

# The Changing Process of Chinese Teachers' Beliefs When Using Thinking Tools

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*With the shifting focus from knowledge acquisition, to nurturing higher-order thinking skills, teachers need to learn new teaching strategies and utilize new teaching beliefs in their lessons. Using a case study, this paper attempts to clarify how the beliefs of Chinese primary school teachers changed their practice of using thinking tools (TTs) to improve children's thinking skills. The Three Layers Model of Genesis (TLMG), an approach of Cultural Psychology, was used to analyze the process of change in the representative teachers. The authors interviewed eight Chinese teachers and focused on their beliefs when they used TTs. The authors found that there were three types of beliefs in Chinese teachers who used TTs. Type 1 teachers kept their traditional belief but changed their value system, Type 2 teachers changed their belief from knowledge acquisition to thinking skills training, and Type 3 teachers kept the balance between knowledge acquisition and thinking skills training. The promoter sign of "the importance of thinking skills" played a great role to trigger Type 2 and 3 teachers to change their existing beliefs. The environmental factors in the concrete context strengthened or weakened the power of promoter signs that affect whether their new beliefs could form or not. In addition, all teachers experienced the conflict of whether "improving thinking skills of students is important" or "improving the knowledge acquisition of students is important" (Conflict 1). The Type 3 teacher, Teacher A, experienced cognitive conflict of "continuing to use TTs" or "giving up using TTs" (Conflict 2) after she experienced Conflict 1. Consequently, the type of beliefs in Chinese teachers influenced their usage of TTs in the classroom.*

*Keywords: Belief, thinking tools, higher order thinking skills, Cognitive Conflict, Three Layers Model of Genesis, China*

## Introduction

With the increasing importance of nurturing higher-order thinking skills in the 21st century society, the Chinese government reflected on the problems of an examination-oriented education and decided to reform education to cultivate talents who can contribute to society in the future. China highlighted improving thinking skills as a policy of 'quality education' (Dello-Iacovo, 2009; Hu & Shou, 2018). In 2016, China announced one key policy that would improve students' logical, critical, and creative thinking from primary education (Core competencies and values research group, 2016).

A teacher's belief strongly influenced the success of implementing new practices (Parwat, 1992; Akita, 2008). New teaching strategies cannot be successfully explored if teachers do not shift from their traditional approach of knowledge acquisition to the new belief of improving students' thinking skills (Sato, Akita, Shimizu, Kotoma & Kitamura, 2016). To reach the new teaching goal in primary schools, teachers were asked to shift their traditional beliefs (Chan & Yuen, 2014; Sato et al., 2016; Bereczkia & Kárpáti, 2018). The Chinese government attempted to push

for high-quality teacher training (Hu & Shou, 2018). However, the transition of belief from knowledge-acquiring to thinking skills nurturing did not occur easily. In this high-quality teacher training, a big challenge was determining how to shift teaching beliefs from knowledge-acquisition to thinking skills nurturing. Thus, identifying whether Chinese teachers change their beliefs when asked to begin the new practice of improving students' thinking skills, is crucial.

## Literature Review

### Difficulty of belief changing in teachers

A teacher's belief is defined as their views about teaching and learning (Akita, 2008). Parwat (1992) indicated that what teachers believe play key roles in changing classrooms since "problems may be overcome if teachers are willing to rethink their views on the issues". At the same time, their existing beliefs are also obstacles for teaching reform (Parwat 1992). Teachers' beliefs are hidden in their core consciousness and forms over a long period of time (Pajares, 1992; Sakamoto, 2007). Therefore, teachers have difficulty changing their existing beliefs to new ones (Pajares, 1992; Wilkinson et. al., 2017). To encourage teachers to change their existing beliefs, teachers were asked to reflect on their current beliefs about teaching and learning in their classroom (Schon, 1983; Shulman & Shulman, 2004; Korthagen & Vasalos, 2005). Wilkinson et al. (2017) designed a dialogic pedagogy to help teachers use new teaching approaches and reflect on their beliefs. As a result, teaching outcomes were positive while teachers did not change their belief. This study called for more studies to clarify what kinds of factors affected teachers' belief when they used new teaching strategies .

### Factors influencing teachers to change their existing beliefs

Two factors affect teachers' shift in beliefs. In the process of teachers rethinking their views about teaching and learning, cognitive conflicts may occur since the existing and new views differ (Rolka, Rosken, & Liljedahl, 2007; Gleeson & Division, 2016). When teachers are confronted with new information and experience cognitive conflict, they may reduce the conflict by seeking information to provide a solution (Piaget,1985; Rolka et, al., 2007). Thus, these cognitive conflicts can trigger teachers to change their existing beliefs. In addition, social and cultural environments influence the transition of teachers' beliefs. Teachers' beliefs strongly influenced their teaching practice, and the beliefs were shaped by the context of teachers' encounters (Ertmer & Ottenbreit-Leftwich, 2010). Zhao and Frank (2003) identified that Chinese teachers encountered cultural pressure from their schools when they tried to introduce new teaching strategies by using ICT into the classroom. This study indicated that the Chinese school culture inhibited teachers' ability to reflect on their beliefs. However, this study examines the use of ICT in Chinese primary schools but not the introduction of teaching strategies to improve thinking skills.

### Ongoing research about Chinese teachers introducing thinking tools

With the goal of promoting students thinking skills in primary schools, teaching strategies using thinking tools (TTs) to improve thinking skills was introduced in some cities in Guangdong, China since 2012 (Li, 2016; Zhang, Kubota, Kubota & Li, 2019a; Zhang, Kubota, Kubota & Li, 2019b; Zhang, Kubota, Kubota & Li, 2019c). TTs are special graphic organizers which focus on developing targeted types of thinking skills. Using special graphic organizers that match thinking skills, and training students to use them have educational benefits (Kurokami, 2012). For example, using a Y Chart to correspond with multiple angle thinking, where students consider content from different perspectives and a Pyramid Chart to match with structure (Figure 1). Owing to the fact that thinking cannot be observed, using thinking tools, which could "show the thinking process visually" in class, is a useful way to understand the development of children's thinking process (Kurokami, 2012). Furthermore, students' thinking skills improved when they were trained to use TTs.

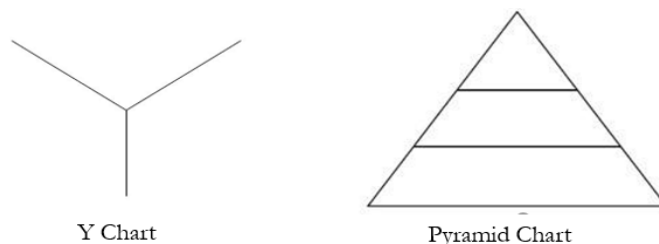


Figure 1. Y Chart and Pyramid Chart

Ongoing research showed that Chinese teachers encountered difficulties when exploring TTs to nurture students' thinking skills (Zhang et al., 2019a; Zhang et al., 2019b, Zhang et al., 2019c). Chinese teachers progressed through some developmental stages to reach the goal of improving students' thinking skills in lessons, and all the developmental stages were related to decision-making associated with social factors (Zhang et al., 2019a; Zhang et al., 2019c). In addition, a survey of Chinese teachers' consciousness showed that some teachers focused on developing students' thinking skills, while others still paid more attention to knowledge-acquisition (Zhang et al., 2019b). Zhang et al. (2019b) identified that some Chinese teachers changed their beliefs while others did not. The studies above identified the developmental stages and indicated that Chinese teachers changed their beliefs when they explored TTs in lessons. However, how these Chinese teachers changed and kept their beliefs was not clear. Therefore, it was crucial to analyze how Chinese teachers changed or retained their beliefs. Furthermore, as mentioned earlier, teachers may experience cognitive conflicts when they change their beliefs. Thus, whether Chinese teachers experienced cognitive conflict or not also needed further examination.

## Research Objective

The research objective, of this study, is to clarify how Chinese teachers changed or kept their traditional beliefs when they used thinking tools. Examining the process of how Chinese teachers changed their beliefs can provide valuable information about how teachers shift from traditional to new beliefs. Understanding teachers' beliefs, about improving thinking skills when using thinking tools, can help when these strategies are introduced to new areas in China.

## Research Methodology

### Three Layers Model of Genesis

This study used the Three Layers Model of Genesis (TLMG), a new qualitative method, to analyze the structure of the Chinese teachers' beliefs. TLMG is a Cultural Psychological methodology to analyze the developmental process in people's beliefs and values (Sato, Mori & Valsiner, 2016). Therefore, this study used the framework of TLMG to analyze the data. TLMG has three layers. Layer 1 is the layer of expressing people's feelings and behavior. Layer 2 is the layer of signs mediated in culture. Layer 3 is the layer of a belief and value system (Valsiner, 2007; Sato et al., 2016). TLMG identifies the psychological phenomenon based on internalization and externalization. Internalization is a sequential constructive process that moves messages through Layer 1 → Layer 2 → Layer 3. Externalization is the process that transfers the belief or value in people into concrete meaningful actions through Layer 3 → Layer 2 → Layer 1 (Valsiner, 2007). In the three layers of TLMG, the promoter sign occurred in Layer 2. The promoter sign is the sign that triggers a change of value system (Valsiner, 2018). Sometimes, cognitive conflict occurred when promoter signs occurred in TLMG (Sato et al., 2016).

In this study, the authors used TLMG to analyze how teachers changed or kept their beliefs. Layer 1 examines what teachers did and felt. Layer 2 identifies what kinds of signs promote changes in teachers' beliefs. Layer 3 analyzes the layer of belief of what teachers want to do in their teaching to trigger new teaching behaviors (Table 1).

Table 1  
*Concepts of TLMG in this study*

	Concept	Position in this study
Layer 1	Feeling and behavior	What did teachers feel and do in the practice of using thinking tools?
Layer 2	Sign	What kinds of signs promote the teachers' belief change?
Layer 3	Belief and value	What did teachers want to do in their teaching?

### Research collaborators

TLMG chose research collaborators who experienced talking about their research theme (Sato et al., 2016). This study chose teachers based on Zhang et al. (2019b), who selected teachers, that the researchers thought could collaboratively "use thinking tools to teach lessons for improving thinking skills". Eight teachers were selected. According to Sato et al. (2016), eight teachers had the possibility of discovering some types of belief changing. These teachers, Teacher A, B, C, D, E, F, G, and H had the following features: (1) Teacher A, B, C and D worked in Foshan City, and E, F, G, and H worked in Guangzhou City. (2) Teacher A and B, C and D, E and F, G and H worked at the same primary school.

(3) They taught one of four subjects: Math, Science, Chinese Literature, and English. (4) Their teaching experience was from 3 to 18 years. In addition, the teachers experienced TTs for more than two years and six months before March 2018. Table 2 shows the summary of information of the research collaborators.

Table 2  
Information of Research Collaborators

Teacher	City	School	Subject	Teaching Experience	Thinking Tools' Experience
A	Foushan	NZ	Mathematics	9 years	3 years
B	Foushan	NZ	Science	3 years	3 years
C	Foushan	GM	Mathematics	5 years	3 years
D	Foushan	GM	Chinese Literature	5 years	3 years
E	Guangzhou	WD	English	18 years	3 years
F	Guangzhou	WD	Mathematics	6 years	3 years
G	Guangzhou	BY	English	12 years	2.5 years
H	Guangzhou	BY	Chinese Literature	17 years	5 years

## Data Collection and Analysis Procedure

The authors interviewed the teachers three times about how they used TTs and how their beliefs changed. The first interview to obtain data was about one hour with each teacher. The second and third interviews were about 30 minutes with each teacher. The authors asked teachers the following questions: (1) How did you guide students to use TTs? (2) What was the ideal situation when students used TTs? (3) What were the teaching purposes previously and currently? (4) Did you think students' thinking skills improved? Why do you think so? (5) How did you feel after introducing TTs?

To guarantee the trustworthiness of the results in this case study, the authors highlighted the importance of the analysis procedure and data interpretation in an educational context in China (Gubo & Lincoln, 1989). Firstly, the authors made transcriptions in Chinese after collecting data. Secondly, the authors analyzed data based on Grounded Theory (Charmaz, 2014). The analysis procedure was as follows: (1) Divide the data based on meaning and attach focused codes; (2) Create and label axial codes based on the focused codes; (3) Identify theoretical codes that illustrate the belief changing process using the framework of TLMG. Use this data to draw a TLMG diagram. From the analysis, 39 axial codes were created from the focused coding. Sixteen theoretical codes were created based on the axial codes. Finally, the TLMG Diagram (Figure 2) was constructed. The authors quoted the theoretical codes in bold type, and cited the interview data with italic type.

## Results and Discussion

Through analysis of the data, the authors found three types of teachers' beliefs. Type 1 teachers kept their traditional beliefs (Teacher E, F and H), Type 2 teachers changed their belief from knowledge acquiring to thinking skills training (Teacher B, C, D and G), and Type 3 Teacher A, wanted to maintain a balance between knowledge acquiring and thinking skills training. The promoter sign of "**the importance of thinking skills**" occurred in all three types of teachers but only triggered Type 2 and 3 teachers to change their existing beliefs (Figure 2).

### Type 1 Teachers: Keeping traditional belief

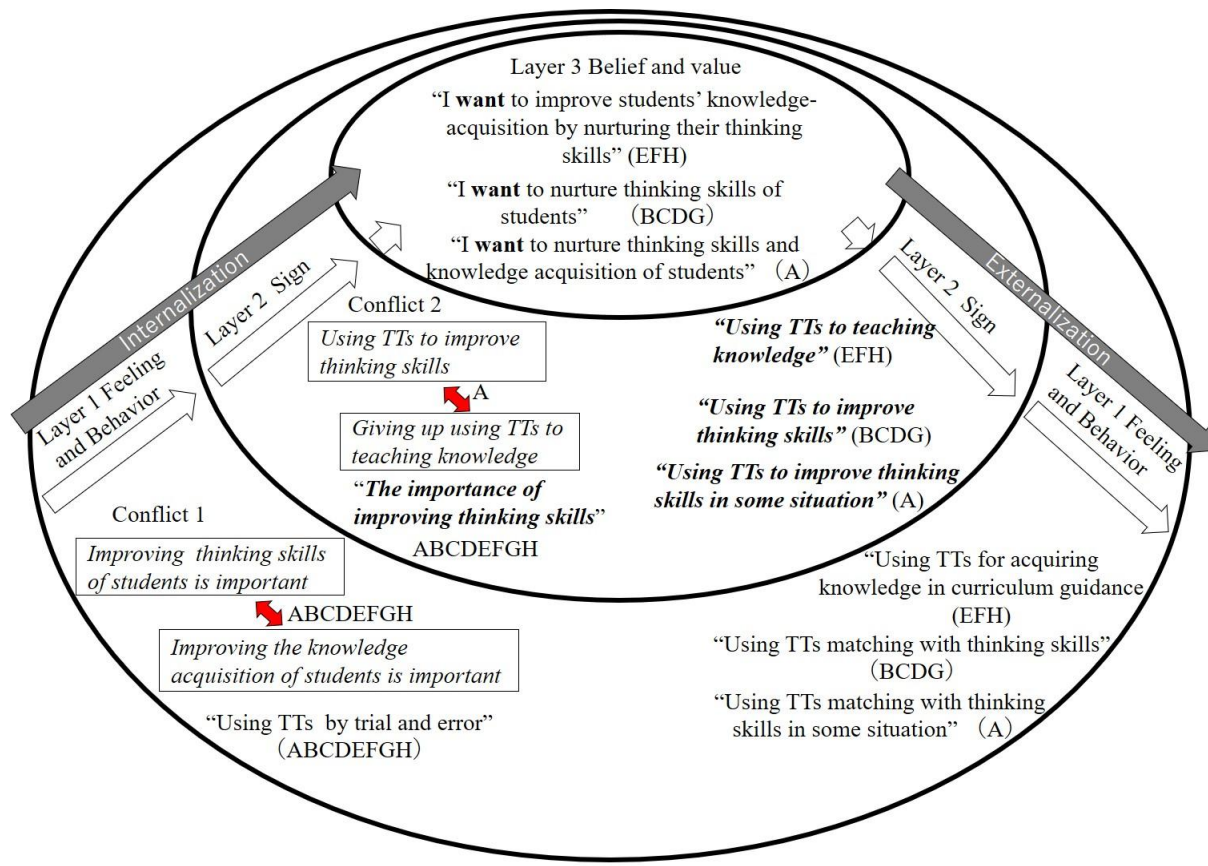
Type 1 teachers, Teacher E, F and H kept their traditional belief. They experienced the conflict of whether "**improving thinking skills of students is important**" or "**improving the knowledge acquisition of students is important**" (Conflict 1) in the first layer of internalization after they used TTs by trials and error. Their conflict was based on great social pressure of "**increasing achievement scores of students in the cultural environment of China**". As Teacher E mentioned, "*the school that helped students get higher achievement scores,*" created competitions in different primary schools in Guangzhou City. However, they found that students began to think more positively after using TTs, and the sign of "**the importance of thinking skill**" occurred in Layer 2. They "**wanted to improve students' knowledge-acquisition by nurturing their thinking skills**" after they realized the importance of

students improving their thinking skills. In the internalization process, nurturing thinking skills was a way to help students learn more knowledge, but their belief of knowledge-acquisition remained the same. In the process of externalization, Type 1 teachers tried to externalize their belief and met the problem of how to use TTs (Layer 3). The new symbol of “**using TTs to teach knowledge better**” occurred in Layer 2. Teacher E, F and H “**used TTs for acquiring knowledge based on the Curriculum Guidance in China**” (Layer 1).

When teachers confront cognitive conflict, they will find solutions to reduce the conflict (Rolka et al., 2007; Gleeson & Division, 2016). Type 1 teachers experienced Conflict 1 but they only accommodated thinking skills as a method to teaching knowledge efficiently, since they felt intense pressure from their district schools competing to increase student achievement scores.

### Type 2 Teachers: Shifting their belief from knowledge acquiring to thinking skills training

Teachers B, C, D and G were Type 2 teachers, who shifted their beliefs from knowledge acquisition to thinking skills training. These four teachers tried to use TTs based on the features of subjects and found TTs were hard to explore. They also experienced the conflict of whether “**improving thinking skills of students is important**” or “**improving the knowledge acquisition of students is important**” (Conflict 1). Their promoter sign of “**the importance of thinking skill**” occurred in Layer 2. The changes of students after they used TTs in the classroom strengthened this promoter sign. Teacher B and C found students inferred step-by-step in science and mathematics classes. Teacher D discovered students wrote compositions clearly and logically, and Teacher G was surprised that students thought with different viewpoints and produced an English travel plan. Finally, they changed from their traditional belief of teaching knowledge and believed that they needed to “**nurture thinking skills of students**”. After Type 2 teachers changed their belief, they tried to change their practice in the classroom. The new promoter sign of “**using TTs matching with thinking skills**” occurred in the process of externalization. This promoter sign triggered teachers to change their behavior to “**use TTs to improve students’ thinking skills**”.



Teacher should improve achievement scores of students in the cultural environment of China

Figure 2. TLMG of the Belief in Teachers After Using Thinking Tools

Type 2 teachers modified their belief from knowledge-acquisition to thinking skills training after the promoter sign of **“the importance of thinking skill”** occurred. The changes in students reinforced the power of the promoter sign. As Valsiner (2018) mentioned, a promoter sign does not often trigger changes in values systems since maintaining the existing value is easier. The changes of students reinforced the strength of **“the importance of thinking skill”** in Type 2 teachers. Furthermore, the free educational environment in Foshan played a role in triggering these teachers to change their beliefs. Zhang et al., (2019b) identified that Foshan has a free educational environment and Teacher G learned the usage of TTs from another teacher who taught in Foshan.

### **Type 3: Balancing both knowledge acquisition and thinking skills training**

Type 3, Teacher A, experienced two conflicts and made great effort to balance both knowledge acquiring and thinking training after she participated in the training class on how to use TTs. She also experienced conflict about the importance of improving thinking skills or increasing knowledge acquisition (Conflict 1) after introducing TTs in the classroom. The promoter sign of **“the importance of improving thinking skills”** occurred after she used TTs in her first lesson study. In this first lesson, she realized that “developing thinking skills was important for the students’ lifetime” based on the support of Chinese researchers. However, she felt the dilemma of **“continuing to use TTs”** or **“giving up using TTs”** (Conflict 2) after feeling a sense of failure in the second lesson study. After spending much preparation for the second lesson that used TTs, Teacher A was unsure if the effort expended would improve students’ achievement scores since she “worried that her students had lower scores than other classes” in her school. She experienced great distress in Conflict 2, on whether to use TTs to improve thinking skills or giving up using TTs to teach knowledge. She did not give up when the head teacher encouraged her to rethink why she should use TTs. Then, she realized she used TTs not only for knowledge teaching, but also improving thinking skills. As a result, her belief, of both nurturing thinking skills and teaching knowledge, was important and gained significance in her teaching (Layer 3). Teacher A tried to externalize her belief into behavior. The new symbol of **“using TTs to improve thinking skills in some special situations”** occurred in Layer 2 in the process of externalization. At that point, she used TTs that matched thinking skills in some teaching situation in the feeling and behavior layer.

Teacher A felt the dilemma of **“continuing to use TTs”** or **“giving up using TTs”** that Type 1 and Type 2 teachers did not confront. The pressure of knowledge teaching in mathematics in her school inhibited her shift from knowledge acquisition to thinking skills training completely. Therefore, she formed her belief of balancing both knowledge acquiring and thinking training. In the case of Teacher A, class competition of knowledge teaching in school, support from Chinese researchers and encouraging words by the head teacher all were the social factors which allowed Teacher A to confront Conflict 2.

## **Discussion**

The authors found that Chinese teachers, using TTs, could be categorized into three types. All teachers experienced cognitive conflicts of whether **“improving thinking skills of students is important”** or **“improving the knowledge acquisition of students is important”** (Conflict 1). The Type 3 teacher, Teacher A, experienced cognitive conflict of **“continuing to use TTs”** or **“giving up using TTs”** (Conflict 2) after she experienced Conflict 1. In addition, the promoter sign of **“the importance of thinking skills”** played a great role to trigger Type 2 and 3 teachers to change their existing beliefs.

The value systems of eight teachers were divided into three types after they experienced cognitive conflicts. Type 1 teachers kept their traditional belief but their value system was modified to **“improving knowledge acquisition by nurturing their thinking skills”**. These results are consistent with the opinions that teachers changed their beliefs when they experienced cognitive conflicts (Rolka et al., 2007; Gleeson & Division, 2016). However, all three types of teachers experienced Conflict 1 but only the Type 3 teacher, who balanced both knowledge acquiring and thinking training, experienced Conflicts 1 and 2. This is a new finding that showed that teachers who try to balance both teaching knowledge and improving thinking skills might have more cognitive conflicts. This points to the need to support Chinese teachers as they adjust to conflicts when TTs is introduced into new areas in China.

Valsiner (2018) said promoter signs played a crucial role in forming new beliefs. From the results of this research, the promoter sign of **“the importance of improving thinking skills”** occurred in the internalization process in three types of teachers but only Type 2 and 3 teachers changed their existing belief. The authors considered that the following factors strengthened the promoter sign. Firstly, the free educational environment in Foshan allowed Type 2 and 3 teachers to reach the promoter sign because they had more freedom to inquire and try new teaching strategies (Teacher G was taught in Guangzhou but was influenced by the Foshan teacher). Secondly, the social support in a

concrete context, mentioned in Zhang et al., (2019b), promoted the sign of **“the importance of improving thinking skills”** to affect teachers’ beliefs. Thirdly, the changes of attitude and thinking skills in students after TTs were introduced in the classroom, helped teachers understand the effectiveness of using TTs. Thus, teachers were more positive about reflecting on their belief more deeply. On the contrary, Zhao and Frank (2003) identified that Chinese teachers met obstacles in primary school culture when they introduced ICT strategies. The competition of high achievement scores in schools in Guangzhou weakened the promoter sign to change ‘Type 1 teacher’ traditional belief.

After teachers construct a new meaning system in their beliefs, the new promoter signs occurred in the externalization process. These promoters, **“using TTs to teach knowledge”** (Type 1), **“using TTs to improve thinking skills”** (Type 2) **“using TTs to improve thinking skills in some situations”** (Type 3) based on different beliefs impacted the usage of TTs directly. This indicated the practice of TTs created changes in beliefs, different beliefs reinforced TTs usage again. This cycle of internalization and externalization indicated what types of beliefs teachers have, and how this affects their practice needs additional attention when Chinese teachers learn to use TTs.

## Conclusion and Future Perspectives

In this study, the authors identified that Type 1 teachers kept their traditional belief, Type 2 teachers shifted their belief from knowledge acquiring to thinking skills training, and Type 3 kept the balance between knowledge acquiring and thinking skills training. The promoter sign of **“the importance of thinking skills”** played a great role to trigger Type 2 and 3 teachers to change their existing beliefs. The environmental factors in the concrete context strengthened or weakened the power of promoter signs that affect whether their new beliefs could form or not. In addition, all teachers experienced the cognitive conflict in the process of changing and keeping their beliefs. Consequently, the type of beliefs in Chinese teachers influenced their usage of TTs in the classroom. How to adjust conflicts, what types of beliefs in teachers and how this affects their practice needs additional attention when TTs are introduced in a new area in China.

Cognitive conflict is easily triggered in self-organization once promoter signs are reached mentally (Sato et al., 2016; Valsiner, 2018). From the perspective of Self Dialogue, there are different I-positions in one’s self (Valsiner, 2018). Through organizing different I positions, people decided their future goals. In this study, the authors did not analyze teachers’ internal dialogues when they experienced conflicts. I-position in the dialogue of Chinese teachers, who experienced conflict, may have merit to support the adjustment of conflict. In addition, I-position analysis can possibly help Type 1 teachers shift from knowledge acquisition to thinking skills training. In the future, the authors will clarify the types of I-positions and examine how teachers organize their I-positions after introducing TTs from the Self Dialogue perspective.

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