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The Relationship of Teachers' Self-Efficacy Beliefs to Other Beliefs: A Systematic Review

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ABSTRACT

The study of teachers' beliefs has been around for more than 60 years. Although the relationship of different beliefs has drew progressively more attention in current research, and also tried to interpret the interior interactive relationship of the belief system, they have not formed a clear overview of the relationship. Based on teachers' efficacy, this study provides a overall picture of the relationship of teachers' efficacy beliefs to other beliefs, which can afford important information for future research on the internal relations of teachers' belief system to a certain extent. In view of the existing research, researchers are inclined to discuss the relationship of teachers' efficacy beliefs to other beliefs based on the hypothesis of single application direction. In general, most of the researchers tend to consider the efficacy belief as more marginal belief, while others are more central beliefs, especially BCK and BSRP; which will influence teachers' efficacy beliefs..

1. Introduction

The study of teachers' beliefs has been around for more than 60 years (Oliver, 1953). Although there was controversy over the definition of the concept of teachers' beliefs in earlier research (Pajares, 1992; Kagan, 1992), Five and Buehl (2012) has classified teachers' beliefs into the following six categories based on the existing research topics: (1) Beliefs about themself (BT), i.e. teachers' beliefs about self-efficacy, identity and their roles. (2) Beliefs about context or environment (BCE), i.e. teachers' beliefs about school environment/culture and the relationship with others (colleagues, administrators and parents). (3) Beliefs about content or knowledge (BCK), i.e. teachers' beliefs about different carriers of the knowledge that they teach students or the knowledge learned by themselves. (4) Beliefs about specific teaching practices (BSTP), i.e., teachers' beliefs about the topics of cooperative learning, scientific teaching and the use of inquiry strategies. (5) Beliefs about teaching approach (BTA), i.e., teachers' beliefs about the holistic approach of constructivism, transmissionism and the development of appropriate practice. (6) Beliefs about students (BS), i.e., teachers' beliefs about students' diversity, distinctiveness, language differences, ability, learning and development. Of which the fourth and fifth categories refer to teachers' beliefs about teaching, and their main focus of study differs according to the specific research. The above-mentioned categories have identified the contents of teachers' beliefs and divided teachers' beliefs based on the existing research topics in an operable way to clean the messy construct of teachers' beliefs, which enable us to explore the concept of teachers' beliefs more comprehensively and systematically. A series of studies have shown that teachers' beliefs have an effect on teachers' teaching practice and students' learning outcomes. Some researchers have pointed out that teachers' self-efficacy beliefs play an important role in the research of teachers' beliefs and are closely related to the teachers and their teaching (Fives, 2003). Teachers' self-efficacy beliefs and collective efficacy beliefs significantly affect teachers' job satisfaction (Caprara, Barbaranelli, Borgogni, Petitta & Rubinacci, 2003), which still significantly influence students' academic performance when their previous academic performance has been controlled (Caprara, Barbaranelli, Steca & Malone, 2006).

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In addition, there are lots of studies focusing on the relationship between teachers' efficacy beliefs and other teacher beliefs. The stronger the teachers' personal efficacy beliefs, the more humanistic the teachers' control orientation to the students (Woolfolk, Rosoff & Hoy, 1990). Another of their studies made further exploration into the relationship of self-efficacy beliefs to students' control beliefs and motivational beliefs (Woolfolk & Hoy, 1990). These two studies have provided an important basis for further research on teachers' efficacy beliefs and been widely cited. The research on teachers' self-efficacy beliefs has flourished, and the emerging evidence has continued to support the above findings up to now (Wei, Chen & Wang, 2017). Rokeachs (1968) put forward the idea of Belief System at an earlier stage, and considered a belief system as having represented within it, in some organized psychological but not necessarily logical form, each and every one of a person's countless beliefs about physical and social reality. Bahcivan and Cobern (2016) constructs their belief system model, which had a more advanced personal epistemology. Green (1971) thought that the organization of belief systems is considered quasi-logical. The stronger beliefs of psychological strength are called core beliefs, which will influence the weaker beliefs of psychological strength which are called peripheral beliefs. Cross(2009) pointed out that mathematics teachers' beliefs about the nature of mathematics are more central than their beliefs about pedagogy and student learning in their belief systems, and these beliefs were very influential on the teachers' teaching practice. When Tsai (2002) explored the relationships among teachers' beliefs about teaching science, learning science and the nature of science, he found these beliefs were closely aligned in most cases, called these closely aligned beliefs as nested epistemologies which affect teachers' practice of science instruction. Glackin (2016) identified a nested epistemology grouping in Charlie, Claire and Megan. These three teachers' espoused beliefs about teaching, learning and science epistemology are congruent and connected. Although previous studies have revealed the relationship of some beliefs within teachers' belief system, it is difficult to survey the internal structure of the teacher belief system wholly. The analysis of these studies is of great significance, which will help us to clarify the relationship of teachers' beliefs to teachers' behaviors while promoting the research on teachers' belief system.

Considering the significance of teachers' self-efficacy belief and many researchers' concerns in this field (Wei, Chen, & Wang, 2017), our study believes it is necessary to get an overview by summarizing the relationship of teachers' efficacy beliefs and other teachers' beliefs, from the perspective of teachers' belief system and through teachers' efficacy belief; so as to provide possible discussion on the internal relationship of the whole teachers' belief systems. The main studying problems in this research are as follows:

(1) What is the research mechanism on the relationship between the existing teacher efficacy beliefs and other teacher beliefs?

(2) What are the main concerns of the research on the existing teacher efficacy beliefs and other teacher beliefs? What is the relationship between the two?.

2. Research Method

First of all, relevant literature were located through an electronic database search, including Web of Science Academic Search Complete、 ERIC、 PsycINFO etc.. The keywords for searching teachers' beliefs are teach* belief* and efficacy. The screening criteria for this phase include: ①Published in peer-reviewed academic journals; ② The language in searching is English; ③Literature published before October 16th, 2018. 635 relevant papers were obtained. Then, in the second selection round reading through the titles, abstracts or the full text of the above-mentioned literature, and screened them again according to the following criteria: ①The study was aimed at K-12 teachers; ②The content of the study must include a discussion of the relationship between teachers' efficacy beliefs and other beliefs. From this procedure, 27 valid papers were selected for the study.

3. Research Results

Structure grams: form "binder, carrier base, bond or a pillar" between the structures in curriculum. They give to curriculum the "systematic breath", but especially "skeleton" of global structuring of the curriculum (structural elements are not isolated, but form a whole system). They are a simplified variant of the flat block diagram in its graphical nature. In the diagram, every single block is designated generally by rectangular (less circle, triangle, etc.) frame; the lines between the blocks indicate their relationships. The horizontal lines are the signs of equivalence; the vertical lines usually mean inclusiveness. In general, under the structure gram we will understand the link of a set of blocks by the set of orientation line (Fig. 1-3).

In our pedagogical practice we use two types of structure grams. Structure grams (based on anatomical nature) and Structure grams (based on physiological nature). The structure diagrams used in the following section belong to physiologically oriented structure programs.

3.1 The Relationship of Teachers' Efficacy Beliefs to other Beliefs

A total of 5,866 subject teachers were involved in the study, and 3,672 teachers were identified by gender, with 1,533 male and 3,672 female. Relevant studies of pre-service teachers were slightly more than in-service teachers. Nearly half of the literature concerned science teachers, with the highest proportion (Figure 1), and next were math and language arts teachers, followed by six studies separately. Over half of the studies ranged over primary school, accounting for 15 and junior high school teachers, accounted for 11. The number of preschool teachers is relatively small, and only one study in senior high school.

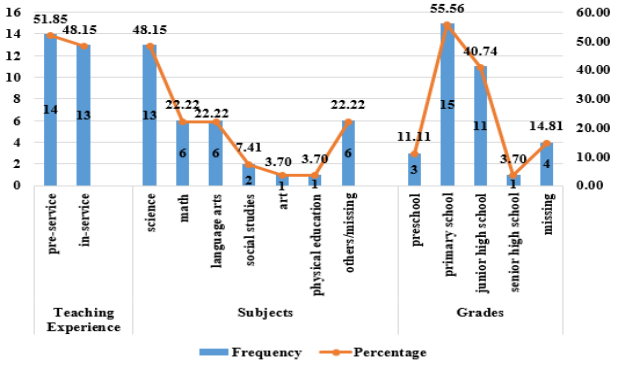

Figure 2. Basic information of study subjects

The vast majority of the studies used quantitative research method, accounting for 19 items. For those adopting mixed or qualitative methods, there were 4 studies respectively. The vast majority of the studies adopted questionnaire method, accounting for 26 items in total(Figure 3). Regarding efficacy beliefs, the questionnaires used in these studies were relatively focused, with the tasks specific questionnaires of Teachers' Sense of Efficacy Scale (TSES) being mostly used, involving 9 studies. The domain specific questionnaire of Science/Mathematics Teaching Efficacy Beliefs Instrument, with

a total of 7 studies involved. Regarding other beliefs, the approaches are more dispersing, with the Attitudes and Beliefs on Classroom Control (ABCC) Inventory being mostly adopted, involving 3 studies in total. The second was interview method, accounting for 7 items; Thirdly, observational method accounted for 3 items. There were also a few researchers adopting diverse methods of data collection. Considering data analysis methods in analyzing the possible relationship between the two, more than half of the studies involved correlation analysis, accounting for 14 items; 8 studies involved regression analysis; and 4 studies dealing with the structural equation model. Besides the above commonly used quantitative statistical methods, there were two studies adopting repeated measures ANOVA respectively to investigate the effects of pre-service teachers' practical teaching experience and beliefs on their effectiveness (Han, 2017). Using the independent sample t-test, the possible relationship between the two has been discussed with the level of efficacy beliefs as the independent variable and the beliefs about language learning as the dependent variable (Genç, 2016). In addition, 6 other studies also try to explain the possible relationship between the two with the qualitative content analysis method.

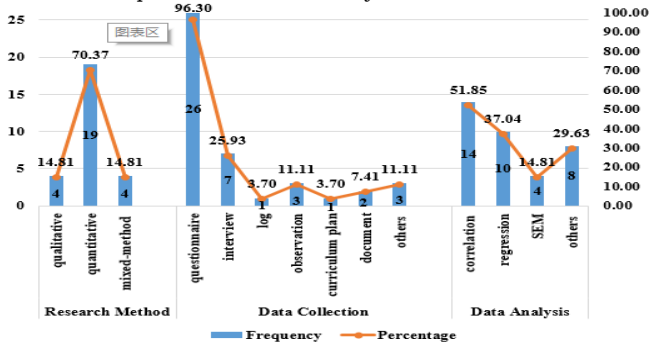

Figure 3. Research design

3.2 The Relationship of Teachers' Efficacy Beliefs to Other Beliefs

The relationship of teachers' efficacy beliefs to other beliefs has been discussed 34 times, and the vast majority of 31 studies found they were closely related. Of which, 15 studies found that teachers' other beliefs affected teachers' efficacy beliefs; however, 9 studies found that teachers' efficacy beliefs influenced teachers' other beliefs. Firstly, more than half investigated the relationship between teachers' efficacy beliefs and teachers' beliefs about specific teaching practices, which shows that this field has been the focus of the researchers. Apart from the fact that only six studies found significant correlations between the two (Brown, 2005; Gencer, 2007; Hsu, 2016; Lai, 2018; Lin, 2001; Nikolopoulou, 2015), five studies found that teachers beliefs about specific teaching practices also made effect on teachers' efficacy beliefs (Bent, 2017; Kazempour, 2014; Kazempour, 2015; Rubie-Davies, 2012; Ruppar, 2015). A series of qualitative studies have shown that teachers' beliefs about teaching and learning have an effect on their efficacy beliefs. For instance, the study of science education in primary schools has shown that teachers' beliefs about science teaching and learning influence teachers' self-efficacy beliefs about science teaching. Kazempour (2015) stated further in several of his subsequent studies that Low and Medium groups, their initial attitudes and self-efficacy were influenced by their prior experiences and the subsequently formed beliefs about science and science teaching. Research in the field of special education also verified the above findings (Ruppar, 2015). In quantitative research, Bent (2017) showed that teachers' beliefs concerning geography education quality were not only significantly related to teachers' self-efficacy beliefs, but also the most important predictive variable of teachers' self-efficacy beliefs. Rubi-Davies (2012) found that, mastery-oriented beliefs predicted teacher efficacy for student engagement and classroom management. But teachers' performance-oriented belief and their belief about the expectation of students' level were not relevant to students' participation, teaching and the management efficiency.

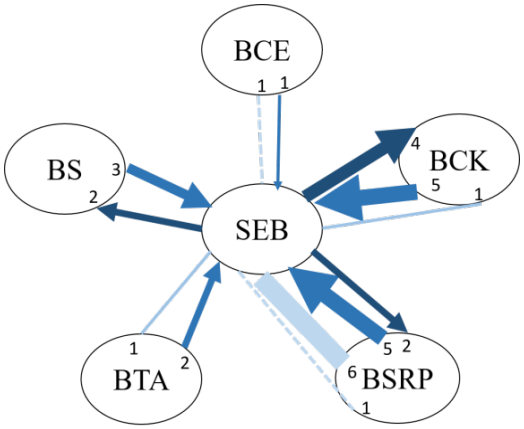

Figure 4. The relationship between teachers' efficacy beliefs and other beliefs

SEB=self-efficacy belief, BCE= beliefs about context or environment, BCK= beliefs about content or knowledge, BSRP= beliefs about specific teaching practices, BTA= beliefs about teaching approach, BS= beliefs about students. The arrow and the straight line represent the direction of the relationship, and the straight line indicates that the two are only related, while the dotted line shows that there is no correlation between the two. The thickness of the line indicates the number of the articles, i.e. numbers annotated in the figures.

Two other studies have found that teachers' self-efficacy beliefs have effect on teachers' beliefs about specific teaching practices. For example, Gebril (2017) found that the self-efficacy beliefs about exam preparation were positively correlated with their positive exam-preparation belief, but negatively correlated with the negative ones in a low level. The structural equation model showed that the self-efficacy beliefs about exam preparation played a significant role in the positive belief of exam preparation. Kurt (2014) found that, there are medium level positive significant relationships between teachers' sense of efficacy and attitudes and beliefs levels on classroom control. It is possible to predict teachers' beliefs about classroom management with teachers' sense of efficacy, middle school students' participation efficacy, teaching strategy efficacy and subject management efficacy. One study even found no significant relationship between the two (KırıK, 2013). Interestingly, both Kurt (2014) and KırıK (2013) conducted research on teachers' efficacy beliefs and classroom management beliefs, but they used different tools on studying the efficacy beliefs with different research objects, and there was obvious difference in their findings.

Secondly, more than one-third of the studies investigated the relationship between teachers' efficacy beliefs and teachers' beliefs about content or knowledge, accounting for 10 items. Apart from one study that explored the correlation and found a significant relationship between the two (Thomson, 2016), five other studies found that teachers' beliefs about content or knowledge have an effect on teachers' efficacy beliefs. Bahcivan (2014) conducted a questionnaire survey of 379 pre-service science teachers of primary school in Turkey, the structural equation model have revealed that the conceptions 'testing', 'calculate and practice', 'increase of knowledge', 'applying' and 'understanding and seeing in a new way' have significantly

predicted PSTE. On this basis, Bahcivan (2016) has studied the effect of epistemological beliefs on efficacy beliefs mainly in a qualitative way; and the results showed that the differences in epistemological beliefs with respect to different domains, topics and dimensions are primarily based on the previous learning experiences of PST, which initially shape their self-efficacy beliefs in regard to learning and eventually influence their epistemological beliefs. This finding has also been evidenced in part by the case studies of in-service science teachers in primary schools by Kazempour (2014, 2015); that is to say, self-efficacy beliefs about science teaching and learning are influenced by previous science-related experiences and beliefs about science and science teaching and learning. Meanwhile, the above findings were also supported by the pre-service math teachers in primary school (Briley, 2012). Four studies found that teachers' self-efficacy have an effect on teachers' beliefs about content or knowledge. Yilmaz-Tuzun (2008) showed that self-efficacy and outcome expectancy can predict the Innate Ability obviously, but teachers' efficacy beliefs cannot predict Simple Knowledge and Omniscient Authority. Memnun (2012) has polled a questionnaire survey of 567 pre-service mathematics and science teachers in primary and secondary schools in Turkey, stating that teachers' self-efficacy beliefs about mathematical literacy were an important predictor on the beliefs about mathematical problem solving. Similarly, ZORLU (2017) found that science self-efficacy belief can predict scientific epistemological belief.

Thirdly, 4 studies has explored the relationship between teachers' efficacy beliefs and teachers' beliefs about students. Three of the studies have found that teachers' beliefs about students have effect on Teachers' efficacy beliefs, for example, based on a regression analysis of 489 geography teachers in primary school in the Netherlands, showed teachers' beliefs concerning students' attitudes and motivation has been not only significantly related to teachers' self-efficacy beliefs, but also been the most important predictor of teachers' self-efficacy beliefs. In addition, the qualitative research on the teaching beliefs and practices of literacy for special education teachers in senior high school also provides further support for this finding, teachers' beliefs about students influenced their self-efficacy as it related to their decisions to create individualized literacy programs (Rupar, 2015). Two studies found that teachers' efficacy beliefs influenced teachers' beliefs about students (Woolfolk, 1990a, 1990b). For both in-service and pre-service teachers, teaching efficacy had a significant negative correlation with their pupil control orientation with a remarkable predictive effect.

Furthermore, 3 studies have investigated the relationship between teachers' efficacy beliefs and teachers' beliefs about teaching approach. Only one of the studies explored the correlation and discovered the significant relationship between the two (Thomson, 2016), other two studies found that teachers' beliefs about teaching approach would affect teachers' efficacy beliefs. For example, the structural equation model made by Muijs (2002) showed that having a connectionist belief is a proximal factor that affects teacher efficacy beliefs, teachers with connectionist beliefs seeing themselves as more effective. Han (2017) found that both before and after the internship, teachers' constructivist or traditional beliefs would significantly influence teacher beliefs, and the constructivist group consistently had higher self-efficacy than the traditional group.

Lastly, there are two studies explored the relationship between teachers' efficacy beliefs and teachers' beliefs about context or environment. Studies in this field are relatively less, which needs the researchers' further attention. And, one study found that teachers' efficacy beliefs has an effect on teachers' beliefs about context or environment. Woolfolk (1990a) found that bureaucratic orientation (belief about work environment preference) was significantly correlated with personal efficacy (PE), but in moderately significant correlation with teaching efficacy (TE); Meanwhile, TE, PE and their interaction made unique contributions to the prediction of bureaucratic orientation. But, one study has found no such things between the two. The questionnaires of 489 primary school geography teachers in the Netherlands polled by Bent (2017) showed that beliefs concerning emphasis on the importance of college support during organizing geography education was not significantly correlated with the self-efficacy belief, and could not predict teachers' self-efficacy beliefs.

4. Discussion

In terms of research objects, the vast majority of the research focused on the relationship of other beliefs to the efficacy beliefs of science, mathematics and language arts teachers. Which might due to the fact that the countries headed by the U.S. significantly emphasizing on mathematics, science and other relevant subjects in primary and secondary education since the latter half of the 20th century. Whereas existing research has tended to be limited to a country, a teaching experience and a subject; there is a lack of comparative studies on different teachers, and long-term follow-up studies are even rarer; especially the follow-up comparative study on the teachers from the pre-service stage to the novice stage, and then to the experienced teacher stage.

Most researchers adopted the quantitative method using the questionnaire for collecting the information of a larger sample, which can help us to understand the status of teachers' efficacy beliefs to other beliefs and their correlation to a certain extent. However, there is relatively little qualitative research, especially the lack of rooted theoretical research, for promoting possible interaction between the teachers' efficacy beliefs and other beliefs within the belief system. Furthermore, with a variety of data collection methods such as questionnaires, interviews, observations, documents, etc., the hybrid paradigm also provides us with the possibility of further interpretation about the relationship of teachers' efficacy beliefs and other beliefs; so as to investigate the interactive relationship within the belief system from the perspective of efficacy beliefs.

Although the relationship of different beliefs has drew progressively more attention in current research, and also tried to interpret the interior interactive relationship of the belief system, they have not formed a clear overview of the relationship. Based on teachers' efficacy, this study provides a overall picture of the relationship of teachers' efficacy beliefs to other beliefs, which can afford important information for future research on the internal relations of teachers' belief system to a certain extent. In view of the existing research, researchers are inclined to discuss the relationship of teachers' efficacy beliefs to other beliefs based on the hypothesis of single application direction. In general, most of the researchers tend to consider the efficacy belief as more marginal belief, while others are more central beliefs, especially BCK and BSRP; which will influence teachers' efficacy beliefs. It is worth noting that in the study of the relationship between SEB and BSRP, a large proportion of researchers hold a wait-and-see state on the relationship between the two, and have not yet directly explored the possible mechanism of the two and carry out relevant analysis then. The results of these interrelated analyses show that SEB and BSRP are significantly correlated, which provides a solid foundation for further discussion of the concrete relationship between SEB and BSRP to a certain extent. But more researchers in this field hold a hypothesis that BSRP has an effect on SEB and have verified it.

Some researchers, however, consider that the efficacy belief is in the central position compared to other beliefs; efficacy belief

takes effect on other beliefs, especially when discussing the relationship between SEB and BCK. There are more results about the research on the relationship of SEB and BCK. Researchers that have different views on who plays a more important role in SEB and BCK are in a similar proportion, and have also verified the view in their own research. However, more empirical studies are needed for further investigation on the concrete relationship between the two.

The study suggests that there might be interactive relationship among the different beliefs within teachers' belief system, especially between SEB and other beliefs, rather than a simple unidirectional effect. But the interaction of different efficacy beliefs on other beliefs might be strong or weak depending on the specific fields and tasks because of the specificity of field and task. In the vast majority of cases, of a certain field or task, other beliefs are in the central position of the belief system compared to the efficacy belief and play a leading role, teachers' other beliefs influence teachers' efficacy belief to a great extent. Whereas the efficacy belief is in a more marginal position of the belief system, although its efficacy belief also takes effects on teachers' other beliefs to some extent, the effect is so little that the effect of efficacy belief on other efficacy belief will be affected by other beliefs and even be eliminated gradually. But there are also some cases (i.e. some other fields and tasks) in which teachers' efficacy beliefs might in a centric position compared to teachers' other beliefs

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