
	Flexible Grouping Practices (a=0.86)[a]	
1.	I frequently group students according to different levels of academic ability.	0.78
2.	Student groupings in my class depend on student need.	0.91
3.	Student groupings in my class depend on my instructional purposes.	0.81

Note: [a] Reliability is Cronbach's alpha.

Table 4: Standardized factor loadings for the items in the Instructional Practices scale

Preliminary Analysis

The means, standard deviations, and correlations among all the factors are summarized in Table 5. As for the intercorrelations among the EBQ subfactors, the factor innate/fixed ability was significantly correlated with certainty knowledge, but was uncorrelated with the other two factors. The factors learning effort/process, criticizing authority, and certainty knowledge are mutually correlated. The correlation between the two TLCQ factors, constructivist conception and traditional conception, was statistically significant and negative ($r = -0.21$, $p<0.01$). The three factors of classroom practices were moderately and positively correlated. Both of the two TLCQ factors were statistically significantly correlated with all the other factors, except for the factors of traditional conception and flexible grouping practice. As for the correlations between the factors of EBQ and instructional practice, certainty knowledge was not significantly associated with standard contemporary practice. In addition, no statistically significant correlation between the factors innate/fixed ability and flexible grouping practices was observed.

Variable	1	2	3	4	5	6	7	8	9
Epistemological beliefs									
1.Innate/Fixed Ability	1.00								
2.Learning Effort/Process	-0.01	1.00							
3. Criticizing Authority	-0.01	0.56**	1.00						
4.Certainty Knowledge	0.46**	0.27**	0.09**	1.00					
Conceptions of teaching and learning									
5.Constructivist Conception	-0.25**	0.42**	0.37**	-0.11**	1.00				
6.Traditional Conception	0.59**	0.11**	-0.07**	0.61**	-0.21**	1.00			
Instructional practices									
7.Standard Contemporary Practice	-0.15**	0.41**	0.32**	-0.02	0.43**	-0.17**	1.00		
8.Focused Instruction	0.13**	0.32**	0.13**	0.30**	0.18**	0.17**	0.59**	1.00	
9.Flexible Grouping Practices	-0.03	0.34**	0.20**	0.17**	0.22**	0.03	0.51**	0.63**	1.00
Mean	*2.38*	*3.86*	*3.82*	*2.78*	*4.29*	*2.54*	*5.13*	*4.43*	*4.60*
Standard deviation	*0.78*	*0.72*	*0.69*	*0.83*	*0.58*	*0.83*	*0.83*	*0.96*	*1.06*

Note. * $p<.05$, ** $p<.01$

Table 5: Means, standard deviations, and inter-correlations among the all factors

Comparisons of Epistemological and Pedagogical Beliefs, and Instructional Practices by Gender, Levels of Qualification, and Ranks of Teachers

The results of gender comparisons of teachers' epistemological beliefs, conceptions about teaching and learning, and instructional practices are presented in Table 6. The results of the gender comparisons of teachers' epistemological beliefs indicate that male teachers scored higher than female teachers did on the innate/fixed ability factor. To some extent, this suggests that male teachers were more likely to believe that the ability of a person is inborn or fixed than that of female teachers. No statistically significant differences were found on the scores of the other three factors of epistemological beliefs between male and female teachers. The results also reveal statistically significant differences on the conceptions about teaching and learning between male and female teachers. Compared to male counterparts, female teachers were generally more inclined to hold a constructivist conception than a traditional conception about teaching and learning. In terms of instructional practices, no statistically significant differences were observed on focused instruction and flexible grouping practices between female and male teachers. However, the statistically significant differences on the factor, standard contemporary practice, indicate that female teachers applied more standard contemporary practices in their classroom instruction than male teachers did.

Factor		Male			Female			t
		N	Mean	SD	N	Mean	SD	
Epistemological beliefs	Innate/Fixed Ability	258	2.51	0.91	746	2.34	0.73	2.80**
	Learning Effort/Process	258	3.81	0.71	746	3.88	0.73	-1.26
	Criticizing Authority	258	3.83	0.71	746	3.82	0.68	0.14
	Certainty Knowledge	258	2.84	0.93	746	2.76	0.80	1.14
Conceptions of teaching and learning	Constructivist Conception	258	4.20	0.62	746	4.32	0.56	-2.73**
	Traditional Conception	258	2.73	0.90	746	2.48	0.80	3.08**
Instructional practices	Standard Contemporary Practice	258	5.03	0.81	746	5.17	0.83	-2.22*
	Focused Instruction	258	4.36	1.02	746	4.46	0.94	-1.39
	Flexible Grouping practice	258	4.49	1.08	746	4.63	1.05	-1.82

Note. * $p<.05$, ** $p<.01$

Table 6: Comparisons of epistemological beliefs, conceptions of teaching and learning, and instructional practices by gender

Table 7 shows the results of the comparisons of the differences on epistemological beliefs, conceptions of teaching and learning, and instructional practices among the teachers holding different levels of educational qualification. There are no statistically significant differences on epistemological beliefs found among the teachers holding different levels of educational qualification. However, statistically significant differences were found among the teachers with different educational degrees. It means that the teachers having different educational degrees may hold slightly different views about the conceptions on teaching and learning. The results of multiple comparisons indicate that the teachers with a qualification above the bachelor degree were more likely to accept the constructivist conception of teaching and learning. However, the teachers with a degree below bachelor endorse the traditional conception about teaching and learning than the teachers with a bachelor degree or above. In addition, no statistically significant differences were detected on the scores of the three factors of instructional practices among the teachers holding different levels of educational qualification.

Factor		Above Bachelor			Bachelor degree			Below bachelor			F
		N	Mean	SD	N	Mean	SD	N	Mean	SD	
Epistemological beliefs	Innate/Fixed Ability	44	2.29	0.68	882	2.38	0.79	78	2.49	0.82	1.02
	Learning Effort/Process	44	3.92	0.57	882	3.85	0.74	78	3.89	0.58	0.28
	Criticizing Authority	44	3.78	0.64	882	3.83	0.71	78	3.76	0.58	0.38
	Certainty Knowledge	44	2.87	0.68	882	2.76	0.84	78	2.93	0.83	1.70
Conceptions of teaching and learning	Constructivist Conception	44	4.39	0.49	882	4.30	0.58	78	4.12	0.59	4.05*
	Traditional Conception	44	2.57	0.75	882	2.52	0.83	78	2.83	0.90	5.19**
Instructional practices	Standard Contemporary Practice	44	5.02	0.80	882	5.15	0.83	78	5.03	0.74	1.25
	Focused Instruction	44	4.18	1.02	882	4.45	0.96	78	4.41	0.92	1.68
	Flexible Grouping practice	44	4.42	1.06	882	4.61	1.06	78	4.58	1.05	0.65

Note. * $p<.05$, ** $p<.01$

Table 7: Comparison of epistemological beliefs, conceptions of teaching and learning and instructional practices by level of qualification

The results of the comparisons of epistemological beliefs among the teachers with different ranks shown in Table 8 indicate statistically significant differences on the scores of the factor, *criticizing authority*, but no statistically significant differences on the other three factors. The differences on the factor, *criticizing authority*, were attributed to the statistically significant differences on the scores of this factor between teachers of senior ranks and teachers from the basic rank. Apparently, more senior-rank teachers were seen as less likely to question and criticize the authorities and experts than teachers with lower ranks. As for the differences on the conceptions about teaching and learning, statistically significant differences were found on the factor, *constructivist conception*, but not on the factor, *traditional conception*, among the teachers with different ranks (See Table 8). The results of multiple comparisons indicate that ordinary teachers (i.e., from the basic rank) concurred with the constructivist conception about teaching and learning than senior-rank teachers. Statistically significant differences were also found on the factors of instructional practices among teachers with different ranks. The results of multiple comparisons indicated that ordinary teachers appeared to apply more standard contemporary practices than their senior counterparts did. In addition, a marginally significant difference was also found on the scores of flexible grouping practices between the ordinary and senior teachers. This result indicates that the ordinary teachers applied slightly more flexible grouping practices than their senior counterparts did.

Examining the Relations between Teachers' Epistemological Beliefs, Teaching and Learning Conceptions, and Instructional Practices

SEM analysis was conducted to examine how well the proposed model (See Figure 1) which describes the relationship between teachers' epistemological beliefs, conceptions of teaching and learning, and instructional practices fits the data. The goodness-of-fit indices indicate that the proposed model fits the data very well (x^2=6215.39, df=1448, p < 0.01; RMSEA=0.057; NFI=0.96; NNFI=0.97; CFI=0.97; IFI=0.97; RFI=0.96; GFI=0.82). The standardized path coefficients which show the relationships among the factors are presented in Table 9. Figure 2 displaying the significant paths within the model as well as the standardized factor loadings reveals a general picture of the relationships between the factors. Teachers' epistemological beliefs were found to significantly predict their conceptions of teaching and learning. Both innate/fixed ability and Certainty knowledge were found to be significantly and negatively associated with constructivist conception ($\beta = -0.17$ for innate/fixed ability; $\beta = -0.15$ for certainty knowledge) but positively related to traditional conception ($\beta = 0.41$ for innate/fixed ability; $\beta = 0.41$ for certainty knowledge). Conversely, the factor criticizing authority was identified as a statistically significant positive predictor of constructivist conception($\beta = 0.18$) but negative one for traditional conception($\beta = -0.16$). In addition, learning effort/process was identified as a statistically significant positive predictor of teachers' conceptions of teaching and learning, particularly for constructivist conception ($\beta = 0.36$).

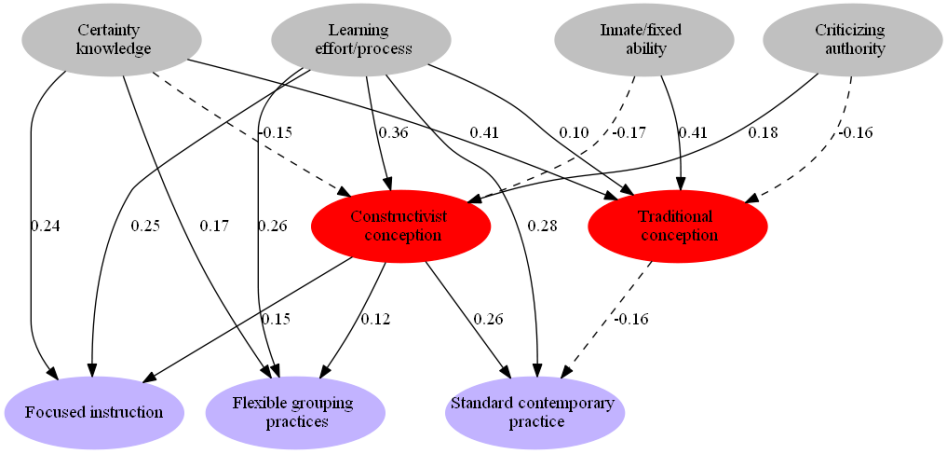

Figure 2: The relationship between teachers' epistemological beliefs of teaching and learning, conceptions of teaching and learning, and their instructional practices (Note: *The dashed line represents negative effect and the solid line represents positive effect*)

As for the prediction of teachers' teaching and learning conceptions to their instructional practices, the factor constructivist conception was found to be significantly and positively correlated with standard contemporary practice (β = 0.26) focused instruction (β = 0.15), and flexible grouping practice (β = 0.12). However, traditional conception was identified as a significantly negative predictor of standard contemporary practice (β = - 0.16) and did not have significant effects on focused instruction and flexible grouping practices.

Teachers' epistemological beliefs appeared to directly and/or indirectly influence their classroom teaching practices through their conceptions of teaching and learning. Learning effort/process could significantly, directly, and positively predict standard contemporary practice (β = 0.26), focused instruction (β = 0.15), and flexible grouping practice(β = 0.12). Certainty

knowledge was also directly associated with focused instruction ($\beta = 0.24$) and flexible grouping practices ($\beta = 0.17$), but was not identified as a significant and direct predictor of standard contemporary practice. In addition, neither innate/fixed ability nor criticizing authority had a significant and direct effect on instructional practices. The results shown in Table 9 also indicate that the epistemological beliefs of teachers could indirectly influence their instructional practices mediated by the conceptions of teaching and learning. Learning effort/process could indirectly affect classroom teaching practices through its effects on teaching and learning conception. Certainty knowledge could also indirectly affect focused instruction and flexible grouping practices mediated by teaching and learning conception aside from its direct effects. Although certainty knowledge was not identified as a significant predictor of standard contemporary practice, it could directly influence teaching and learning conception which in turn could influence standard contemporary practice. This pattern was also applicable to the effects of innate/fixed ability and criticizing authority on instructional practices. Both innate/fixed ability and criticizing authority indirectly affected instructional practices mediated by teaching and learning conception, although they did not have direct effects on instructional practices.

Factor		1(Basic rank)[a]			2(Medium rank)[b]			3(Senior rank)[c]			F
		N	Mean	SD	N	Mean	SD	N	Mean	SD	
Epistemological beliefs	Innate/Fixed Ability	414	2.40	0.81	471	2.35	0.75	109	2.44	0.78	0.74
	Learning Effort/Process	414	3.90	0.75	471	3.84	0.71	109	3.79	0.69	1.38
	Criticizing Authority	414	3.87	0.72	471	3.81	0.68	109	3.66	0.67	3.99*
	Certainty Knowledge	414	2.78	0.81	471	2.78	0.86	109	2.79	0.78	0.02
Conceptions of teaching and learning	Constructivist Conception	414	4.35	0.60	471	4.26	0.55	109	4.19	0.61	4.35*
	Traditional Conception	414	2.50	0.82	471	2.56	0.84	109	2.59	0.81	0.87
Instructional practices	Standard Contemporary Practice	414	5.22	0.77	471	5.09	0.85	109	4.97	0.93	4.90**
	Focused Instruction	414	4.42	0.96	471	4.42	0.97	109	4.55	0.87	0.91
	Flexible Grouping practice	414	4.68	1.04	471	4.50	1.10	109	4.67	0.94	3.43*

Note. *$p<0.05$, **$p<0.01$; a- Secondary teacher rank two or below 中教二级及以下(Basic rank)；b- Secondary teacher rank one 中教一级(Medium rank)；c- Secondary teacher senior rank or above 中教高级及以上 (Senior rank)

Table 8: Comparisons of epistemological beliefs, conceptions of teaching and learning, and instructional practices by teacher rank

Predictors		Instructional Practices			Conceptions of teaching and learning	
		Standard Contemporary Practice	Focused Instruction	Flexible Grouping Practices	Constructivist Conception	Traditional Conception
Conceptions of Teaching and Learning	Constructivist Conception	0.26**	0.15**	0.12**	-	-
	Traditional Conception	-0.16**	-0.01	-0.06	-	-
Epistemological beliefs	Innate/fixed ability	0.00	0.06	-0.03	-0.17**	0.41**
	Learning effort/process	0.28**	0.25**	0.26**	0.36**	0.10**
	Criticizing Authority	0.05	-0.09	-0.01	0.18**	-0.16**
	Certainty knowledge	0.02	0.24**	0.17**	-0.15**	0.41**

Note: *$p<0.05$, **$p<0.01$

Table 9: SEM analysis of the relationship between epistemological beliefs, conceptions of teaching and learning, and instructional practices

Discussion

Importance of Learning Effort/Process and Criticizing Authority Factors

For epistemological beliefs, the two factors of learning effort/process and criticizing authority had mean subscale scores well above 3, whereas the means of the other two factors innate/fixed ability and certainty knowledge were both below 3 suggesting that Chinese teachers are not inclined to believe that ability is innate and fixed, and that knowledge is certain and permanent. The relatively high mean scores of learning effort/process and criticizing authority suggest that Chinese teachers believed that learning requires effort and a process of understanding. In addition, knowledge transferred by authority and expert should be questioned. Similar to Hong Kong student teachers, Chinese teachers believe in the role of learning effort and process in acquiring knowledge. Traditional Confucian Chinese culture, which considers effort and hard work as extremely important attributes of personal success, could explain this belief (Chan & Elliott, 2004; Lau, 1996). Consistent with the findings of Western scholars (Ryan, 1984;Schommer, 1990, 1993), Chan and Elliott (2004) have also indicated that young student teachers are inclined to believe in certainty knowledge, and considered knowledge as certain and unambiguous. However, they have determined that Hong Kong student teachers believe that authorities are more experienced and convincing, although they state that the authorities should be questioned or doubted. Chan (2008, p.262) argues that this might be explained by the societal context of Hong Kong, a former British colony for over 100 years and continuously under the interaction between the Eastern and Western cultures. As explained by Chan and Elliott (2004), the factor of authority/expert knowledge identified in the Chinese context indicates the significance of the belief in authority in traditional Chinese culture because teachers are considered knowledgeable and the transmitters of knowledge; therefore, the students should show their respect and obedience to the teachers under the Confucian Chinese culture. To some extent, the socialization of Chinese children to respect and not to question the authority of teachers, as well as to view the written word as the authoritative source of knowledge, may reflect the influence of Chinese thinking and educational orientation on children and adults in the Chinese context (Ho, 1996; Lam, 2011).

The findings of the present study, however, highlights that the relatively high mean score of criticizing authority in the Chinese Mainland may be slightly different but did not contradict the findings in Hong Kong, where the mean score of authority/expert knowledge for teacher education (pre-service) students was below 3. In addition, based on research data and the context of Chinese culture, the diversified interpretation of criticizing authority requires additional elaboration. Tang (1991, p. 283) explains that in Chinese culture, the parents are superior in a family, the emperor is superior in governance, and the saints and teachers have superior statuses in education. This statement demonstrates that experts and teachers are highly respected in Chinese society. However, Tang (1991, p. 286) argues that this respect was different from the meaning of authoritarianism in Western society. According to Confucius, “in my method of teaching, I always wait for my student to make an effort himself to find his way through a difficulty, before I show him the way myself. I also make him find his own illustrations before I give him one of my own” (Gu, 1996). This idea implies that teaching adjusts according to the learning needs of students, and keeps the students from deference to authority. The well-known saying, “We would rather be short of books than believe all that they say” (retrieved on January 21, 2012, from http://wenku.baidu.com/view/3f9ab1f8770bf78a652954c7.html), is widely accepted in Chinese society. This saying undoubtedly echoes Tang’s conception that criticizing authority has a long history in Chinese culture and provides an alternative explanation to the research results.

Another possible reason for "criticizing authority" is that the knowledge and authorities of experts encountered a trust crisis at a societal level (People's Daily, 2011; Tang, 2010). A recent survey of 5,492 respondents conducted by the China Youth Daily Social Survey Center indicated that only 6.5% expressed belief that experts were trustworthy because they are the authorities only on certain aspects of life. The survey revealed that approximately 40% expressed belief that the opinions of experts were merely personal views and can only be used as reference, and approximately 32% expressed belief that opinions of experts need to be judged according to circumstances (Shanghai Administrative Law Institute, 2010).

Another possible explanation of our findings is that while other studies involved high school leavers and pre-service teachers who might not be drastically different from university undergraduates who were at their early stage of development, and tended to avoid criticizing experts and authorities (Chan & Elliott, 2000; 2004), our study involved in-service teachers with varying teaching experiences. This view is echoed by Chai and Khine (2008, p. 290): "The general trend is that pre-service teachers were distributed across a range of developmental stages in terms of their epistemological beliefs; with the majority of them holding relativistic epistemological outlooks… In addition, it seemed uncommon for pre-service teachers to hold absolutist/dualistic epistemological beliefs." As the sample in this study comprised in-service teachers with varied teaching experiences, these teachers may have clear epistemological beliefs after working in schools and started to question and doubt the knowledge transferred by experts.

The findings of the current study reveal that both innate/fixed ability and certainty knowledge were significantly and negatively associated with constructivist conception but positively related to traditional conception. Conversely, criticizing authority significantly and positively predicted constructivist conception, but negatively affected traditional conception. Learning effort/process was identified as a statistically significant and positive predictor of teachers' conceptions of teaching and learning, particularly for constructivist conception. Unlike the study of Chan and Elliott (2004), the relationship between the epistemological beliefs of Hong Kong student teachers and their teaching and learning conception indicates that the traditional teaching and learning conception was positively associated with innate/fixed ability, authority/expert knowledge, and certainty knowledge. However, the constructivist conception of teaching and learning was positively related to innate/fixed ability and authority/expert knowledge, but negatively associated with learning effort/process. The difference seemed to lie in the factor of learning effort/process, which positively correlated with both traditional and constructivist conceptions.

Effort, as highlighted in Chinese culture, entails multiple meanings, which include not only personal active continual inquiry and reflection during the learning process, but also understanding or mastering learning materials by memorization or repetitive practice. Therefore, a teacher may have both constructivist and traditional conceptions when he/she has the epistemological belief of learning effort/process. The diligence of Chinese teachers with an emphasis on learning effort/process could be cultivated through culturally specific child-rearing practices (Biggs, 1996; Dooley, 2003). Based on the work of Stevenson and Stigler (1992), Zhao (2009) argues that difference in creativity between Asians and Americans exists partly because American mothers tend to be more satisfied with their children's academic performance compared to their Chinese and Japanese counterparts (p. 93). Chinese teachers are more likely to retain their former schooling experiences, which were dominated by didactic and traditional teaching and learning practices, because their learning effort has led to their successful learning experiences. When teachers are exposed to new curriculum and teaching reform, their entrenched epistemological belief of learning effort/process continues to exert some influence on their conceptions of teaching and learning.

Importance of the Influence of Constructivist Conceptions on Instructional Practices

The findings that constructivist conception could positively affect teachers' instructional practices might have educational implications as this study shows that constructivist conception dominated the teachers' conceptions of teaching and learning (mean = 4.29; SD = 0.58) rather than traditional conception (mean = 2.54; SD = 0.83). For instructional practices, standard contemporary practice (mean = 5.13; SD = 0.83) had a higher mean score than flexible grouping practice (mean = 4.60; SD = 1.06) and focused instruction (mean = 4.43; SD = 0.96), although all three types of instructional practices had a mean score of above 4.

Constructivist and post-modernism theories have been widely translated and introduced in China since the new curriculum reform was launched in the country. These theories provide alternative viewpoints to reflect on the drawback of traditional, examination-oriented education. With the deepening of educational reform, this background provides a fertile platform for teachers and scholars to transform traditional ideas and question the ultimate authority of ideas provided by experts. The reform of teaching and teacher development has been affected by the globalization process, and the promotion of "quality education" through decentralization, teacher collaboration, and multiple textbook versions may motivate teachers to rely less on experts and become authorities and experts on their own (Lee, 2009). Since the Curriculum Reform Guidelines for Basic Education (Experimental draft) was promulgated in 2001, students are no longer viewed as knowledge receivers but as knowledge constructors, and that teachers should help students to learn how to learn. Similarly, the traditional view on teacher development, which treats teachers as the receiver of the experts' knowledge, must be transformed into a new perspective focusing on the voice of teachers and the importance of their practical knowledge (Gu, 2001; Wang & Zhao, 2011; Yang, 2003; Yang & Wen, 2006). As a possible result of the implementation of the new curriculum reform, teachers gradually changed their beliefs from traditional to constructivist conceptions, and began to view knowledge as constructed outcomes arising from people and their interactions.

With the curriculum reform moving forward progressively, frontline teachers have embraced the ideas "for the development of every student" and constructivist educational theories (Ma & Tang, 2004). At the same time, successful experimental practices, such as integrating multiple teaching methods, involving students in curriculum design, and connecting teaching materials with students' daily experiences, also strengthen in-service teachers' constructivist conception (HEIT, 2007). These influences could partly explain the trend of the increasing number of teachers holding a constructivist conception of teaching and learning in Mainland China. These findings reveal that the implementation of the new curriculum reform in China advocating the constructivist conception had a positive effect on teachers' practice. Different studies on the new curriculum reform indicate that most teachers have accepted the constructivist conception and adopted discovery and participatory teaching methods (Dello-Iacovo, 2009; Li, 2004; Ma & Tang, 2004; Song, Lee, & Cheng, 2010; Wang & Zhao, 2011). Sargent (2011) also reveals that a vast majority of teachers also reported the frequent use of several teaching and learning methods in line with the reforms, including open-ended questions, class discussion, group work, opportunities for students to express their own ideas and opinions, small group work, inquiry-based learning, applied activities, role play, use of multimedia, games, and hands-on activities. To some extent, the present study echoes the findings of Sargent, and indicates that teachers tend to translate the constructivist teaching and learning conceptions into

standard contemporary and flexible grouping practices that focused on student needs as the new curriculum reform progressed.

As regards the influence of gender, Table 6 shows that female teachers appeared to be more inclined to hold a constructivist conception regarding teaching and learning, and conversely, less likely to hold a traditional conception about teaching and learning compared to male teachers. These findings concur with another study using the instrument of Chan and Elliott (2004) which indicates that Turkish student teachers strongly preferred the constructivist conception in teaching and learning, and female student teachers' mean score on constructivist conception was significantly higher than that of their male counterparts (Aypay, 2010, p. 2603).

More importantly, the findings reveal that teachers' constructivist conception was significantly and positively correlated with standard contemporary practice, focused instruction, and flexible grouping practice. However, teachers' traditional conception was identified as a significantly negative predictor of standard contemporary practice, and did not have significant effects on focused instruction and flexible grouping practices. More follow up case studies will be needed to understand these relationships.

Implications for Teacher Education and In-service Professional Development Programs

The profiles of epistemological and pedagogical beliefs of teachers, as well as their instructional practices generated from this study in China, seem to provide some empirical support for the constructivist-oriented curriculum and teaching reforms. The complicated linkage between the epistemological and pedagogical beliefs of teachers and their instructional practices demonstrates clear implications for teacher education and in-service professional development programs. Teacher educators are encouraged to facilitate the professional development of teachers by engaging them to be conscious of their epistemological beliefs. These beliefs could be shaped by cultural influences, former parenting and schooling experiences, prior teaching practice and field experience (Chan, 2010). In the case of China, professional development programs could help participants to unpack the values of curriculum reform and reflect on the relevance and feasibility of student-centered pedagogy regarding students in group seating with their colleagues (Seah, 2011).

Teacher educators are advised not to indoctrinate specific epistemological and pedagogical beliefs nor teaching and learning approaches. In particular, teachers could facilitate the development of critical thinking skills and attitudes, challenge claims by experts and authorities, and become open-minded to constructivist conceptions and different instructional approaches. Tools could also be developed to analyze teachers' instructional classroom practices that are compatible with curriculum reform documents, and to facilitate them to explicitly and critically determine whether connections exist between the nature of knowledge, the conceptions of teaching and learning, and instructional orientations (Kang & Wallace, 2004).

Scholars such as Perry (1970) have suggested different means of promoting epistemological development. One suggestion is to assess the epistemological level and be aware of the developmental trajectory of individual students (i.e., teachers) such that instructors or teacher educators could individually and collectively facilitate their epistemological development above their current levels (Hofer, 2001). Adapting the suggestion of King and Kitchener (2002) may allow teacher educators to consider the measures that may enhance the epistemic cognitive development of teachers, such as providing opportunities for teachers to analyze ill-defined classroom and educational problems in different settings, engaging them to discuss controversial teaching and learning issues, and helping them to examine their assumptions about knowledge

and how such knowledge is gained. Teacher educators must respect teachers' assumptions to provide support and feedback at both cognitive and affective levels (Hofer, 2001, p. 375). In contrast, effective intervention measures using augmented activation and refutational text enhance the awareness of pre-service teachers of their specific epistemological beliefs, and induce belief and conceptual change. Augmented activation refers to the technique of "written directions (a) alerting readers that the information they are about to read may contain information that conflicts with their own beliefs and (b) directing them to pay attention to the ideas that differ from their own" (Gill, Ashton, & Algina, 2004, p. 168). Refutational text pertains to the introduction of "a common theory, belief, idea, refutes it, and offers an alternative theory, belief, or idea that is shown to be more satisfactory" (Hynd, 2001, p. 700).

From a constructivist perspective, Baxter Magolda (1996) advocates relational pedagogy that hinges on valuing student (the teacher in this case) and "facilitating a constructivist perspective of knowing and learning" (Cheng, Chan, Tang, & Cheng, 2009, p.326; Tickle, Brownlee, & Nailon, 2005). Baxter Magolda and Terenzini (2004) further proposed strategies to facilitate changes in teachers' epistemology (Brownlee & Berthelsen, 2008, p. 415), such as "modeling an informed critique of knowledge and how evidence can be weighed; assisting students to practice their skills for evaluating knowledge in a collaborative learning community; [and] explicitly acknowledging and being inclusive of the complexity and subjectivity of knowledge." For in-service teachers, teacher educators and mentor teachers could work together to co-construct curriculum materials that support the implementation of different approaches to teaching and learning, including standard contemporary practice, focused instruction, and flexible grouping practice, as well as foster teachers' self-identities of criticizing authority and becoming adventurous intellects rather than routine knowledge transmitters (Chai, Teo, & Lee, 2009). Several scholars also advocate "learning constructivism by doing constructivism" (Howard et al., 2000, p. 460; Tickle, Brownlee, & Nailon, 2005, p. 713), in which teachers participate in the constructivist learning environment and engage in discussion and problem solving through a "community of learners" and the support of peer-to-peer tutoring" (Tickle, Brownlee, & Nailon, 2005, p. 713).

Conclusion

This exploratory, empirical study on the Chinese mainland teachers has revealed that teachers' epistemological beliefs can directly or indirectly through its effect on their conceptions of teaching and learning impact teachers' instructional practices. The findings of the current study is helpful to understand the development of the Chinese in-service teachers' epistemological beliefs, their conceptions of teaching and learning, as well as the effects of these beliefs on teachers' instructional practices under the background the curriculum and education reform in the Chinese mainland. In the future, more efforts could be exerted to investigate whether variations in epistemological beliefs could be subject-specific and related to age and other personal and school-based factors. And further research could also be conducted to explore how teachers' epistemological beliefs and their instructional practices influence the students' approaches to learning and learning outcomes. Such research will enhance the understanding of the domains of epistemological and pedagogical beliefs, which would be useful to teacher education research and development and the improvement of teaching and learning.

References

Aypay, A. (2010). Teacher education studentsÕ epistemological beliefs and their conceptions about teaching and learning. Procedia Social and Behavioral Sciences, 2, 2599-2604. http://dx.doi.org/10.1016/j.sbspro.2010.03.380

Baxter Magolda, M.B. (1996). Cognitive learning and personal development: A false dichotomy. About Campus, 1, 16-21.

Baxter Magolda, M. & Terenzini, P. (2004). Learning and Teaching in the 21st Century: Trends and implications for practice. U.S.: American College Personnel Association.

Biggs, J. (1996). Western misperceptions of the Confucian-heritage learning culture. In D.A. Watkins & J.B. Biggs (Eds.), The Chinese learner: Cultural, psychological and contextual influences (pp.45-67). Hong Kong and Melbourne: Comparative Education Research Centre and Australian Council for Educational Research.

Brownlee, J. & Berthelsen, D. (2008). Developing relational epistemology through relational pedagogy: New ways of thinking about personal epistemology in teacher education. In M.S. Khine (Ed.), Knowing, knowledge and beliefs: Epistemological studies across diverse cultures (pp.405-422). The Netherlands: Springer. http://dx.doi.org/10.1007/978-1-4020-6596-5_19

Cano, F. (2005). Epistemological beliefs and approaches to learning: Their change through secondary school and their influence on academic performance. British Journal of Educational Psychology, 75, 203-221. http://dx.doi.org/10.1348/000709904X22683 PMid:16033663

Chai, C.S., Hong, H.Y., & Teo, T. (2009). Singaporean and Taiwanese pre-service teachers' beliefs and their attitude towards ICT use: A comparative study. The Asia Pacific Education Researcher, 18, 117-128.

Chai, C.S. & Khine, M.S. (2008). Assessing the epistemological and pedagogical beliefs among pre-service teachers in Singapore. In M.S. Khine (Ed.), Knowing, knowledge and beliefs: Epistemological studies across diverse cultures (pp. 287-299). The Netherlands: Springer.

Chai, C.S., Teo, T., & Lee, C.B. (2009). The change in epistemological beliefs and beliefs about teaching and learning: A study among pre-service teachers. Asia-Pacific Journal of Teacher Education, 37, 351-362. http://dx.doi.org/10.1080/13598660903250381

Chan, K.W. (2008). Epistemological beliefs, learning, and teaching: The Hong Kong cultural context. In M.S. Khine (Ed.), Knowing, knowledge and beliefs: Epistemological studies across diverse cultures (pp. 257-272). The Netherlands: Springer. http://dx.doi.org/10.1007/978-1-4020-6596-5_12

Chan, K.W. (2010). The role of epistemological beliefs in Hong Kong preservice teachers' learning. Asia Pacific Education Researcher, 19, 7-24.

Chan, K.W. & Elliott, R.G. (2000). Exploratory study of epistemological beliefs of Hong Kong teacher education students: Resolving conceptual and empirical issues. Asia-Pacific Journal of Teacher Education, 28, 225-234. http://dx.doi.org/10.1080/713650691

Chan, K.W. & Elliott, R.G. (2002). Exploratory study of Hong Kong teacher education students' epistemological beliefs: Cultural perspectives and implications on beliefs research. Contemporary Educational Psychology, 27, 392-414. http://dx.doi.org/10.1006/ceps.2001.1102

Chan, K.W. & Elliot, R.G. (2004). Relational analysis of personal epistemology and conceptions about teaching and learning. Teaching and Teacher Education, 20, 817-831. http://dx.doi.org/10.1016/j.tate.2004.09.002

Cheng, M.H., Chan, K.W., Tang, S.Y.F., & Cheng, A.Y.N. (2009). Pre-service teacher education students' epistemological beliefs and their conceptions of teaching. Teaching and Teacher Education, 25, 319-327. http://dx.doi.org/10.1016/j.tate.2008.09.018

Cohen, E. (1994). Restructuring the classroom: Conditions for productive small groups. Review of Educational Research, 64, 1-35. http://dx.doi.org/10.3102/00346543064001001

Correa, C.A., Perry, M., Sims, L.M., Miller, K.F., & Fang, G. (2008). Connected and culturally embedded beliefs: Chinese and US teachers talk about how their students best learn mathematics. Teaching and Teacher Education, 24, 140-153. http://dx.doi.org/10.1016/j.tate.2006.11.004

Cravens, X.C., Chu, H. & Zhao, Q. (2011). Defining school effectiveness in the reform for quality-oriented education. In The impact and transformation of education policy in China International Perspectives on Education and Society, 15, 153-185. http://dx.doi.org/10.1108/S1479-3679(2011)0000015010

Dello-Iacovo, B. (2009). Curriculum reform and Quality Education in China: An overview. International Journal of Educational Development, 29 (3), 241-249. http://dx.doi.org/10.1016/j.ijedudev.2008.02.008

Dooley, K. (2003). Reconceptualising equity: Pedagogy for Chinese students in Australian schools. The Australian Educational Researcher, 30, 25-42. http://dx.doi.org/10.1007/BF03216796

Epler, C.M. (2011). The relationship between implicit theories of intelligence, epistemological beliefs, and the teaching practices of in-service teachers: A mixed method study. Doctoral dissertation submitted to the Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Gamoran, A. (1987). Organization, instruction, and the effects of ability grouping: Comment on SlavinÕs Òbest-evidence synthesisÓ. Review of Educational Research, 57, 341-345. http://dx.doi.org/10.3102/00346543057003341

Gill, M.G., Ashton, P.T., & Algina, J. (2004). Changing preservice teachers' epistemological beliefs about teaching and learning in mathematics: An intervention study. Contemporary Educational Psychology, 29, 164-185. http://dx.doi.org/10.1016/j.cedpsych.2004.01.003

Gu, H.M. (1996). *Collected works of Gu Hongming(辜鸿铭文集)*. Haikou(海口): Hainan Press(海南出版社). [in Chinese]

Gu, M.Y. (2001). The century review and prospect on the curriculum reform(课程改革的世纪回顾与瞻望). *Educational Research (教育研究), 7*, 1-4. [in Chinese]

Hangzhou city Educational Investigating Team (HEIT). (2007). The investigation of new curriculum implementation reform in senior middle schools(普通高中新课程实施情况的调查报告). *Zhejiang Education Science(浙江教育科学), 5,* 25-29. [In Chinese]

Ho, D.Y.F. (1996). Filial piety and its psychological consequences. In M.H. Bond (Ed.), The handbook of Chinese psychology (pp.155-165). Hong Kong: Oxford University Press.

Hofer, B.K. (2001). Personal epistemology research: Implications for learning and teaching. Educational Psychology Review, 13, 353-383. http://dx.doi.org/10.1023/A:1011965830686

Hofer, B.K. (2008). Personal epistemology and culture. In M.S. Khine (Ed.), Knowing, knowledge and beliefs: Epistemological studies across diverse cultures (pp. 3-22). The Netherlands: Springer. http://dx.doi.org/10.1007/978-1-4020-6596-5_1

Hofer, B. (2010). Personal epistemology in Asia: Burgeoning research and future directions. Asia Pacific Education Researcher, 19, 179-184.

Hofer, B. & Pintrich, P.R. (1997). The development of epistemological theories: beliefs about knowledge and knowing and their relations to learning. Review of Educational Research, 67, 88Ð140. http://dx.doi.org/10.3102/00346543067001088

Howard, B. C., McGee, S., Schwartz, N., & Purcell, S. (2000). The experience of constructivism: Transforming teacher epistemology. Journal of Research on Computing in Education, 32, 455-466.

Hynd, C. R. (2001). Refutational text and change process. International Journal of Educational Research, 35, 699-714. http://dx.doi.org/10.1016/S0883-0355(02)00010-1

Joong, P., Xiong, Y., Li, L., & Pan, C. J. (2006). Voices of students, parents, and teachers in ChinaÕs secondary education reform. International Electronic Journal for Leadership in

Learning, 10(18). Retrieved 10th January, 2012, from http://www.ucalgary.ca/iejll/vol10/jian

Joreskog, K. & Sšrborm, D. (2004). LISREL 8.70. Scientific Software International, Inc.Ê

Kang, N.H. & Wallace, C.S. (2004). Secondary science teachers' use of laboratory activities: Linking epistemological beliefs, goals, and practices. Science Teacher Education, 89, 140-165.

King, P.M., & Kitchener, K.S. (1994). Developing reflective judgment: Understanding and promoting intellectual growth and critical thinking in adolescents and adults. San Francisco, CA: Jossey-Bass.

King, P.M. & Kitchener, K.S. (2002). The reflective judgment model: Twenty years of research on epistemic cognition. In B.K. Hofer and P.R. Pintrich (Eds.), Personal epistemology: The psychology: The psychology of beliefs about knowledge and knowing (pp.37-61). Mahway, NJ: Erlbaum Mahwah.

Kirschner, P.A., Sweller, J., & Clark, R.E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational Psychologist, 41, 75-86. http://dx.doi.org/10.1207/s15326985ep4102_1

Lam, B.H. (2011). Constructivist perspectives on learning. In S. N. Phillipson and B. H. Lam (Eds.), Learning and teaching in the Chinese classroom: Responding to individual needs (pp.31-61). Hong Kong: Hong Kong University Press. http://dx.doi.org/10.5790/hongkong/9789888083428.003.0002

Lau, S. (1996). Growing up the Chinese way: Chinese child and adolescent development. Hong Kong: The Chinese University of Hong Kong Press.Lee, C.K.J. (2009). Teacher development and teacher education in the new century(新世纪的教师发展与教师教育). *Contemporary Education and Culture(当代教育与文化), 1* (1), 69-73. [In Chinese]

Lee, J.C.K. (2011). School development, curriculum development and teacher development. In J.C.K. Lee and B. Caldwell (Eds.), *Changing Schools in an Era of Globalization* (pp.123-141). New York/London: Routledge.

Leithwood, K., Louis, K. S., Wahlstrom, K., Anderson, S., Mascall, B., & Gordon, M. (2010). How successful leadership influences student learning: The second installment of a longer story. In A. Hargreaves, A. Lieberman, M. Fullan & D. Hopkins (eds.), Second international handbook of educational change (pp.611-629). Dordrecht, The Netherlands: Springer. http://dx.doi.org/10.1007/978-90-481-2660-6_35

Li, Q. & Ni, Y. (2011). Impact of curriculum reform: Evidence of change in classroom practice in mainland China. International Journal of Educational Research, 50, 71-86. http://dx.doi.org/10.1016/j.ijer.2011.06.003

Li, Z. C. (2004). The curriculum reform of basic education in western China: The Present Situation and Strategies(西部农村基础教育课程改革的现状与策略). *Journal of Western Chongqing University (渝西学院学报), 3*(3), 74-77. [In Chinese]

Lim, C.P. & Chan, B.C. (2007). Micro lessons in teacher education: Examining pre-service teachersÕ pedagogical beliefs. Computers and Education, 48(4), 474-494. http://dx.doi.org/10.1016/j.compedu.2005.03.005

Ma, Y. P. & Tang, L. F. (2004). A survey and thought on the experiment of curriculum reform(对新课程改革实验状况的调查与思考). *Primary and Secondary School Management(中小学管理), 1*, 12-16. [In Chinese]

Ministry of Education of the People's Republic of China (2001). *Curriculum reform guidelines for basic education (Experimental draft)*. Beijing, China: People's Education Press. [in Chinese]

Newmann, F. (Ed.) (1996). Authentic achievement: Restructuring schools for educational quality. San Francisco: Jossey-Bass.

Niu, R. and Andrews, S. (2012). Commonalities and discrepancies in L2 teachersÕ beliefs and practices about vocabulary pedagogy: A small culture perspective. TESOL Journal, 6, 134-154.

Palmer, B. & Marra, R.M. (2008). Individual domain-specific epistemologies: Implications for educational practice. In M.S. Khine (Ed.), Knowing, knowledge and beliefs: Epistemological studies across diverse cultures (pp. 325-350). The Netherlands: Springer. http://dx.doi.org/10.1007/978-1-4020-6596-5_16

People's Daily (人民日报) (2011). How to rebuild the public trust in experts(如何重建专家的公信力). *People's Daily(人民日报)*, 2011-07-21. [in Chinese]

Perry, W.G. (1970). Forms of intellectual and ethical development in the college years: A scheme. New York: Holt, Rinehart and Winston.

Printy, S. (2010). Principals' influence on instructional quality: Insights from US schools. School Leadership and Management, 30, 111-126. http://dx.doi.org/10.1080/13632431003688005

Richardson, V. & Placier, P. (2001). Teacher change. In V. Richardson (Ed.), Handbook of research on teaching (4th ed) (pp.905-947). Washington, DC: American Educational Research Association. PMid:11580735

Rosenhine, B. (1995). Advances in research on instruction. The Journal of Educational Research, 88, 262-268. http://dx.doi.org/10.1080/00220671.1995.9941309

Ryan, M.P. (1984). Monitoring text comprehension: individual differences in epistemological standards. Journal of Educational Psychology, 76, 248Ð58.

Sang, G., Valcke, M., Tondeur, J., Zhu, C., & van Braak, J. (2012). Exploring the educational beliefs of primary education student teachers in the Chinese context. Asia Pacific Education Review, 13, 417-425. http://dx.doi.org/10.1007/s12564-012-9206-0

Sargent, T.C. (2011). New curriculum reform implementation and the transformation of educational beliefs, practices, and structures in Gansu Province. Chinese Education and Society, 44 (6), 47-72. http://dx.doi.org/10.2753/CED1061-1932440604

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. Journal of Educational Psychology, 82, 498Ð504. http://dx.doi.org/10.1037/0022-0663.82.3.498

Schommer, M. (1993). Epistemological development and academic performance among secondary students. Journal of Educational Psychology, 85, 1Ð6. http://dx.doi.org/10.1037/0022-0663.85.3.406

Schommer, M. (1994). Synthesizing epistemological belief of research: tentative understandings and provocative confusions. Educational Psychology Review, 6, 293-319. http://dx.doi.org/10.1007/BF02213418

Schommer, M. (1998). The influence of age and education on epistemological beliefs. British Journal of Educational Psychology, 68, 551-562. http://dx.doi.org/10.1111/j.2044-8279.1998.tb01311.x

Seah, W.T. (2011). Ten years of curriculum reform in China: a soft knowledge perspective. In J. Ryan (Ed.), Education reform in China: Changing concepts, contexts and practices (pp. 161-184). London/New York: Routledge.

Shanghai Institute of Administrative Law(上海市行政法制研究所) (2010). The experts abused overdraft the public trust of the whole society (被滥用的专家透支了整个社会的公信力). *The Law Reference of Shanghai Government(上海政府法制参阅)*, 82,. [in Chinese] Retrieved 10th January, 2012, http://www.chinalaw.gov.cn/article/dfxx/dffzxx/sh/zffzcyzb/201008/20100800259584.shtml.

Song, H., Lee. C.K., & Cheng, D.M. (2010). A comparative study on the policy and implementation of the curriculum reform in the mainland of China and Hong Kong (中国大陆与香港课程改革政策及其实施之比较). *Curriculum & Instruction Quarterly (课程教学季刊)*, *13*(4), 1-40. [in Chinese]

Stevenson, H.W. & Stigler, J.W. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education*. New York: Simon & Schuster.

Tang, J.Y. (1991). *The spirit value of Chinese culture(中国文化之精神价值)*. Taipei(台北): Cheng Chung Press(正中书局). [In Chinese]

Tang, L.L. (2010). The mass media and experts' discourse: Choice, representation, and trust crisis(大众传媒与专家话语：选择、呈现与信任危机). *Southeast Communication(东南传播)*, *11*, 5-7. [in Chinese]

Tickle, E.L., Brownlee, J., & Nailon, D. (2005). Personal epistemological beliefs and transformational leadership behaviours. Journal of Management Development, 24, 706-719. http://dx.doi.org/10.1108/02621710510613735

Wahlstrom, K.L. & Louis, K.S. (2008). How teachers experience principal leadership: The roles of professional community, trust, efficacy, and shared responsibility. Educational Administration Quarterly, 44, 458-495. http://dx.doi.org/10.1177/0013161X08321502

Wang, J.Y. & Zhao, Z.C. (2011). Basic education curriculum reform in rural China: Achievements, problems, and solutions. Chinese Education and Society, 44(6), 36Ð46. http://dx.doi.org/10.2753/CED1061-1932440603

Yang, B., Zheng, W., & Li, M. (2006). Confucian view of learning and implications for developing human resources. Advances in Developing Human Resources, 8, 346-354. http://dx.doi.org/10.1177/1523422306288427

Yang, L.J. (2003). Constructivism learning theory and the curriculum reform of basic education(建构主义学习理论与基础教育课程改革). *Journal of University of Jinan (济南大学学报), 13*(5), 87-92. [in Chinese]

Yang, Y.C. & Wen, Y. (2006). Constructivism teaching conception and its effect on the new curriculum reform in China (建构主义教学观及其对我国新课程改革的影响). *Contemporary Educational Science(当代教育科学)*, *20*, 25-26. [in Chinese]

Yin, H. B. & Lee, J. C. K. (2012). China's national curriculum reform in the global era. In H. B. Yin and J. C. K. Lee (eds.), *Curriculum reform in China: Change and challenges* (pp. 1-10). New York: Nova Science Publishers, Inc.

Zhao, Y. (2009). *Catching up or leading the way: American education in the age of globalization*. Alexandria, Virginia, USA: Association for Supervision and Curriculum Development (ASCD).

Zhong, Q.Q. (2006). Curriculum reform in China: Challenges and reflections. Frontier of Education in China, 3, 370-382. http://dx.doi.org/10.1007/s11516-006-0014-3

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