Thinking-based classroom teaching theory and practice in China

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Introduction: teaching thinking in China

Teaching thinking has a long history in China and most teaching thinking programmes are infusion approaches. The teaching thinking ideologies of educators in ancient China are the following (Hu & Liu, 2011). First, attaching great importance to the role of thinking and emphasizing thinking as the core of teaching. Second, paying attention to the accumulation of knowledge and clarifying the relationship between knowledge and thinking. Third, emphasizing the great importance of heuristics and advocating students’ active thinking. Fourth, encouraging questioning to develop students’ innovative thinking. Fifth, reinforcing the training of thinking methods to ensure students’ efficiency of thinking. Sixth, inspiring the non-intelligence factors, and then realizing the optimization of students’ thinking.

In recent years, several teaching theories have emphasized the importance of thinking-based classroom teaching. The Situational Teaching Method was established by the famous child educator Jilin Li in China (Li, 2013). It advocated that during the teaching process, teachers should introduce or create vivid and specific scenes containing certain emotions with images as their theme, so as to initiate students’ attitudes and experience, and finally develop their mental functions. In the Situational Teaching Method, the “conceptions” dwelled in “situations”, the “learning” was guided by “emotion”, the “abstraction” was transferred into “image” and the “thinking” hid in “affection”. Children’s sense of sight, hearing, feelings and thinking went synchronously, and then formed “emotional memory” in their consciousness, which covered not only emotion and inner awareness, but also creative thinking, which included appearance and imagination.

The Heuristic-seeking Teaching Approach was proposed by Professor Zhang (1997) based on his several years of experience in teaching. Its core conception is that educators should turn “teaching” to “guiding” and “learning” to “thinking”. Also, it aims at enhancing students’ thinking ability by guiding and promoting students’ development. In the Heuristic-seeking Teaching Approach, teachers ought to inspire students to think positively with their leading role. Students, moreover, should think independently and exert principal force. The INQUIRY, which is characterized by observation and enlightening students actively, reflects the process, mode and method of teaching. In the teaching process, teachers should respect the psychological characteristics of teaching, obey the principles of thinking, and understand textbooks as well as their students in order to optimize the teaching process.
Based on the “subject education and children’s subjective development”, Professor Pei (2000) built up the Theory of Subject Education. The goal of the Theory of Subject Education is guiding students’ self-mining, self-development of creativity and training their ability to learn creatively. In the process of participation, it puts particular emphasis on positive thinking so that individuals should not only think independently but also discuss personal perspectives collectively by speculation, imagination, derivation, generating and forming creative ideas. Thereby, the information is restructured and transformed.

The Try Teaching Theory (Qiu, 1997), with the basic perspective that “students can have a try, trying enables success and success leads to innovation”, is based on the ideas that “trying is in the first place and introduction comes afterwards” and “exercise is followed by teaching”. Teaching activities highlight students’ practice so that they can gain knowledge, develop their thinking skills and cultivate their abilities. Try Teaching Theory makes it possible for students to play the dominant role sufficiently. In order to put students in an active position, some exercises are given to them at the very beginning. If students meet obstacles in their trying, they will do a self-study or go to teachers for help automatically. Then study becomes based on the students’ own needs (Liu, 2010).

Structure Teaching Method was put forward by Sun Weigang, a special-grade teacher in China (Tang, 2008). He suggested that knowledge is connected and can be comprehended by analogy. The thinking structure among different subjects was related and organized. In teaching activities, he asked students to: (1) find the original evidence for everything; (2) explore the relationship within knowledge all the time; (3) deepen the present understanding into philosophical views in a systematic way. Moreover, teachers should encourage students to trace the sources and search for links between different objects when they learn the content of texts or solve problems in detail. In this way, students can gradually form a deep-rooted thinking habit as well as an all-pervasive thinking mode. In the learning process, students can develop a temperament of automatic association and make their observation and thinking in a philosophical position so that they can have great powers of conception and march forward with irresistible force. Also, with the help of this method, students could size up the essence of problems, be better at finding, concluding and exploring the characteristics of objects and then extract general principles to direct them to solve new problems at any time or make additional correction and supplement for a philosophical understanding (Chen, 2012).

Chongde Lin (1999) is the most influential expert in teaching thinking in China. He developed a learning and development theory and applied it to classroom teaching in various subjects. Three thousand schools have taken part in his teaching thinking experiment in China. Most teaching thinking projects are based on his teaching thinking theory. Based on his theory and practice research, Lin (Lin & Li, 2003) proposed a thinking structure consisting of six components: self-regulation, purpose, materials, process, non-cognitive factors, and qualities and outcomes of thinking. Self-regulation of thinking is the supreme commander of the whole thinking structure, an invisible self underlying the visible self. Purpose of thinking refers to the direction and the expected outcome of thinking activities, or the realization of such functions of thinking as adaptation. The materials of thinking can be divided into two categories: concrete and abstract materials. Concrete materials include senses, perceptions, images and so on. The abstract material mainly refers to concepts. Processes of thinking include searching, discriminating, representing, imaging, comparing, classifying, analysing and synthesizing of thinking materials. Non-cognitive factors of thinking include mental factors that are not directly involved in cognitive process yet have a direct effect on them, including motivation, interests, emotions, affections, will, temperament, personalities and so on. Qualities of thinking are the criteria of assessment for the outcome of thinking. There are five main qualities of thinking: profundity,
flexibility, originality, criticism of thinking and agility. Training the qualities of thinking is the breakthrough point in the cultivation of thinking ability.

The main criticisms of the infusion approach (though this does not apply to all) are that thinking cannot be guaranteed to flourish in traditional curriculum and instruction. Lipman (1985, p. 106) points out that the traditional curriculum is fragmented, taught in isolated subjects. Schools have not had formal instruction in thinking because educators have wrongly believed that students would acquire thinking skills automatically through subjects (Ruggiero, 1995, pp. 5–6). Students have been taught what to think, but rarely how to think. A Thinking-Based Learning Theory is proposed by Robert Swartz and colleagues (2010). It is primarily about how we can make use of effective educational practices to infuse instruction in skilful thinking into standard content instruction at any education level and in any subject area to achieve dramatic improvement in students’ content learning.

In response to criticisms of the infusion approach to teaching thinking, a Thinking-Based Teaching Theory was developed and a “Learn to Think” (LTT) curriculum has been designed which draws on the strengths of both types. The Thinking Ability Structure Model (TASM), principals and basic requirements for thinking-based classroom teaching, LTT curriculum design, as well as the effects of intervention on primary and secondary school students will be introduced in this chapter.

**Thinking-based classroom teaching theory**

Based on Piaget’s cognitive theory, Vygotsky’s social construction theory and Chongde Lin’s thinking theory, as well as the viewpoints of good thinking, learning and teaching, a Thinking-Based Teaching Theory was developed. It includes the Thinking Ability Structure Model and five principles for teaching thinking.

**Thinking Ability Structure Model**

On the basis of Chongde Lin’s theory of intelligence and viewpoints of good thinking, a three-dimensional Thinking Ability Structure Model (TASM) is proposed.

But what counts as good thinking? Three views emerge most strongly from the teaching thinking tradition. The first is understandings of knowledge. Since the 1980s one strong contention has been that thinking ability is inevitably domain-specific. The philosophical argument for the function of knowledge in good thinking is expressed by John McPeck (1994, p. 111), who emphasizes the “so obvious and commonsensical” ideas that (1) there is no generalized thinking, only thinking about something; (2) a good thinker on one matter is not necessarily a good thinker on another matter; (3) the quality of thinking depends on the amount of knowledge about the topic and in the discipline to which it belongs; (4) teaching thinking must focus on teaching for understanding of the theoretical discipline. Some empirical studies suggest that the main factor in the good thinking of experts is knowledge; or rather their understanding of knowledge (Perkins & Salomon, 1989) and that it is knowledge which distinguishes the expert from the novice thinker.

The second viewpoint of good thinking incorporates the ideas of “thinking skills”. This viewpoint suggests that instead of imparting bodies of knowledge, we must impart to our students abilities of good thinking. Thus, the “educational market” would be filled with thinking skills of various qualities, for example, skills of critical thinking, of creative thinking or effective thinking (Marzano, 1988). Sternberg (1996, pp. 127–146) argued that successful intelligence included analytic intelligence, creative intelligence and practical intelligence but that these three need to work together.

The third viewpoint on good thinking relates to dispositions. Scholars in the field of teaching thinking use various concepts to describe the dispositional dimension of thinking. Dewey (1933, pp. 29–33) wrote of three attitudes: open-mindedness, whole-heartedness and responsibility.

Some integration of these three viewpoints was provided as long ago as 1943 by Russell who proposed that critical thinking had four components: knowledge of the field or fields in which thinking is being done; attitude and habit of questioning and suspending judgment; the application of logical and scientific method to problem situations; and taking action in light of this line of thinking (Russell, 1943, p. 746). Subsequently, he offered a concise definition: critical thinking seems to involve attitude plus knowledge of facts plus some thinking skills (Russell, 1960, p. 651). The Thinking Ability Structure Model (TASM) builds on this definition. It is an integrated model of thinking content (understanding of knowledge), thinking methods (thinking skills) and thinking quality (kinds of disposition).

In Figure 8.1, the x-axis is thinking content, y-axis is thinking method, and z-axis is thinking quality. The model has three basic characteristics. First, it is a whole system consistent with the idea that thinking ability consists of content, method and quality of thinking. They depend on each other, facilitate each other, develop together and form an integrated system. Second, the model is not static, but also has a developmental nature. Thinking ability should be a combination of both static and developmental structures. As knowledge is acquired, methods elaborated and quality advanced, thinking ability develops and the model becomes more complex and fully integrated. Third, the model has the nature of self-regulation under the influences of purpose of thinking, non-cognitive factors, the environment and social factors.

Each two-dimensional plane of the model has special meaning: the x–y plane (thinking content × thinking method) represents subject structure; the y–z plane (thinking method × thinking quality) represents general thinking ability, and the x–z plane (thinking content × thinking quality) represents understanding of the content.

![Figure 8.1 The Thinking Ability Structure Model (TASM)](image-url)
The TASM is consistent with the theories and practices of teaching thinking summarized above. Relating it to Lin’s six components of thinking, the thinking content dimension of the TASM represents the *materials* of thinking and *outcomes* of thinking. The thinking quality of the TASM is the thinking quality of Lin’s model. The thinking method of TASM represents the *process* of Lin’s model. Although the *purpose*, *self-regulation* and *non-cognitive factors* of thinking are important parts of thinking structure which influence the development of thinking ability, they do not belong to the area of ability.

**Principals for thinking-based classroom teaching**

To achieve its aims of cultivating children’s thinking ability, creativity, academic performance, motivation to learn, learning strategy acquisition and sense of self efficacy, we need not only well-described curriculum content but also advanced teaching methods, expressed in the following five principles:

**Stimulating interest and motivation:** Cognitive research takes account of affective and social aspects, and interest and motivation play an important part in thinking because thinking requires effort. Lin proposes that non-cognitive factors, including motivation, interests and so on, have a direct effect on cognitive processes. Therefore, our thinking-based teaching must aim not just to teach skills and knowledge, but also to develop interest and motivation in their use. All aspects of activity selection, from choosing activity content, materials and situations to producing cognitive conflict, teacher–children social construction, and reflection or transfer, are focused on stimulating children’s learning interest and motivation, encouraging children to explore learning methods and strategies, and staying positive and active in the acquisition of scientific thinking.

**Cognitive conflict:** This term comes from CASE, designed by Adey and Shayer (1994, p. 62). It is used to describe an event or observation which the students find puzzling and discordant with previous experience or understanding. Cognitive conflict is an effective means to stimulate children to think actively and can lead to constructive mental work by students to accommodate their conceptual framework to the new type of thinking necessary. It is a feature both of Piaget’s account of the impact of environmental stimulus and children’s constructivist response on cognitive growth, and of teaching thinking programmes.

**Social construction:** This comes from Vygotsky’s contention that social interaction is central to children’s development. The teaching environment for social construction needs to be constructed, and teacher–child interactions and child–child interactions are emphasized in the delivery of the “Learn to Think” curriculum. Teachers allow students to explain their reasoning to each other and to learn from each other’s errors through co-operative learning. Discussion is a well established method, but it must involve analysis of the processes of argument if it is to be effective in teaching thinking.

**Self-regulation and metacognition:** Underlying all these methods is the principle of metacognition, or self-regulation. Metacognition, a concept introduced by Flavell in 1976, is the awareness and control of your own thinking processes. Perkins and Salomon (1989) claim that metacognition is likely to be an essential element of any programme which is successful in improving general thinking skills. Adey and Shayer (1994, p. 68) also use this principle in CASE, and it is the overarching component of Lin’s thinking structure. The aim here is to give pupils practice in monitoring their own thinking, with the teacher initially making his or her strategies explicit and the learners then internalizing them, making them part of their habitual
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mode of thinking. Thus learning to learn means taking over from the teacher the control and management of your own learning and thinking. At the end of each activity, the students should reflect on and summarize the thinking methods, thinking strategies, problem finding and solving methods, and what they have got out of the activities.

**Application and transfer:** Generally, an activity in LTT or a special subject only belongs to a specific domain. The thinking methods and strategies studied in the activity need to be applied and transferred to daily life or other domains for training the thinking qualities and forming general habits of effective thinking. So there is broadening content (or “bridging” in Shayer and Adey’s terminology) in each activity.

Based on the five basic instructional principles mentioned above, we put forward four fundamental steps for Thinking-Based Classroom Teaching: lead-in, teaching process, teaching reflection and application. The goal of lead-in is to elicit the question. The basic requirements of lead-in are: stimulating students’ interest and motivation, causing students’ cognitive conflict and inspiring students’ thinking through observation and experimentation. The goal of teaching process is to enable students to master knowledge and skills, to cultivate the students’ abilities and non-intelligence. There are four basic requirements of teaching process. First, create teaching situation, cause students’ cognitive conflict and stimulate students’ interest and motivation. Second, pay attention to the interaction between teachers and students and the interaction between students, especially the interaction of thinking. Third, strengthen the methods learning in the procedure of knowledge formation. Fourth, lay stress on students’ exploring ability; cultivate students’ ability. The goal of teaching reflection is to master the knowledge, method of the lesson, reflect on the experience and format the cognitive structure. Four basic requirements should be given attention: first, students conclude what they learned through the teacher’s guidance. Second, students conclude the knowledge and the methods they learned in the class. Third, students master the ins and outs of the knowledge and format the cognitive structure. Last, students conclude that they learned. The goal of application is to apply and transform knowledge as well as methods, and cultivate students’ ability to analyse and problem solve, as well as their creativity.

**Basic requirements for thinking-based classroom teaching**

Core activity in classroom teaching is thinking, therefore, we come up with the basic requirements for classroom teaching according to principles of thinking-based classroom teaching.

**Make clear classroom teaching goals:** Thinking, which is generated by interactions between subject and object, is a kind of rational recognition based on perceptual messages. The premises of rational recognition include conscious orientation, predicting the future inititatively, making plans, remaking nature and reforming society consciously, self-control. Therefore, purposiveness is the radical character of thinking, also cardinal is the composition of a “triangular structure”, reflecting consciousness, directionality and motility of thinking. As a kind of purposeful and planned classroom teaching designed to promote knowledge learning, ability development and attitude formation, clear teaching goals are essential. First, we should make clear teaching goals and plans according to students, teachers and teaching contents. Second, we should induce cognition conflict, further to activate active thinking. Third, focus on “How the students raise a question” and purposiveness and orientation for students to analyse and solve problems, desiring to enhance conscientiousness and motility in thinking.

**Highlight the process of knowledge generation:** The process of thinking is the second component of thinking structure, emphasizing not only analysis, synthesis, abstract, summarize, comparison,
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classification, systematization and materialization, but also the frame and index of thinking: make goals clear; receive information; process and code; generalize and abstract; operate; achieve success. Knowledge can be divided into descriptive knowledge and procedural knowledge, telling us “What” and “How” respectively. In classroom teaching, we should highlight the process of knowledge generation and pay attention to many kinds of teaching method. First, we should highlight the generation of conception, rules, theory and so on. Second, promote the students to master the method of building conception and rules, generalizing knowledge, analysing and solving problems, observing, trying and thinking. Third, induce students’ cognition conflict by questions which need high cognition resources and give them enough time to guide active thinking.

Connect students’ prior experience and knowledge: The students’ knowledge and experience play an important role in constructing new knowledge, promoting students’ thinking development. First, we must recognize that learning is an active constructing process and knowledge is the rationalization of individual experiences, teaching is the process by which teachers help students’ active construction of knowledge. Second, since previous experience is of great importance for learners, teachers should enumerate typical examples of life appropriately to arouse students’ perceptual knowledge, show about the occurrence, development and change of phenomena and processes by observation and experimentation, as well as connect students’ prior life experience and knowledge for teaching, so as to make them truly understand and master knowledge. Third, it is essential to attach great importance to the thinking of primary and secondary students, create all the conditions for increasing students’ abstract thinking materials with the development from concrete images to abstract logic thoughts, and then improve the abstraction and logicality in thinking activities, and thus enhance their ability to understand abstract knowledge.

Pay more attention to fostering non-intelligence factors: Non-intelligence factors, which include motivation, affect, will, temperament, personality and so on, play dynamic, stereotypical and compensatory roles in students’ learning. Thinking activity is the unity of the intelligence and non-intelligence factors, which cannot be separated from each other. If this idea is applied to classroom teaching, the requirements will be as follows: one is to take the cultivation of non-intelligence factors as a goal, which refers not only to the affection, attitude and values that come up in the basic education reform, but to the special attention paid to motivation, interest, ideals and beliefs, world view and so on; the second is to create a pleasant teaching environment to stimulate students’ learning motivation and interest. Furthermore, the creation of a pleasant environment and the mobilization of affective factors aim to have students think actively and improve the effectiveness of classroom teaching.

Training students’ thinking quality and improving students’ intellectual ability: The quality of thinking refers to intellectual activities, especially the individual performance on intelligence and ability characteristics in thinking activities, which embodies the difference on individual thinking level, intelligence and ability. Profundity refers to the abstractive degree and logical level of thinking activities and the breadth, depth and difficulty of thinking activity. If students have the quality of thinking depth, they can think logically and systematically, grasp the essence of problems, and have good reasoning. Flexibility refers to the flexible degree of thinking activity. It reflects the “migration” of intelligence and ability and it has four distinctive features: the first one is the flexibility in thinking direction. It requires students to be able to think from different angles and in different ways, and be able to apply different knowledge and solve the problem correctly in different ways. The second one is be agile in the process of thinking. It requires students be able to approach questions from analysing to comprehending and from comprehending to analysing. The third one is be flexible of your thinking result. It requires students have a diversifying, flexible
and rational thinking result. And the fourth one is migration ability. It requires students to be able to positively transfer knowledge and methods effectively. Criticalness is an intellectual quality which requires students to be able to estimate thinking materials strictly and check the process of thought carefully in thinking activities. It has five characteristics including the intellectual qualities of analytics, strategy, comprehension, independence and validity. Agility refers to the speed based on correct rate, originality, named creative thinking. It requires students be able to think independently and find and solve problems creatively, uniquely, with novelty and divergently. The five qualities of thinking can overall reflect the students’ thinking ability, so training students’ thinking quality is the breakthrough to cultivate students’ abilities in the process of teaching and learning. And then provide a scientific theory and effective operation method for promoting the development of students’ thinking ability in classroom teaching.

Create good teaching contexts: A good thinking environment is the precondition of positive thinking. Therefore, during classroom teaching, teachers are required to create good teaching contexts to promote the initiative thinking of students. First, creative teaching contexts should be established. In creative teaching contexts, teachers adopt a democratic teaching method, and treat every student equally; build a “student-oriented” educational concept that focuses on cultivating students’ consciousness of innovation and creative ability; they also encourage their students to think independently, to be innovative and to challenge authority; and an invigorating class atmosphere could be constructed, in which students would learn and actively participate in the class. Second, teaching contexts that encourage students to express their queries should be established. Teacher’s attitude toward students’ queries refers to the general and stable mental disposition of the teacher toward a student query, including positive disposition and negative disposition. Teachers should maintain a positive attitude toward students’ queries, which means they should like, support, encourage, and guide students to express their queries. Third, teachers should make efforts to ask high cognitive questions. High cognitive questions are those that can lead to students’ cognitive conflict, and inspire their positive thinking. On the other hand, we should be aware that creating teaching contexts is just a kind of strategy, the purpose of which is to inspire students’ active thinking and learning.

Teach according to different aptitudes: Diversity of intelligence and differences of personality are taken seriously by a growing number of people. The theory of multiple intelligence proposed by Gardner has largely influenced practices of education. We also believe that thinking and intelligence are multiple structures that can hardly be counted thoroughly, thus, we propose subject ability based on it. The difference between students is an objective reality: from the aspect of developmental levels, it can be categorized as supernormal, normal and subnormal; from the aspect of developmental ways, there are differences of cognitive pattern; from the aspect of constitute types, it may manifest as different combinations and application of various subject abilities; from the aspect of its representation areas, there are differences in learning area and non-learning area, in performance area and non-performance area, academic area and non-academic area. Therefore, the diversity of thinking and intelligence and the difference between individuals require us to teach according to different aptitudes.

Thinking-based classroom teaching practice

A “Learn to Think” curriculum (LTT)

Based on TASM, Piaget’s cognitive development theory, and Vygotsky’s social construction theory, a “Learn to Think” curriculum has been designed consisting of a series of learning
situations that are planned to be conducive to the development of students’ thinking methods or strategies and improving the quality of thinking.

The structure model TASM is designed as a theoretical foundation for the cultivation of thinking ability. It tells us that the cultivation of thinking ability requires the teaching of thinking methods, the training of thinking quality and that these must be set within the context of a body of knowledge.

Piaget proposed that children proceed through four stages of cognitive development: sensorimotor, pre-operations, concrete operations and formal operations. Each stage has major cognitive tasks which must be accomplished. In the sensorimotor stage, the mental structures are mainly concerned with the mastery of concrete objects. The mastery of symbols takes place in the preoperational stage. In the concrete stage, children learn mastery of classes, relations, and numbers and how to reason. The last stage deals with the mastery of thought (Evans, 1973).

Vygotsky asserted that children’s development can be fostered both by adults and by more competent peers when working in the “zone of proximal development” – the difference between “the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). Based on the notion of a zone of proximal development, Vygotsky propounded a new formula, namely that the only “good learning” is that which is in advance of development (p. 89). Vygotsky argues that social interaction is essential for children’s development and that by verbalizing their reasoning they accept reasoning at a higher level than they start out with.

The theoretical foundations for the design of the difficulty of activities of the Learn To Think curriculum embrace notions from Piaget’s account of cognitive development which allows specification of the cognitive complexity of tasks, Vygotsky’s zone of proximal development and the principle that good learning must be in advance of development. On these bases, the difficulty of activities is adjusted not just to match but to provide a challenge to and so promote the development of students’ thinking ability.

Thinking contents – x-axis: Because abilities as measured are largely domain-specific, activities of the thinking curriculum are contextualized in almost all areas studied by students including mathematics, language and literature, science, society, art, other disciplines and daily life experience. The x-axis includes six factors.

Thinking methods – y-axis: The curriculum incorporates the thinking methods of concrete thinking (observation, association, imagination, space cognition), abstract thinking (comparison, combination, classification, inductive and deductive reasoning, analysis and synthesis, abstraction and generalization, composition, philosophic thinking), and creative thinking (reorganization, analogy, brainstorming, lateral thinking, divergent thinking, transfer, set break through, question asking, exploring activity, story inventing). So the y-axis contains 22 factors.

Thinking qualities – z-axis: Thinking qualities promoted by the curriculum include profundity, flexibility, critical thinking, agility and originality. As a result, there are five factors in the z-axis.

In total, the three-dimensional TASM described in Figure 8.1 offers 660 cells, and the x–y plane representing subject structure provides 132 cells, for each of which activities may in principle be designed. Drawing on their experience of primary and secondary education in China, we interviewed primary and secondary school teachers of different subjects, and asked them to select those which they thought would stand for the main thinking abilities in primary and secondary school students. The result suggested that some aspects were believed to be more important than others and on this basis, activities for all children in primary and secondary schools were designed. Every grade from 1st to 8th has its specific manual, each
including 24 activities covering different thinking content and methods. The thinking contents are used as the carrier, the thinking methods are the main thread, and thinking qualities are trained in each activity.

The “Learn to Think” curriculum involves three types of training: basic thinking strategy training, problem solving skills training and creative thinking skill training. Basic thinking skills training is completed through establishing the learning situation, thinking method recognition, method deduction, method application, evaluation and reverse transfer consolidation, and transfer consolidation. Problem solving skill training is completed through introducing a problem, problem analysis, brain storming, selection of the best method, evaluation and reflection, and consolidation via transfer practice. Creative thinking skill training is completed through task introduction, preparation activity, deductive reasoning, brain storming, choosing the best answer, producing a result, evaluation and reflection, and consolidation transfer.

In summary, LTT has five characteristics: (1) Suitability. The difficulty of each activity is in the “zone of proximal development”, and it is not only suitable for, but also can promote the development of thinking ability of students. (2) Systematization. The whole project covers almost all the thinking methods appropriate for students across the eight grades from the first grade of primary school to the second year of secondary school. Each thinking method appears in different grades, and the thinking difficulty increases with grade. The whole curriculum trains the thinking ability of students step by step in a spiral manner. (3) Diversity. Drawing on the strong points of teaching thinking programmes, activities of LTT include thinking method training, space cognition, problem finding, problem solving, scientific inquiry, story inventing and so on. (4) Elicitation. Each activity is planned to induce some cognitive conflict in students, encouraging them to think actively (Adey & Shayer 1994, pp. 62–65). (5) Gradualness. The arrangement of activities accords with the character of student thinking, from simple to complex, from shallow to deep, from easy to difficult, step by step, to enable students improve the ways of thinking gradually.

LTT had been implemented for more than 10 years in 300 primary and secondary schools. More than 200,000 students took part in the experiment. It has been assessed by using scientific methods. Results showed that LTT had long-term far transfer effects on thinking ability (Hu et al., 2011), academic achievement (Hu, et al., 2011), scientific creativity (Hu, et al., 2013), creative personality (Wu, et al., 2012; Jia, et al., in press), and learning motivation (Jia, et al., 2012) of students.

**Conclusion**

In this chapter, A Thinking-Based Classroom Teaching Theory and Learn to Think intervention programme that combines elements of out-of-context and infusion methods of teaching thinking have been introduced. We have shown that Thinking-Based Classroom Teaching Theory and Learn to Think intervention programmes grounded in psychological theory and represented by a multi-faceted theoretical model can have a consistent, long-term, and growing effect on students’ general thinking ability, academic achievement, creativity, creative personality, learning motivation as assessed by using scientific methods. We suggest that the Thinking-Based Classroom Teaching Theory and LTT curriculum will prove to be valuable across China and further afield.

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References


