Kekang He

New Theory of Children's Thinking Development: Application in Language Teaching

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Preface

In this Internet era, many traditional concepts and theories need to be revised. Education theories especially need reexamination. This is necessary because, in this Internet era, information technology typified by computer and network communication has exerted increasing influence and has brought about alterations to our ways of production, work, learning and even life. Typified by computer and network communication, information technology is not just ordinary technology, but is today's greatest and most dynamic concrete manifestation of productivity. As the "big two" of information technology, computer and network communication combine perfectly to produce the Internet. Ever since its birth, the Internet has been in rapid expansion both in its technical connotations and in its field of application, and these two continue to be in a stage of rapid development even now.

Dialectical thinking means observing and analysing matters from the perspective of dialectic. That is, respecting objective laws, valuing researches and investigations, as well as being realistic and seeking truth from facts. A basic tenet of dialectical approach is that development should cope with time. Thus, in the Internet Era, "Innovative Theory, Advancing Concept" is the vital requirement for social development. We will fall behind, and even be abandoned by time, if we stick with conventional theory. But if constant breakthroughs in thinking and concept are made, we will be the trend setters, walking in the forefront of time and will promote progress in accelerated development in different areas, including education. Since 2000, real-life proof of this has been provided by innovative experiment on the leapfrogging development approach in language teaching that has been carried out in a large number of schools across the country.

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Chapter 1
Innovative Exploration of an Leapfrogging Development Approach to Language Education in the Internet Era

1.1 Targets of the Experiment

Since September, 2000, the Contemporary Pedagogical Research Institute of Beijing Normal University has been carrying out a revolutionary experiment in 2 primary one classes (with a total of 80 students) of Nanshan Experimental School (Primary Section) in Shenzhen. It is a web-based experiment which effectively integrates information technology into language teaching. It was conducted mostly under a network environment. (Students usually had lessons in a networked class-room that was connected to the Internet, and each of them had a computer which could access the Internet at anytime. Apart from that, most students had access to the Internet at home as well.) **The experiment strives to enable Chinese children to "read and write" in around 2 years, that is to master 2500–3000 common Chinese characters, read popular literatures without difficulty, and write structurally complete and fluent passages of 800–1000 characters**. According to the standard of the new curriculum, these goals can only be achieved after at least the tenth semester (i.e. primary 5–6). That is to say, the teaching efficiency required to attain the targets of the experiment is at least double that needed in reaching the traditional targets. Thus, this education reform experiment is named **"innovative experiment on an leapfrogging development approach in language teaching" (Leapfrogging Development Experiment)**.

1.2 Overview and Outcomes of the Experiment

It is 10 years since the Leapfrogging Development Experiment commenced in Shenzhen Nanshan Experimental School in September, 2000. The total number of schools enrolled in the experiment exceeded 130, including national or provincial

prestige schools, as well as schools with very poor student source and school conditions. Careful investigation was carried out on the type of teaching materials that would best suit the experiment. Up till now, the Leapfrogging Development Experiment has roughly gone through the following four developmental stages:

1.2.1 Stage 1—Initial Formation of Theoretical Method (National Prestige Schools, Specialized Teaching Materials, Internet Environment)

This stage lasted from around September, 2000 to July, 2002. It is the initial formation stage of the theoretical method of the Leapfrogging Development Experiment. This stage had the following characteristics: (1) A comprehensive theoretical method was not yet established, since it had just been proposed; (2) There was a serious lack of teaching materials; (3) The teaching mode and method for our innovative approach was not yet confirmed. Yet, with the active participation of teachers and students, and the great attention paid by the principal of Nanshan Experimental School, the experiment there was able to achieve quite outstanding results: Students in the two experimental classes had already learned 746 words at the end of the first semester (January, 2001), and at the end of primary one, they had acquired nearly 1900 words. This huge number of words was not attained through intensive "concentrated character recognition", but in a comparatively relaxed way through extensive reading. The experimental classes made an effort to create a relaxed and pleasurable learning atmosphere. An "edutainment" mode of teaching was frequently adopted in conducting reading activities (and sometimes even reading competition) involving fairy tales, fables and idiom stories. Close connection was also made between the knowledge gained during reading and matters that students had contact with in their daily lives, so as to further trigger their interest in learning, making them willing and happy to learn. After practising such literacy teaching and extended reading training for two semesters, there was a swift improvement in the reading ability of students in the experimental classes. Most of them (above 85 %) were able to read without difficulty popular reading materials (including teenage readers, newspapers and magazines, and even the starter edition of *Romance of the Three Kingdoms*).

   Along with literacy teaching and extensive extended reading, teachers also guided students to express themselves through writing with computers. At the beginning, they put no limit on the number of words students should type in their reflections on reading materials. This trained students' composition ability to a much greater extent than was expected by teachers. Initially, students could only write reflections of one or two sentences. But in just over half a year, they were able to complete, on average per student, a 100–300 word writing exercise every day. All these writing activities were conducted at the students' own initiation and will. They were not homework that students were forced to hand in. The students were able to write fluently and record their feeling and thoughts on daily

life. Their writings were realistic and touching. They were also able to use rhetorical devices, for example, metaphor, parallelism and personification (Yu 2001), in a more proper sense. It was gratifying that near the end of primary one, some of the more able students in the experimental classes were able to complete daily exercise of nearly a thousand words with high readability. It is especially worth mentioning that some among them could even compose their own science fiction, e.g. a new version of *Journey to the West*, and an adapted version of *Romance of the Three Kingdoms*. A six-year-old boy in the experiment classes created an adapted version of *Romance of the Three Kingdoms* by switching the original characters and story to modernized weapons and battlefields. He had Zhuge Liang commanding missiles, planes, rocket infantry, and added some new episodes. At the end of primary one, he had already edited 7 chapters amounting to 17,000 words. The rich imagination and stronger analytic ability displayed in his writing were astonishing.

Apart from conducting teaching activities in character recognition, reading and writing earnestly, teachers of the experimental classes also paid special attention to cultivating students' creative thinking with various methods, including leading divergent thinking, inspiring association and imagination, and encouraging analysis and investigation. For instance, after studying a fairy tale in the text, teachers would often lead students into divergent thinking and multi-directional thinking, so that students could put themselves in the shoes of different characters in that tale, expand or adapt the original plot and type it out immediately during the lesson. Inspired and motivated by teachers in this way, not only did the short stories composed by students stick firmly to the topic, rich in personal style and with playful elements typical of children, but some were even more marvellous than the original text. It was particularly delightful that such little stories were not only the creation of one or two children, but that most students in the experimental classes were performing excellently along similar lines (Yu 2001).

Shenzhen Nanshan Experimental School had already conducted several rounds of experiment in sequence since September, 2000 (in 2001 and 2002, some classes still continue to participate in the second and third round experiment). The achievements of students at the end of the first academic year showed that the more able students in the experimental classes (about 15 %) had basically reached the above experiment targets in only one year (that is, mastering about 2500–3000 Chinese characters, and typewriting with pace passages of 800–1000 words). The other students (with few exceptions) were also able to come close to the targets. They were able to master about 1500–2000 characters, and typewrite with pace passages of 200–500 words. The first, second and third rounds of the experiment suggested that there would be no problem for the majority of students (more than 85 %) in this school to recognise and read about 3000 Chinese characters after only 2 years. Theoretically, there would also be no problem for primary two students to typewrite with pace passages of hundreds or even more than a thousand words. When various aspects of the writings were compared, namely, ideological content, logic and depth of contents, students in these two primary experimental classes fell behind the ordinary (non-experimental) primary five or six students.

(This is no doubt closely related to, for example, the knowledge base, cognitive level, and life experience of students in different grades.) Yet, if judged only from the requirements of language teaching in character recognition, reading and writing abilities, it should be said that the experimental class students had attained all of the above accelerated development targets.

1.2.2 Stage 2—Gradual Refinement of Theoretical Method (Provincial Prestige Schools, Common Teaching Materials, Internet Environment)

Although the experiments conducted in Shenzhen Nanshan Experimental School were quite successful, the teaching materials used by the school at that time were special experimental materials developed locally. These materials had more new words, and they involved greater difficulties in teaching, making a higher demand on teachers. They lacked generalizability. Thus, some teachers showed little conviction regarding that school's achievement. They were unsure if this kind of innovative Leapfrogging Development Experiment bore meanings and values that should be extensively promoted. Therefore, in order to explore the influence of teaching materials on the result of the experiment, the Leapfrogging Development Experiment was also carried out in Guangzhou East Dongfeng Road Primary School, beginning in September, 2002. Language teaching materials that were most commonly used in China (published by the People's Education Press) were adopted, and two primary one classes with more than a hundred students formed the experimental classes. This experiment also achieved outstanding results, exceeding the expected target. The language teacher of the experimental classes reported that after conducting the experiment for two semesters, students in the classes had already acquired the same level of character recognition, reading and writing as her previous primary four students. She also said that examples of more outstanding compositions were produced by some students. In order to show this achievement, East Dongfeng Road Primary School compiled the selected compositions of the two primary one experimental classes into a book and officially published it with the title "*The First Glimpse of Talent*" ("*Xiao He Cai Lu*") in August, 2003.

In May, 2004 (that is, when the experiment had been conducted for less than 2 years), most students in the two experimental classes of East Dongfeng Road Primary School had attained the language proficiency standard of primary 5–6 as prescribed in the new curriculum. The majority of them were able to read different kinds of reading materials, including classics. They could compose narrative writings of more than a thousand words. Some had even produced science fiction texts of ten thousand-odd words, and many others had built personal homepages to display their prose writings and poems.

As the experiment conducted in East Dongfeng Road Primary School employed the most commonly used teaching materials in the country published

by the People's Education Press, it had higher generalizability and was more persuasive. Thus, the success of the experiment in this school triggered a strong reaction from China's language education circle. Endless streams of people visited the school and its class. (Visitors included not only language teaching experts from Guangdong province and Guangzhou, but also principals and teachers from other parts of the country.)

1.2.3 Stage 3—Increasingly Sophisticated Experiment (Ordinary Schools, Common Teaching Materials, Internet Environment)

After gaining success in the experiments with Shenzhen Nanshan Experimental School and Guangzhou East Dongfeng Road Primary school, it was believed that the Leapfrogging Development Experiment could probably be promoted to a greater extent. However, while seeking opinions on it, some leaders of the education sector and pedagogical researchers raised a question—"Both Shenzhen Nanshan Experimental School and Guangzhou East Dongfeng Road Primary School are national or provincial prestige schools. These schools enjoy better facilities and higher quality teachers. It is only to be expected that the experiment would be successful in schools like that. But in other schools, especially those in poorer conditions, can it attain success there as well?" It is indeed natural for leaders and teachers to be doubtful about it. To clear their doubts, theory alone is not enough, but facts are needed. So, starting from September, 2003, the Leapfrogging Development Experiment was conducted in a school with the worst student source (Pak Mong Primary School) on the urban fringe of Nanshan District under substantial support of the Shenzhen Nanshan Education Bureau. None of the parents among the 500 odd students in the school were civil servants, teachers or businessmen, and none were regular workers either. 90 % of the students came from families of rural households, migrant workers, or vendors in the vicinity of Pak Mong Village and Ma Hom Village. They were in a relatively poor economic condition. Only less than 10 % of the students came from families of long-term residence. Though these families were in a better condition, most parents were jobless and had low education levels. The school also bore another characteristic—Its students had high mobility. The transfer rate in every semester was above 12 %. Other than that, none of the students had attended kindergarten. They had nearly zero preschool education. When Leapfrogging Development Experiment was conducted in the primary one class of the school in September, 2003, some students were not even able to speak Mandarin. (Their parents were workers from Sichuan or Hubei.) In addition, the facilities of the computer room were old and outdated, and there was no access to the Internet. This posed many problems for the experiment. And the teachers participating in the experiment did not have much faith in it. They thought that with such poor student source, it would already be a great

achievement if the students could catch up with the ordinary teaching progress, not to mention accelerated development. One even believed that "accelerated development is just a fantasy for schools like ours".

Yet, after a little more than half a year's concentrated effort and hearty cooperation by the principal, participating teachers, and members of the experiment's steering group, initial success in the experiment was seen in the school. In April, 2004: (1) Most students (including those who could not even speak Mandarin at the very beginning) had gained basic IT skills and a certain level of reading and writing ability; (2) Not only could they read some simpler popular literature, namely, fables, fairy tales and idiom stories, but they could also typewrite with computers short passages of 100–200 words displaying some playful elements typical of children; (3) After mastering how to use computers and access the Internet, many students taught their parents as well. The students' swift progress not only surprised the teachers who had joined the experiment, but parents were really excited as well. They were grateful to the school for carrying out the experiment. Some who originally planned to let their children study on a temporary basis in Pak Mong Primary School and were prepared to change to a better school after some time now changed their mind and decided to stay with the school. Principal Wang Shui Ping of Pak Mong Primary School said with deep feeling, "Not only can Leapfrogging Development Experiment bring a general and efficient improvement in students' ability to recognise characters, and to read and write, what's more surprising is that the atmosphere (diligence, proactivity, solidarity, civility and so on) of the experimental class is also much better than in the other classes. We should really reflect on it seriously and give deep thought to it!".

To extend the influence of the Leapfrogging Development Experiment, the Shenzhen Nanshan Education Bureau held a live demonstration of the education reform experiment at Pak Mong Primary School on 27th April, 2004—Observation of Chinese and English demonstration lessons of the experimental class of Pak Mong Primary School. Observers included teachers and pedagogical researchers of the Nanshan District, as well as 47 teachers who came all the way from the 12 Zhongshan schools which joined the experiment. The demonstration had a good outcome: Teachers (both from Nanshan District and from Zhongshan) who came for the demonstration all agreed that from the confidence students showed in class and their ability to express themselves in words (both in their mother tongue and in English), they showed no trace of the shortcomings understood to be characteristic of children from rural areas. Their performance in general even surpassed that of their counterparts in some outstanding schools in the urban area.

By joining the Leapfrogging Development Experiment, the experimental class in Pak Mong Primary School was able to achieve a much better academic result than the control class. After the second semester of primary two (that is, midway through the experiment), teachers enrolled in the experiment felt that students in the experimental class had shown more obvious improvement. The teachers' confidence—both in the experiment and in their experimental class students—was greatly enhanced. Even the teacher who thought that with very poor student source, "accelerated development is just a fantasy for schools like ours",

completely changed his view, and said with much pride, "The experimental class students of our school are comparable to their counterparts in any of the urban schools. Our students are definitely not inferior to them in terms of knowledge, skills, or morality."

1.2.4 Stage 4—Multilevel Experiment (Rural Schools, Common Teaching Materials, Non-internet Environment)

Not only was the Leapfrogging Development Experiment able to acquire encouraging results in Shenzhen Nanshan Experimental School, Guangzhou East Dongfeng Road Primary School, and Pak Mong Primary School in Shenzhen Nanshan District which had a poorer student source and conditions, but many other schools (e.g. Xiang Nan Primary School and Nanshan Primary School in Shenzhen, Pei Zheng Primary School and Jian She Main Road Primary School in Guangzhou Dongshan District, Yang Xian Yi Primary School and Shiqi No. 1 Primary School in Zhongshan, Cheng Nan Primary School and Er Mao Primary School in Beijing Changping District) that enrolled in the experiment at different times also had outstanding outcomes. They reached, or were approaching, the targets of the Leapfrogging Development Experiment. These cases and facts fully proved that: (1) The theory and approach of "accelerated development in language teaching" are effective; (2) Student source, school conditions, and teaching materials (all materials that meet the requirement of the new curriculum could be used in the Leapfrogging Development Experiment) are irrelevant to the outcomes of the experiment; (3) Even schools with poorer student sources can attain a huge improvement in their quality and efficiency of teaching through the Leapfrogging Development Experiment, and can achieve accelerated development in language teaching. That is to say, the theory, mode, and approach of the Leapfrogging Development Experiment embrace both practicability and generalizability.

In June, 2004, a "Basic Education Leapfrogging Development Experiment Experimental District" was set up in Heibei Fengning, a national poverty alleviation county, with substantial support from the leader of its Education Bureau (1 secondary school and 5 primary schools joined the Leapfrogging Development Experiment at first. At the end of 2005, a total of 10 schools had enrolled in the experiment). Special attention was placed on how accelerated development could be achieved in a conventional teaching environment without the support of the Internet. This will bring the Leapfrogging Development Experiment into a new phase of development. That is to say, in future, there will be two types of Leapfrogging Development Experiments: "First Level Leapfrogging Development Experiment" (aka "Internet-based Leapfrogging Development Experiment"), and "Second Level Leapfrogging Development Experiment" (aka "Non-Internet-based Leapfrogging Development Experiment") which would be conducted in conventional teaching environments.

1.3 Major Factors Contributing to the Success of the Experiment

It is believed that there are three major factors that enabled the Leapfrogging Development Experiment to bring about a large surge in language teaching quality within a shorter timeframe.

1.3.1 The Internet Provides Rich and High Quality Teaching Materials that Enable Extensive Extended Reading

As stated before, normally, the Leapfrogging Development Experiment was conducted in an Internet environment. (Indeed, it could also be conducted in the conventional teaching environment without the support of the Internet. This concerns the mode and approach of practice of the "Second Level Leapfrogging Development Experiment". A lengthy discussion of this is not provided here as there is a special paper devoted to it.) All students had direct access to the Internet through the PC in their school, and this served to extend their scope of reading and broaden their horizons. The teenage and children-oriented Chinese websites of China already include a considerable number of multimedia fairy tales, fables, and idiom stories with illustrations, and even audio recordings and animations. As an example, the famous website "Tong qu" has hundreds of stories like this. Curiosity is a natural trait of children and teenagers. Naturally, they love listening to stories and reading picture books. Multimedia fairy tales, fables or idiom stories are "picture books in motion", and they are especially attractive to children and teenagers. Thus, children will search for them eagerly in relevant websites without the request of teachers.

Taking into account this special characteristic of children, teachers made in-depth analyses of the learning objectives of each lesson, grasped the key points and difficult points, analysed them and discussed them in various ways. They guided and inspired students in thinking seriously or doing group investigation about the key issues rather than spending too much time on lecturing the general content of the text. With all this, a certain amount of time in the lesson was left free for students to direct their own learning. Students would access the Internet and carry out extended reading of materials that were recommended by teachers. These materials were carefully chosen by the teachers and were multimedia materials that were directly related to the themes and contents of each lesson. Students could also share among themselves textual materials or pictures that they had collected before the lesson. In this way, all students could read pieces of further readings during every lesson (5–6 pieces at most, 2–3 pieces at least). In addition to self-directed reading, teachers also encouraged students to share their gains and feelings during the reading process with their neighbours; or they organized group investigation, role play and class discussion to foster students' understanding of

the text. Traditional classroom teaching relied merely on the lecturing by teachers on the text, and usually material other than the text would not be read during lesson time. Occasionally there were some supplementary materials, but these were printed textual materials, which were relatively short and boring, and usually ineffective, as they failed to trigger students' interest. The reading quantity and quality of the traditional approach was no match for that of the self-directed multimedia extended reading in the Internet environment. Self-directed extended reading through the Internet enabled students to gain a much more substantial increase in vocabularies in every lesson than with the traditional teaching approach, in which there are only 12–13 new words in each text, compared with those of the experiment, each of which has on average more than 25 new words. Furthermore, as the extended reading was carried out completely at the students' own initiation and will, and full of fun, students experienced no stress or burden, although there was a significant increase in vocabularies.

1.3.2 Isolation and Separation of Character Recognition, Reading and Writing in Traditional Teaching is Altered—The Three are Integrated Dynamically in the Information Technology Environment, Achieving the Important Reform of "Use-centred" Language Teaching

The experiment stresses that students should learn to recognise a vast quantity of Chinese characters as quickly as possible when they are in primary 1, but does not put too much emphasis on their ability to write the characters by hand. These characters that students are required to recognise and pronounce are incorporated into reading materials, namely, nursery rhymes, riddles, stories, fairy tales, and ballads. The content of these reading materials is what the students love and have been familiar with, or have had basic understanding of, before they entered school. During the teaching process, students' abilities to read, say and recite the materials are stressed, and correct understanding of the content is emphasized. Students are not required to learn to write the words by hand immediately. **(Note that this does not mean that nil importance is attached to handwriting teaching. It merely means that unlike reading ability and writing ability, the same level of substantial improvement is not required in the ability to write Chinese characters by hand. Yet it strictly follows the requirement of the curriculum, and training in writing Chinese characters by hand is to be completed by the time of graduation from the primary stage.)** Rather, they are required to type the words out with computers (as it is much easier to do that than to handwrite them). In this way, children would learn to recognise characters quickly, and to write some of them as well. They were able to use computers to make up phrases, construct sentences and typewrite short passages, and at the same time, to read the

text fluently. This "3-in-1" approach to character recognition, reading, and writing in teaching enables students to learn in very little time dozens of words by studying each text. Through repeated occurrence and usage in extensive extended readings, making up phrases, constructing sentences, and typewriting short passages, these words were swiftly consolidated.

It is worth emphasizing that one of the important innovations of the Leapfrogging Development Experiment is that unlike the traditional teaching approach, it does not isolate and separate character recognition, reading and writing, but integrates the three together dynamically in an Information Technology environment. As stated before, the highly efficient character recognition teaching in this experiment was not carried out in isolation, but was achieved at the same time with extended reading. It was only by extended reading that the most ideal environment and conditions were created for consolidating and transferring the effects of character recognition teaching. Apart from that, after reading the materials on the websites, teachers also encouraged students to express their feelings and thinking in the class message board on the school website (through typewriting with computers). No rigid requirement was given on the topic and word limit. The teachers only hoped that after each lesson's extended reading, students could express their feelings and thinking by typewriting. They would give timely feedback to students' writings on the class message board, carrying out necessary communication with students, and correcting wrong characters and sentences. Students who had written a good piece would also be praised in the next class. Initially, students could only typewrite one or two sentences. But with the above procedures, they were able to typewrite ten to twenty sentences after 2 months, and proceed to typewrite short passages of few hundred words fluently in just over half a year's time. They were also able to use rhetorical devices, namely, metaphor, personification and parallelism more properly in their passages. Some of the more able students could even write more than a thousand words in one assignment with quality and distinctive personal style. Such a result was achieved by having a dynamic integration of character recognition, reading and writing in the experiment. Swift character recognition was closely followed by a large quantity of readings, and encouragement was then given to students to "write" on the message board (typewrite with computers).

The whole language teaching process was **use-centred rather than language analysis-centred**. Language was learned by using it in the actual context, but not by analysis of phrases and sentences. It is obvious that "standardized and easy-to-learn computer typewriting" is essential to such an innovative language teaching approach. It is unrealistic to urge primary one students to handwrite passages of hundreds or even a thousand-odd words. (If this is forced to be done, it will greatly increase the students' homework burden.) Without "composing passages", the target to integrate character recognition, reading and writing would be impossible, and the "**use-centred**" teaching approach would then become a fantasy. Here, **"computer typewriting" is not merely a writing tool that is substituted for handwriting, but a teaching strategy that fosters the dynamic integration of character recognition, reading and writing. It is also a cognition**

**tool that enhances serious thinking, self-directed investigation and high
level psychological processing**. This is a powerful proof that using Information
Technology correctly is vital in achieving higher level subject teaching reform and
accelerated development in education.

1.3.3   Breaking Through the Restrictions of Traditional Concepts to Promote Innovation in Education Theory. Attempts to Integrate Training in Language Ability and Thinking Ability (Especially Creativity Thinking) in Junior Primary School Grades

The lesson on "The Cock and the Fox" by Yu Hong, teacher of Shenzhen Nanshan
District experimental class, will be used as an illustration to this section.

"The Cock and the Fox" is a story about how the cock used his wisdom to scare
away the fox, who wanted to eat him, and to protect the orchard. Before giving
the lesson on the text, Yu Hong introduced some related websites to the children.
The children then searched for knowledge and fairy tales related to the cock and
the fox before the lesson. Information collected was posted on the class message
board on the school website. The children's message showed that they already had
a certain amount of understanding of cock and fox before the lesson. They knew
especially that foxes are more cunning. They trick strong animals, and always
bully small animals. The first hour of the lesson was mainly used to let children
learn the new words in the text. The teacher assisted the children in various ways
at this stage, for example, by encouraging them to use the words to make up their
own riddles and stories, or to make associations, imaginations, and comparisons
on these words' antonyms and characters with similar shapes.

After learning these words, the teacher questioned the children in order to cul-
tivate their thinking ability in areas such as divergent thinking, differentiation,
association, imagination, analysis, and integration. These questions included: "Can
you help the cock to think of some smarter ways to deal with the fox?", "Can you
think of any way that would help the fox to achieve its aim?", "Can you help the
fox to give up evil, and be a good friend with the cock?", "Can you compose a
new fairy tales of 'The cock and the Fox'"?…Students thought of these questions
and actively expressed their opinions on the class message board. Many creative
ideas and methods were raised: 98 assignments were produced in only one day—
some students wrote two passages.

Many students continued to post their assignments on the message board during
the following 2 days. Yu Hong analysed the children's assignments. She found that
they all centred on her questions and could be divided basically into four catego-
ries: (1) Providing ideas to the cock; (2) Providing methods to the fox; (3) Making
the cock and the fox good friends; (4) Creating new fairy tale "The Cock and
the Fox". The children gave all kinds of distinctive ideas and methods. Many of

these showed the children's wisdom, and displayed higher level imagery thinking, logical thinking and even creative thinking. For example, some students provided the following idea to the cock—the cock pretended that he was ill, and said to the fox, "It's good if you eat me, I have bird flu anyway, it will prevent me from suffering then." The fox heard it and believed it. He put down the cock and rushed to the river to wash its hands. He was afraid that he would be infected, and never dare to come for the cock again. Another student thought of this "trick" for the fox—using the "food chain" to prove that it was rational for the fox to eat the cock: If men could eat cows and sheep, then we foxes could eat cocks. This is the law of the food chain of nature. (It is surprising that a primary two students know about the food chain!) These witty writings of children were not only seen in the lesson of "The Cock and the Fox". There are handy examples of what occurred more generally in the lessons of the experimental classes.

To provide a concrete reflection on the achievements of the experiment, Nanshan Experimental School and Xiang Nan Primary School in Shenzhen, East Dongfeng Road Primary School and Pei Zheng Primary School in Guangzhou, Yang Xian Yin Primary School and Shiqi No. 1 Primary School in Zhongshan compiled students' "selected online assignments" into books and formally published them. Many other schools were restricted by their economic conditions and were unable to formally publish their students' assignments. However, they let their students draw their own illustrations, then edited them and printed them out as collections of students' work with illustrations. These collections were kept as precious information about the school. It is not rare for national prestige schools to publish selected writings of their students who are in primary four or above (especially those from primary five or six students). But this publication of selected writings of junior primary students (especially primary one or two students) is the first of its kind. It is not only a national pioneering work, but an international one as well. These primary one or two students were only about 6 or 7 years old (usually not older than eight). It is unexpected that after conducting the experiment for only one or 2 years, they would generally attain such a high level of intellectual development. It is what the traditional education theories fail to explain and achieve. This inevitably put the authoritative education theories, especially those related to children's cognitive development, in question, and an urge to carry out serious examination and reflection on those theories emerged. Chapter 2 of this book sets out the basic understandings and discussions on this matter.

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Chapter 2
Practices of Innovative Exploration in Language Teaching: Questioning the "Stage Theory of Children's Cognitive Development"

As early as 1952, the famous Swiss educational psychologist Jean Piaget had proposed the important perspective that "children's cognitive development" is divided into stages, which children must go through in order without skipping any of them (Piaget 1952). Further writings were published subsequently to elaborate this view. In 1970, he published his masterpiece *The Principles of Genetic Epistemology* (Piaget 1972), in which he delivered an in-depth and systematic discussion on the matter, forming his unique "Stage Theory of Children's Cognitive Development", making a seminal contribution to researches in this area.

2.1 Summary of Piaget's "Stage Theory of Children's Cognitive Development"

Piaget's "Stage Theory of Children's Cognitive Development" believes that if determined by "operation", children's cognitive development can be divided into two large stages, "pre-operational" and "operational". The pre-operational stage can be further divided into "sensori-motor level" and "pre-operational level", and the operational stage can be divided into "the stage of concrete operations" and "the stage of formal operations". Thus, there are four stages in total. Here, operation does not refer to operation in formal logic or in mathematics. It means psychological operations: they operate psychologically and internally through images, representations or symbols; for example, "pouring the water in a bottle into a cup" is originally an external and perceptual behavioural act, its result is observed with the eyes. However, for adults or senior grade students, the result of this act can be foreseen merely by imagining the whole process with representations in mind. There is no need to carry it out in actual behaviour. This process of imagining the

process of pouring water in mind is an interiorized psychological operation. These psychological operations have two basic characteristics:

① **Reversibility**—Things can be done in one direction and in the opposite direction. Taking the "pouring water" operation mentioned before as an example, not only can the water be poured from a bottle to a cup in the mind, but it can be poured back to the bottle and returned to its original state as well. This is refers to as "reversibility" or "reversible operation". Reversibility is divided into inversion (aka "reversibility") and reciprocity, such as +A is the inversion of –A and A > B is the reciprocal of B < A.

② **Conservation**—The operation will cause changes in the external appearance of the object while its original property remains constant. This immutability is called conservation, for example, "narrow × high" equals to "broad × short" (area unchanged).

Using operations as determination, Piaget divided children's cognitive development from birth to adolescence into "sensori-motor level", "pre-operational level", "the stage of concrete operations" and "the stage of formal operations" as mentioned above. The characteristics of these four stages can be summarized as follows.

2.1.1 Sensori-Motor Level (Piaget 1952; Pi 1977; Li 1999)

This stage ranges from infancy to 2 years of age. During this stage, children's cognitive development is focused on differentiation of sensory perceptions and motions. At birth, infants only have innate inherited unconditioned reflex. Then, they gradually acquired the ability to cope with external stimulations by organizing their sensory perceptions and motions. The latter part of this stage is the germ of thinking, and there emerges a clear distinction between sensory perceptions and motions, and gradual differentiation of methods and goals. In reference (Piaget 1952), Piaget provided a detail description of the observational study on this stage and further divided it into six sub-stages:

(1) **Sub-stage 1** (birth–1 month old)—"Exercising of Reflexes". This stage is characterized using innate unconditioned reflexes to adapt to the external environment, such as sucking a nipple whenever there is one and crying whenever feeling hungry or thirsty.

(2) **Sub-stage 2** (1–4.5 months old)—"Formation of Primary Circular Reactions". During this stage, combination of several behaviours to form circular reactions based on innate unconditioned reflexes occurs, which helps infants to adapt to external environment more effectively, for example, by seeking the origin of a sound as soon as they hear it and tracing an object with the eyes immediately when movement occurs.

(3) **Sub-stage 3** (4.5–9 months old)—"Formation of Purposeful Reactions". As infants always touch and play with various equipments and articles around them with their hands, their activities move beyond self-preoccupation. The infants, as the agents, are able to influence objects around them as well. After the surrounding object is influenced by the agent, it will attract more attention from the agent and trigger influence from the agent again. In this way, there is a gradual differentiation between the infant's behaviour (that is, the infant's method) and the result of the infant's behaviour (that is, the infant's goal), which allows the infant to start realizing that certain behaviour could be taken to achieve certain goals.

(4) **Sub-stage 4** (9–11, 12 months old)—"Coordination of Methods and Goals". With the differentiation of methods and goals, some schemata are formed as the specific methods to achieve certain goals. For example, infants will stretch their hands to places beyond their reach. This reveals that they aimed at reaching an object before stretching their hands. With increasing amount of daily activities, infants are able to learn more and more methods (that means schemata, such as, grasping, pushing, knocking, hitting, and shouting) to cope with the surroundings in order to achieve their goals. The connection between schemata becomes more flexible and diversified, and there is also better coordination and clearer distinction between methods and goals.

(5) **Sub-stage 5** (11, 12 months old–1.5 years old)—"Accidental Discoveries". With increasingly frequent use of different schemata, infants will also make some changes instead of merely repeating the original behaviour. That means they learn to solve new problems through trial and error. For example, there is a doll on the bed, but the infant is not able to reach it, so it grasps whatever nearby in a random manner. Eventually, it grasps a corner of the bed sheet and discovers that the movement of the sheet is connected to the location of the doll. Then, it pulls the sheet slowly and gets the doll. This way of discovering solutions to problems seems simple, but it is a great advancement in infants' cognitive development. However, these are accidental discoveries. At this stage, infants still have not acquired the ability to discover solutions to predetermined goals.

(6) **Sub-stage 6** (1.5—2 years old)—"Purposeful Discoveries". Infants begin to discover solutions to problems according to specific goals and directions. For example, there is a transparent plastic box containing chocolates. At first the infant turns the box around and looks. Then it attempts to put its little finger through the crack on the box to get the chocolates, but fails. After that, it stops and looks at the box, opening and closing its mouth before forcefully pulling open the box with its hands. At last, the box is opened and it gets the chocolates. Such opening and closing of mouth symbolize the infant's "imagination" of opening the box in its mind. This shows that infants have already acquired the most basic of interiorized psychological operations. It is only that the subjects of such psychological operations are still not abstract symbolic representations or representations of some specific objects, but the image of the concrete object (the chocolate box) at the present moment.

During the first 3 of the above 6 sub-stages, infants still do not have the concept of permanent objects, but only flickering sensory images. They find that the agents seem to be the centre of the world, but still have not realized the existence of self. With the enrichment and development of schemata, infants gradually distinguish the agent and objects, and begin to view themselves as one of the numerous objects that form the world. Piaget appreciated this emergence of detachment from egocentrism in infants' consciousness very much, and thought that it is the "Copernican revolution" (Piaget 1972) in children's cognitive development and the greatest achievement in the whole "sensori-motor level". He believed that this Copernican revolution marked by "**detachment from egocentrism**" is generally attained progressively after sub-stage 4.

2.1.2 Pre-operational Level (Piaget and Inhelder 1964, 1954)

During the pre-operational level, the sensori-motor schemata of children are gradually interiorized into representational schemata or image schemata. Intensified by the emergence and development of language, children use increasingly more representations and words to depict external objects. Yet, at this stage, they are still not able to represent abstract concepts with representations, words or other symbols. These can only be applied with the presence of concrete objects and in actual scenarios, which means that cognition is still bounded by the visual images of concrete objects. In reference (Piaget 1972), Piaget divided children's cognitive development in this level into two sub-stages:

2.1.2.1 Pre-operational Sub-stage 1 (2–4 years old)—"Formation of Representation System"

During this stage, children start to establish and use representative system, which means a system of indications and symbols. Piaget (1972) pointed out that during this period, with further development in children's intelligence, "the series of successive physical actions, each given momentarily, is completed by representative systems capable of evoking in the form of an almost simultaneous whole, past or future actions or events as well as present ones and spatially distant as well as near ones". Obviously, when Piaget talked about representative systems here, what he actually meant is a representation system, and he did not included other representative systems (such as language) in it. This is because the only way to reproduce activities and events in the past and future "simultaneously" is by a three-dimensional visual representation system. Yet, the linguistic symbol system is one dimensional and can only be shown in a linear and sequential manner. Apart from that, the interiorized representation of actual activities is equivalent to "internalization" (turning external behaviours and activities into interiorized

psychological operations) mentioned before, which is the "conceptualization" of activities. However, Piaget clearly stated that "conceptualization" at this stage is still not equal to the establishment of real concepts. It can only be called "pre-concept" (Piaget 1972) as it is established with representation system (rather than linguistic symbol system).

Children are able to establish representation representative systems in this sub-stage because there is separation of "signifiers" and "referents". To understand this issue, Piaget stated that special attention should be paid to distinguishing between symbols and signs.

In an ordinary representative system, the relationship between symbols them-selves (signifiers) and matters denoted or represented by symbols (referents) does not existed in the objective matters themselves, but in the subjective consciousness of the cognitive subjects (i.e. the minds of the children). For example, in children's games, they use bamboo rods as horses and wooden stools as cars. Here, the bam-boo rods and wooden stools are "signifiers" and horses and cars are "referents" (things being signified). In this situation (that is, when representations are used as symbols to denote objective matters), "signifiers" and "referents" are connected by children's subjective imagination. However, that is not the case for signs. Signs are a part of the properties or components of objective matters. They indicate the appearance of the objective matters; for example, footsteps indicate that someone is coming and a sinking float indicates that a fish is biting the bait. Footsteps and sinking float are signs. In this case, the "signifiers" (footsteps and sinking float) become one of the properties or components of the "referents" (someone and the fish that bite the bait). The connection between "signifiers" and "referents" existed in the objective matters themselves rather that in the subjective consciousness of the cognitive subjects.

The development of children's representative system relies mostly on the crea-tion and mastery of the symbolic representative system (especially that of the linguistic symbol system). Language is a symbolic representative system that is generated and established by society. It is the most important types of symbolic representative system. Piaget believed that in this sub-stage, children are still not good at using language to express matters that catch their attention and interest. Although they have already acquired the ability to use words, nevertheless con-cepts are still unformed (they cannot capture the common properties between matters). Children are only using words as a symbol to denote the image of a par-ticular matter rather than the intrinsic property of that matter.

2.1.2.2 Pre-operational Sub-stage 2 (5–6 years old)—"Elimination of Egocentrism"

As stated before, in between the first half and the second half of the sensori-motor level, there is a Copernican revolution marked by "detachment from egocentrism". In sub-stage 2 of the pre-operational level, a similar phenomenon occurs with further advancement in the representation system. There is a gradual elimination

of egocentric cognition (this elimination commences in the middle of the pre-operational level, that is, when sub-stage 2 starts). There exist differences between "detachment from egocentrism" and "elimination of egocentrism". The former points to the separation between cognitive subjects and objects, which means that the children no longer view themselves as the centre of the world, but rather as one of the objects that form the world. The latter means that the subjects give up or eliminate egocentric cognition while comprehending objective matters. Piaget thought that before 5 years old, children are egocentric. They understand objective matters only from their own viewpoint, and are unable to think in others' perspectives and points of views. Piaget reached this conclusion with the following experiment: Let a child sat on one side of a model mountain and put a doll on the other side. Then, asked the child to describe the scenery that the doll see. The result of the experiment proved that most children under 5 described the scenery according to what they saw in their own location (they were unable to describe it according to what the doll saw in its location).

2.1.2.3 Major Characteristics of the Pre-operational Level (Piaget 1972; Pi 1977; Zhu and Lin 1991)

Piaget believed that children in the pre-operational level exhibit the following characteristics in their cognitive development:

① **They mainly Reflects objective matters with a representation representative system** (representation system) **rather than a linguistic symbol representative system** (linguistic symbol system). As concepts are still unformed (as Piaget put it, there is only pre-concepts), there is no logical thinking based on verbal concept, but only thinking based on representation (that means imagery thinking and intuitive thinking).

② **Mostly egocentric cognitive style**. It is not until the later stage of this level that this kind of cognitive style is gradually given up or eliminated.

③ **Lack of reversibility in thinking**. Reversibility means that the cognitive subject can alter the direction of thinking, that is, to apply mental processing in both positive and negative directions. In general, children in the pre-operational level do not possess such reversibility. That is why they always understand relationships in a single direction only. For example, when a 4-year-old children was asked, "Do you have any brothers?", he answered, "Yes". And when asked further, "What is your brother's name?", he said, "Jim". But when he was asked in the other way round, "Does Jim have any brothers?", the boy then answered, "No".

④ **Lack of conservation in thinking**. Conservation refers to the awareness that certain original properties (such as, length, area, volume, weight) remain constant in spite of changes in the objects' appearance. Usually, children in the pre-operational level do not possess conservation, and thus their understanding of volume is always single dimensional. For example, a group of 4–5-year-old

children were given two cups, A and A', of same size and shape. Let the children put the same numbers of wooden beads into the cups with their own hands. The children knew at this moment that the two cups had the same numbers of beads. Then, the experimenter poured the beads in A' into a tall and narrow cup B, and asked them if cup A and B had the same numbers of beads. This time, some children said cup B had more beads than A while some said cup A had more beads than B. Why would there be two different answers? Piaget believed that this is because children in the pre-operational level have not acquired conservation in their thinking. When they thought about the height, they missed the width, and vice versa. In psychology, this phenomenon is called "unidimensionality".

⑤ **Lack of transitivity in thinking**. Transitivity refers to the cognitive subject's ability to recognize that causal relation produced by interplay of matters is sometimes transferred through an intermediary. Normally, children at the pre-operation level do not recognize this transitivity. For example, children of 6 years old were given three glasses of different shapes, A, B and C. A contained red liquid, C contained blue liquid, and B was empty. Then, behind a curtain, the liquid in A was poured into B, then C's into A, and lastly B's into C (so as to swap the liquid in A and C). After that, the curtain was drawn to let the children observe the result after the swap. In general, they did not recognize B's role as the intermediary in this transference process. Thus, they said that the liquid in A was poured directly into C, and that in C was also poured directly into A.

2.1.3 The Stage of Concrete Operations (Piaget 1953, 1950)

During this stage, abstract concepts start to form in the cognitive structure of children. Piaget (1972) pointed out that "The age of 7–8 years, on average, marks a decisive turning point in the development of conceptual tools". Children begin to possess basic logical reasoning ability, and their thinking start to show an awareness of reversibility and conservations. In reference (Piaget 1972), Piaget divided the cognitive development of children at this stage into two sub-stages:

2.1.3.1 Concrete Operational Sub-stage 1 (7–8 years old)—"Formation of Reversibility and Conservations"

Piaget believed that reversibility in children's thinking does not emerge from nowhere. It is rooted in the process of cognitive development, during which children integrates the cognitive activities of "anticipation" and "retrospection" into one single activity. For example, when a child at this stage was asked to put rods of various lengths in order, he would not search for the correct sequence through continuous trial and error as when he was in the pre-operational level. He would

first pick out the shortest rod, and then pick out the shortest again in the remaining rods, and continue this process until all rods were lined up. In this way, "anticipation" (picking out the shortest rod in sequence, making it possible to get the correct order in the shortest time) is integrated with "retrospection" (after every step, the child will look back to check if the actual result is in accord with the "anticipation"). This avoids performing trial and error blindly, and greatly improves efficiency in sequencing the rods. In the process of interiorized psychological operations, anticipation is equivalent to direct operation, and retrospection is equivalent to inverse operation. Their integration produces reversible operation.

The formation of conservation in children's thinking is far more complex, and Piaget (1972) believed that three conditions are needed:

① **Reflective abstraction**—It means that the subject's abstraction of the object's properties is gained through his action and influence on that object, rather than by direct perception.
② **Coordination**—Such coordination combined the various pieces of scattered and partial understandings into an integrated whole
③ **Self-regulation**—This enables understandings to convert in two directions (addition and subtraction, positive and negative) and to reach an equilibrium, which ensure conservation in thinking

The formation of these three conditions (that is, the formation of conservation) is the major hallmark of children's cognitive development at the concrete operational sub-stage 1. As conservation and transitivity in thinking are closely connected (detail discussion can be found in reference Piaget 1972), **the formation of conservations in thinking inevitably means the formation of transitivity**. In other words, conservation and transitivity in children's thinking are formed at the same stage.

2.1.3.2 Concrete Operational Sub-stage 2 (9–10 years old)—"Exploration of Causality"

This sub-stage is hallmarked by children's development in exploring the reasons for movements and changes in things, which means the development in searching for causal explanations. Piaget (1972) pointed out that such development indicates "a clear advance over the first sub-stage (from 7 to 8 years), leads the subject to raise a group of kinematic and dynamic problems, which he is as yet unable to solve with the operational means at his disposal. There then occurs a series of fruitful disequilibrium states, and it is these that we would characterize as novel". Piaget went on to say that the development in logical mathematical operation is the major factor that enhances children's active search for causality, and logical mathematical operation is an ability gained through the aforementioned "reflective abstraction" (which means it is attained through the subject's direct act and influence on the object). Obviously, such ability founded on the subject's practice does not only act to enhance children's exploration in causality, but is also significant in fostering the whole formation and development of children's cognitive structure.

2.1.3.3 Major Characteristics of the Stage of Concrete Operations (Piaget 1972; Li 1999)

① **The major characteristic of the stage of concrete operations is its concreteness**. As mentioned earlier, with the formation of abstract concepts during this stage, children begin to possess basic logical reasoning ability. This ability is said to be at the basic level because logical reasoning at this stage is still relying on the support of concrete matters, in the absence of which children will have difficulties. For example, if an inference question based on transitive relations was asked, e.g. "If A > B, B > C, which is larger, A or C?" Most children at the stage of concrete operations are not able to come up with the correct answer. Yet, if asked in another way, "Miss Zhang is taller than Miss Li, and Miss Li is taller than Miss Wang; who is taller, Miss Zhang or Miss Wang?" (Zhang, Li and Wang are all teachers with whom the subjects are familiar), the children were able to answer it. This shows the concreteness of such an operation and that the logical reasoning ability at this stage is thus still at a basic or rudimentary level.

② **Possess conservations in thinking**. According to the research by the Piagetian school, awareness of conservation of different properties is attained at different ages, for example, the conservation of liquid is learned at 7–8, conservation of weight at 9–10, and conservation of volume at 11–12.

③ **Possess reversibility in thinking**. As there is still no interaction between the two types of reversibility, "inversion" and "reciprocity", the two of them can only control class and relation separately, and the logic in concrete operations concerns only the logic of class and the logic of relation. Children can only apply such logic to concrete objects, and the class and relation system in concrete operation have not been combined into an integrated whole.

④ **Possess transitivity in thinking**.

⑤ **Frequent disequilibrium in cognition**. As mentioned before, such disequilibrium is caused by children's active search for causality between matters. It is indeed the actual driving force of children intellectual development, because it triggers the two important cognitive activities of "assimilation" and "accommodation", and enhances expansion and development in children's cognitive structures in both quality and quantity, which allows them to reach new cognitive equilibrium.

2.1.4 The Stage of Formal Operations (Piaget 1941, 1946–1969, 1946–1970, 1948)

Piaget believed that children enter the stage of formal operation at around 11–12. The major characteristics of this stage are as follows:

① **Commencement of separation of form of thinking and content of thinking**

The major characteristic of formal operations is that thinking is no longer restricted to concrete objects. There is a separation of the content and form of

thinking, and thinking starts to take its role and function in formal reasoning. Before that, all operations are directly related to the objects (concrete matters), which means that the content of form of thinking are still not separated. For example, for some concrete operations that can be applied to various objects, there is no difference between the content of their psychological processing, but they differ only on the sequence of processing. In other words, before entering into the stage of formal operations, the objects of children's psychological processing can only be concrete objects, not abstract concepts. Yet, after entering into the stage of formal operations, as Piaget pointed out (Piaget 1972), children's knowledge "transcends reality itself, relating it within the possible and the necessary; thus dispensing with the concrete as intermediary".

Piaget believed that formal operations are formed by the logical relations (such as conjunction, disjunction and implication) between the propositions of interiorized psychological operations, namely classification and seriation. As formal operations, which are not limited by concrete matters, are carried out in the form of propositions, it is thus also commonly referred to as propositional operations.

② **Capable of carrying out various acts of logical reasoning with hypothetical propositions**

The capability to deal with hypothetical propositions is another major characteristic of children at the stage of formal operations. Children are no longer only capable of dealing with propositions about actual objects. Piaget pointed out in reference (Piaget 1972) that "The chief characteristic of formal operations is their capacity to deal with hypotheses". The hypotheses children raise during this stage are not about objects, but propositions. The content of these hypotheses consists of "intrapropositional operations" which can be verified directly, such as class and relation. However, deductive operations (such operations enable a hypothesis to reach its conclusion) are a totally different type. They are operations on operations, and so Piaget named them "interpropositional operations" or "second-order operations". Piaget believed that (Piaget 1972), "It is this power of forming operations of operations which enables knowledge to transcend reality, and which by means of a combinatorial system makes available to it an infinite range of possibilities".

③ **Specified structure of operation**

Piaget thought that formal operations carry structural integrity. He pinpointed the combinatorial system based on bi-propositional operations and INRC quaternary conversion group as the actual practical structures of formal operations.

A binary proposition is a compound proposition with two sub-propositions (p and q). Each sub-proposition carries two values, true and false, thus forming four possible combinations:

```
                                   ┌─ Additive (additive cluster of symmetrical relations)
                      ┌ Symmetrical┤
                      │            └─ Multiplicative (binary multiplicati ve cluster of
                      │                             relations)
Reciprocal Reversibility┤
                      │            ┌─ Additive (additive cluster of asymmetrical
                      │            │              relations)
                      └ Asymmetrical┤
                                   └─ Multiplicative (multiplemultiplicative cluster of
                                                     relations)
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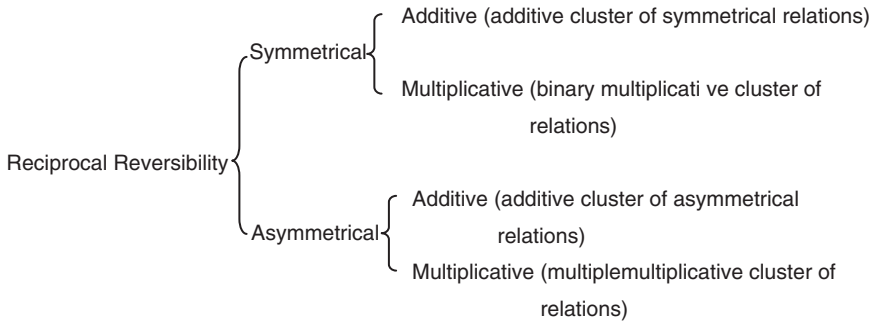
To the subjects of formal operations, the structures of propositions are $((p \land q)$ $(p \neg \land q)$ $(\neg p \land q)$ $(\neg p \neg \land q)$ rather than a "class—product" one. These structures represent a hypothetical judgment (proposition), and thus, further combination based on the above four combinations are possible, and it will produce the following 16 combinations, which is Piaget's bi-propositional operations-based combinatorial system.

Disjunctive Forms	Numbers and names given by Piaget
(o)	(2) complete negation
$(p \land q)$	(3) disjunction
$(p \neg \land q)$	(8) nonconditional
$(\neg p \land q)$	(10) inverse nonconditional
$(\neg p \neg \land q)$	(6) conjunction
$(p \land q) \lor (p \neg \land q)$	(13) affirmation of p
$(p \land q) \lor (\neg p \land q)$	(15) affirmation of q
$(p \land q) \lor (\neg p \neg \land q)$	(11) biconditional
$(p \neg \land q) \lor (\neg p \land q)$	(12) exclusion
$(p \neg \land q) \lor (\neg p \neg \land q)$	(16) negation of q
$(\neg p \land q) \lor (\neg p \neg \land q)$	(14) negation of p
$(p \land q) \lor (p \neg \land q) \lor (\neg p \land q)$	(5) incompatibility
$(p \land q) \lor (p \neg \land q) \lor (\neg p \neg \land q)$	(9) inverse conditional
$(p \land q) \lor (\neg p \land q) (\neg p \neg \land q)$	(7) condition
$(p \neg \land q) \lor (\neg p \land q) (\neg p \neg \land q)$	(4) conjoint negation
$(p \land q) \lor (p \neg \land q) \lor (\neg p \land q) \lor (\neg p \neg \land q)$	(1) complete affirmation

The INRC quaternary conversion group is founded as there is convertibility between different formal operations. As stated before, both concrete operations and formal operations carry the characteristics of reversibility, conservations and transitivity (as mentioned, reversibility is divided into inversion and reciprocity), and these characteristics imply convertibility. Thus, based on the different natures involved in the transformations, these conversions can be categorized into four types: inversive conversion (N), reciprocal conversion (R), correlative conversion (C) and identical conversion (I). A complete transformation structure, the INRC conversion group, is then formed.

The INRC conversion group is an actualization of the Klein four-group in mathematic. It is Piaget's innovation to apply it in reflecting the rules of conversion in formal operations.

2.2 Contributions of Piaget to Theories of Children's Cognitive Development

The summary of Piaget's "Stage Theory of Children's cognitive development" presented above shows that Piaget has made important and outstanding contributions to the study of the area. His contributions mainly concern the followings aspects:

2.2.1 Insisting on a Dialectical Materialism View on Cognitive Development, Opposing the Idealist and Mechanical View

Regarding the fundamental issues of the origin and development of cognition, there has been continuous debate between two schools of thought and two world views for a long time. One side takes the idealist apriorism view and insists, like innatism and various apriorisms, that "the subject possesses from the start endogenous structures which it imposes on objects" (Piaget 1972). The other side believes in mechanical materialism and, like the empiricists, thinks that "the subject is instructed by what is outside him". Piaget took the viewpoint of dialectical materialism and strongly criticized both of these sides. Regarding the origin of knowledge, he firmly believed that (Piaget 1972), "knowledge arises neither from a self-conscious subject, nor from objects already constituted (from the point of view of the subject) which would impress themselves on him; it arises from interactions that take place mid-way between the two and thus involve both at the same time". Concerning the development of cognition, he provides the following clear exposition (Piaget 1972), "the problem stated by genetic epistemology is whether the genesis of cognitive structures only represents the totality of presuppositions for the achievement of knowledge, or whether it provides the constitutive conditions of knowledge. In other words: does genesis correspond to a hierarchy or even a natural interdependency of structures; or does it merely describe the temporal process by which the subject discovers these structures as pre-existing realities? The latter alternative involves the view that theses structures are preformed; either in the objects of physical reality, or as a priori in the subject himself, or in the ideal world of possibility in a Platonic sense. Now, through its analysis of genesis itself, genetic psychology has tried to show the inadequacy of these three hypotheses, and to make a case for the view that genetic construction in its wider sense is an effectively constitutive construction". Piaget also had his own unique and

brilliant idea on how cognitive structures are actually constructed, "The achievement of knowledge is thus to be explained in terms of a theory indissolubly linking structuralism with constructivism, every structure being the resultant of a genesis and every genesis being the transition from a more to a less elementary (or more complex) structure".

Through such brilliant philosophy, Piaget clearly indicated his dialectical materialism standpoint on children's cognitive development, and sharply differentiated his view from the idealist and mechanical materialism viewpoints of cognitive development. He showed the right direction for researches on cognitive development and led them onto the right track.

2.2.2   Pioneering in the Introduction of Researches in Children's Psychogenesis into Epistemology, Giving a Seminal Contribution to the Establishment of "Genetic Epistemology"

Piaget believed that (Piaget 1972), "the study of the psychogenesis of knowledge is an indispensable part of epistemological analysis". This is just the same as how "anthropogenesis" is studied. With a lack of information about prehistoric man, seeking help from biologists is the only way. Biological knowledge about embryogenesis is then used to patch the missing parts in anthropogenesis. To researches on epistemology, especially those on the origin of human cognition, this bears the implication that the targets of the researches can be reached through studying infants' psychogenesis. This analogical method arose in Piaget's mind because he had been a zoologist, and it was natural for him to compare his research with that of an embryologist. He thought that just as researches on embryology are able to reveal the structural similarities among animals and the early development of mankind, researches on infants' psychogenesis and development would also help to clarify the origin and structure of human cognition. He believed that careful study of the most elementary intellectual activities of humans (that of children and even infants) would aid deeper understanding of adults' thinking. However, this is just the opposite way of the traditional epistemology. The traditional ignored the lower level cognition, but studied only the higher level cognition of adults. That is to say, it only focused on part of the eventual development of cognition. Thus, the results always went athwart. Thus researches in epistemology remained stagnated and without any breakthroughs for a long time.

By introducing the psychogenesis and development of infants and children into researches on epistemology, Piaget sought to engage in an in-depth study of the origin of cognition and psychogenesis of infants by going through the primal form of cognition. He also sought to investigate the relationship between such primal cognition and the development of child psychology at later stages and levels (including the stage at which comprehensive advanced thinking ability,

that is, advanced cognition level, is attained). Piaget put all these thoughts into action, and at last achieved his aim; he established a blank new subject—"Genetic Epistemology", which is just as what Piaget said (Piaget 1972), "an epistemology that is naturalist without being positivist; that draws attention to the activity of the subject without being idealist; that equally bases itself on the object, which it considers as a limit (therefore existing independently of us, but never completely reached; that the above all sees knowledge as a continuous construction".

Piaget contributed seminal research to "Genetic Epistemology", and his name will forever be linked with "Genetic Epistemology". To honour his outstanding contribution to the area, the American Psychology Association specially presented him with a citation. On it was stated, "He has approached questions up to now exclusively philosophical in a resolutely empirical manner, and has made epistemology into a science separate from philosophy, but related to all human sciences". Piaget is worthy of such praise.

2.2.3 Pioneering in Revealing the Existence of Stratification in Children's Cognitive Development, and Providing Precise Descriptions to the Development of Some Stages

Considerable researches and practical observations have proved that Piaget's notion that "there is stratification in children's cognitive development" is scientific and ubiquitous. From the outset of children's cognitive ability to its maturity, there exist some stages that children go through from a lower level to a higher level. The order of these developmental stages cannot be changed and there is no skipping. For example, children in the pre-operation stage cannot skip the stage of concrete operations and arrive directly at the cognitive ability attained at the stage of formal operations. This is a general rule of cognitive development. Knowing and mastering this rule provides an important guide to reform in basic education and to the improvement of the quality of education.

Piaget had made in-depth studies on the characteristics of every stage of children's cognitive development, and his analysis on the sensori-motor stage is especially brilliant. He divided the cognition of infants of 0–2 years of age into six stages, ranging from the outset of cognition to the preliminary formation of "interiorized psychological operations". Careful and detail observations were made on each of the sub-stages, which formed the basis of his comprehensive and brilliant analysis. Apart from that, making "elimination of egocentrism" the hallmark of pre-operational sub-stage 2 and drawing an analogy between this hallmark and the "Copernican revolution" at sensori-motor stage are as well one of his impressive achievements, which combined fertile imagination with thorough and profound theoretical analysis.

2.2.4 Creating a Complete and Unique Research Method for Children's Cognitive Development

Exactly as Professor Lin Chong De, famous psychologist of our country, pointed out (Zhu and Lin 1991), Piaget devoted his whole life to researches on children's cognitive development and his contributions were not restricted to what has been outlined above. He not only established a new theory of children's cognitive or thinking development, but also created a whole new set of unique research methods for child psychology, namely the "clinical method" (a method that combines both interview and experiment). "Clinical method" is the major research method of the Piagetian school. To avoid redundancy, it will not be repeated here. Interested readers may refer to related references (such as reference Zhu and Lin 1991; Flavell 1963).

2.3 Thinking Theory Researches: Challenges to Piaget's Criteria for Dividing "Children's Cognitive Development Stages"

The above discussion shows that many of Piaget's thoughts and ideas connected with his founding of genetic epistemology are prominent and brilliant, and that they acted as a huge driving force to the advancement of researches on children's cognitive development. All these we sincerely admire and adore. However, through our theoretical researches on creative thinking in recent years and from years of explorations in primary school language teaching reform, we have found that there are still some problems in Piaget's theory, and some of his basic viewpoints even show an obvious discrepancy with the outcomes of our teaching reform experiment. At first, we were puzzled, and then became doubtful, about Piaget's authoritative viewpoints. After serious reflection for a longer time, and especially after re-examining the theory of cognitive development, we finally came to the conclusion that there is a need to critique the "bases" and "criteria" Piaget applied in dividing the stages of children's cognitive development (for they are the foundation of Piaget's theory), and to raise our own viewpoints.

2.3.1 Piaget's Criteria in Dividing "Children's Cognitive Development Stages"

As stated at the beginning of Sect. 2.1 of this chapter, Piaget used "operation" as the basis or criterion in dividing children's cognitive development into stages. Although operation is a concept Piaget introduced from the science of logic, as

mentioned above, it does not refer to logical operation in formal logic or operation in general mathematics. It refers instead to an interiorized psychological operation, in which explicit behaviours and actions are transformed into interiorized action performed psychologically through some kind of representative system. According to Piaget's definition, two more basic properties (reversibility and conservation) are needed for such interiorized psychological operations to become an "operation". That means

Operation = Interiorized Psychological Operation + Reversibility + Conservation

Applying operation according to this definition as his basis or criterion, Piaget divided children's cognitive development into the following stages:

0–2 years old: As mentioned, basic interiorized psychological operations appear only at the end of this stage. Before that, there is no interiorized psychological operation, indeed no operation at all (that means no sign of thinking). Thus, cognitive development at this stage can only be marked by explicit behaviours and actions that are not interiorized and can be directly perceived only through sensory organs. This stage is thus named the "sensori-motor stage". Actually, according to the original ideas of Piaget, it would be more precise to name this stage "non-thinking stage" (a stage when thinking ability has not been acquired).

2–6 years old: There are already interiorized psychological operations at the beginning of this stage. However, these interiorized psychological operations do not have reversibility or conservation, and are neither perfect nor of more advanced level. That is to say they have not reached the level of "operation", but can only be regarded as "pre-operation" (or "quasi-operation"). Thus, naturally, this children's cognitive development stage is named the "pre-operational stage".

7–10 years old: Interiorized psychological operations have started to acquire reversibility and conservations at this stage, which means that they have reached the level of operation. Yet, operations at this stage still rely on concrete objects, and the contents and forms of psychological operations are still inseparable. As operations are still of a lower level, this stage of children's cognitive development is named the "stage of concrete operations".

11 or 12–15 years old: Interiorized psychological operations have further developed on the foundation of the former stage. Operations are no longer restricted by concrete objects, and their contents and forms have completely separated. Operations have reached an advanced level in which they can be carried out through propositions and hypotheses. Thus, this stage is named the "stage of formal operations" or "stage of propositional operations".

Through the above analyses, it is not difficult to note that "operation", as Piaget's basis or criterion in dividing children's cognitive development stages, is of the nature of what is generally referred to as "thinking". More precisely, it is equal to "abstract logical thinking", which uses language concepts as the processing materials of thinking. This view of Piaget is clearly revealed in the above division of children's cognitive development, and more prominently in the

concrete analysis of these stages in Sect. 2.1 of this chapter. For example, during the 2–6-year-old stage, although a representative system based on representations has already been established, Piaget still thought that children's ability to interiorize psychological operations had not reached the level of operation. As reversibility and conservation have not been acquired in children's interiorized psychological operations, and since a representative system based on language concepts has not been established (which means they still cannot conduct logical thinking), this stage can only be called the "pre-operational stage" (that is, the stage of pre-logical thinking). When children are 7–11 or 12 years old, their interiorized psychological operations have reached the level of operation, but still require the support of concrete objects (which equals basic logical thinking). Thus, this stage can only be named the "stage of concrete operations" (that is, the stage of basic logical thinking). During the 12–15-year-old stage, with further advancement in their abilities to interiorize psychological operations, the cognition (thinking) of children is no longer restricted by concrete objects. They are capable of carrying out formal operations or propositional operations through propositions, hypotheses, judgments and inferences. It is the stage of advanced abstract logical thinking.

2.3.2 Major Principles for Setting the Division Criteria of Children's Cognitive Development Stages

To determine the rationality of the above division criteria, we should first discuss and set out the principles upon which the division criteria of children's cognitive development stages should be based.

It is well known that issues of cognitive development are equivalent to those of thinking development, and researches on the division of children's cognitive development stages are equivalent to those on the division of children's thinking development stages. Thinking ability concerns at least two factors: mental processing ability and mental processing materials. Mental processing ability is the manifestation of integrated abilities, namely, application of mental processing modes and strategies, and storage of mental processing materials (that means memory). It is the aforementioned ability to interiorize psychological operations. Mental processing materials refer to the various symbolic representative systems, such as representations and concepts. Thus, in dividing children's cognitive (thinking) development into stages, "mental processing ability" and "mental processing materials" should be considered at the same time. They are the major principles upon which the division criteria of children's cognitive development stages should be based. Violating this principle by only considering one of the factors will create one-sided division criteria, thus failing to guarantee rationality and scientificity.

2.3.3 Comments on Piaget's Division Criteria of "Children's Cognitive Development Stages"

Returning to Piaget's division criteria, the problem now becomes very obvious: Piaget depended solely on "operation ability" (that is, "interiorized psychological operation ability" with reversibility and conservations) to divide children's cognitive development into stages. He completely ignored the effect of the other factor ("mental processing materials") and even further restricted the first factor with reversibility and conversations. Piaget employed such restrictions to turn "operations" into a real criterion that determines the existence of logical thinking ability in children. But this also introduced irreparable defects into his division, in the following ways:

2.3.3.1 Determining the Development of Cognition (Thinking) with "Operations" Puts the "Sensori-Motor Level" Completely Out of the Scope of Thinking

Piaget's operation has not yet emerged at the sensori-motor level, and that level is thus a "non-operational stage". As stated, in Piaget's perspective, "operations" share the same nature with what is generally called "thinking", and the existence of operations represent the existence of thinking. In this way, the sensori-motor level is a stage when there is no real thinking, and therefore Piaget put it completely out of the scope of thinking. However, such a view is open to discussion. In fact, many experts in academic circles have recognized that there is thinking in some higher animals, and this is especially obvious in primates (such as chimpanzees) which have already acquired the ability to solve problems with simple tools (for example, they get fruits in high places by connecting bamboo rods) (He 2000). This kind of ability is actually similar to the thinking ability of infants of about 1-year old (i.e. infants in the fourth or fifth sub-stage of the sensori-motor level. As mentioned above, infants at the fifth sub-stage can, for example, get a doll which is out of reach by pulling the bed sheet). Why is it, then, that thinking ability in animals is recognized, but similar intelligence in human infants is not? Humans actually evolved from animals. Although thinking in humans is essentially different from that of animals, but this does not mean that there is an insuperable gap between them. Indeed, infants gradually develop animalistic thinking from the start of the third sub-stage (the emergence of the Copernican revolution) of the sensori-motor level. Such animalistic thinking shares the same characteristics with the general thinking of humans. It also includes "interiorized psychological operations" and "mental processing materials".

As mentioned, the third sub-stage of the sensori-motor level is also called "Formation of Purposeful Reactions". During this sub-stage, there is a gradual differentiation between infants' behaviour (method) and the result of the behaviour

(goal), which at last allows infants to acquire the ability to reach a certain goal by performing a particular behaviour—at first, there is a certain goal in mind, and then execution by the four limbs is commanded (to perform a particular behaviour). Without doubt, before executing such behaviour, the cognitive subject must first complete the related procedures psychologically (that is, interiorized psychological operations), or else he would not be able to command the movements of the limbs. In other words, basic interiorized psychological operations do not emergent, as Piaget proposed, at the end of the sensori-motor level (Sub-stage 6), but already exist at the third sub-stage. As for mental processing materials, though the more advanced representative systems based on **representations** and **concepts** have not yet been formed at the sensori-motor stage, the concrete image of objects can still be used as materials for mental processing. This is the **common ground** of human and animal thinking. Both animals and humans are capable of using "concrete image of objects" as the mental processing material for thinking.

The **differences** between human and animal thinking are as follows: "Concrete images of objects" constitute the only mental processing material used by animals, but for humans, mental processing materials include not only "concrete images of objects", but also various representative systems, including, "representations of objects", "language-based concepts" and "other symbol-based representations" (for example, gestures, postures, semaphore). More importantly, humans basically use only the two representative systems of representation and concept ("concrete images of objects" are rarely used) as the processing materials of thinking. This is the fundamental difference between human thinking and animal thinking.

Here, the two different concepts of "concrete images of objects" and "representations of objects" should be clearly distinguished. The former (**concrete images of objects**) refers to the impression that the now perceiving object has left in the mind of the perceiving subject. Although such impression can continue to exist without the presence of the concrete object, it reflects the total impression of the particular object at the moment, and it cannot be decomposed or integrated. Thus, the concrete images of objects do not embrace generality, but only concreteness and intuitiveness. The latter (**representations of objects**) refers to the impression that a formerly perceived object, which is not perceived currently, has left in the mind of the perceiving subject. These impressions exist even after being detached from concrete objects, and can be decomposed or integrated. Thus, representations of objects comprise not only concreteness and intuitiveness, but also generality (Zhu and Lin 1991). This is what enables humans to perform advanced thinking activities, such as analysis, integration, abstraction, generalization, association and imagination, through representations. Animal thinking based on "concrete images of objects" can never carry out such activities.

Thus, it can be seen that excluding the sensori-motor level from the scope of thinking is unreasonable. Scientifically, the sensori-motor level should be named

the "stage of animal thinking" (that is, a "lower stage of thinking development" when the mental processing materials are concrete images of objects). This would make possible a clearer recognition of the relations and differences between humans and animals, and a deeper understanding of the nature of thinking, which in turn would direct us towards a more conscious effort to enhance development in human thinking.

2.3.3.2 Determining the Level of Cognitive (Thinking) Development with only the Level of "Operations" Downplays the "Pre-thinking Stage" or "Quasi-thinking Stage", Which Does Not Consist of Logical Thinking, but only of Representational Thinking

As stated in Sect. 2.1 part 2 of this chapter, the representative system based on representations has already been established during the "pre-operational level", and children at that level are able to use representations as the mental processing materials for thinking, which means that they have already acquired representation-based imagery thinking and intuitive thinking. However, as their interiorized psychological operations have not acquired reversibility and conservation, and in particular, as the representative system based on language concepts has not been established (they are not able to carry out logical thinking), they are still unable to perform operations. Thus, this stage of children's cognitive (thinking) development is named "pre-operational". As mentioned above, Piaget equated "operations" with general "thinking" (more precisely, "abstract logical thinking"), and by defining this stage as the "pre-operational level", he implied that, during this stage, children's cognitive development is still at the level of "pre-thinking" or "quasi-thinking", which means that there is still no real thinking during this stage. Downplaying or even denying representation-based thinking means downplaying or even denying imagery thinking and intuitive thinking as well (because both these kinds of thinking employ representations as mental processing materials). This is precisely one of the most serious academic flaws in Piaget's stage theory of children's cognitive development and even in his "genetic epistemology". In the twenty-first century, no one would ever doubt the importance of imagery thinking and intuitive thinking, not to mention denying them. In fact, during the previous century, long before Piaget published his "genetic epistemology" (1970), lots of famous artists and scientists had already discussed the importance of representational thinking. For example, the world-famous aesthetics master and founder of art psychology, R. Arnheim, had published a monograph of 500-odd pages in the 1960s. This monograph provides a thorough and detailed discussion on the nature, characteristics and importance of representation-based thinking (Arnheim 1969). With lots of convincing facts, Arnheim

proved that representational thinking is not of a low level, but conversely, it is the most basic form of human thinking. Early in 1945, the greatest physicist of the Twentieth century, Albert Einstein, had already given a very precise description on two important stages of thinking processes during creative activities: at the first stage, imagery thinking and intuitive thinking are employed to grasp the nature and properties of objects or the implicit relationships between complicated matters; then, one would proceed to the second-stage selecting the suitable conceptual terms for logical analyses and inferences (that means logical thinking), so as to prove and examine the correctness of imagery thinking and intuitive thinking. Obviously, Einstein focused more on the effect of the first stage during creative activities, i.e. the effect of intuitive thinking and imagery thinking. Because of this, he clearly claimed, "I believe in intuitions and insights". Thus, it makes one extremely sorry to see that, as the arbiter of psychology, Piaget was still stubbornly downplaying and even denying representation-based thinking in the 1970s in his researches on children's cognitive development. It is easy to imagine what a negative impact it will result from dividing children's cognitive (thinking) development on the basis of such a perspective and employing it as the theoretical basis for cultivating and educating children.

2.3.3.3 Determining the Level of Cognitive (Thinking) Development with only the Level of "Operations" Involves Merely the General Development of Logical Thinking at "The Stage of Concrete Operations" While that of Imagery Thinking and Intuitive Thinking is Excluded

As mentioned in Sect. 2.1 part 3 of this chapter, Piaget further divided the stage of concrete operations into two sub-stages. The major hallmark of sub-stage 1 is the formation of reversibility and conservations in children's thinking (as transitivity and conservations are closely related, the formation of conservations implies also that of transitivity). Sub-stage 2 is mainly hallmarked by the gradual increase in children's interest in exploring causal relationships.

Here, reversibility, conservations and causal relationships are the basic properties and relations of formal logic. As mentioned, there are two forms of reversibility, "inversion" and "reciprocity", and their logical expressions are as follows:

$+A-A = 0$ (Inversion)

$A = B, B = A$ (reciprocity)

Piaget believed that children at the stage of concrete operations should be able to master the eight cluster structures formed by three layers, which comprise the two types of reversibility mentioned above, symmetrical and asymmetrical, additive and multiplicative (Piaget 1950; Li 1999):

Inverse Reversibility
  Symmetrical
    Additive (combinational additive cluster of class)
    Multiplicative (bijective binary multiplicative cluster of class)
  Asymmetrical
    Additive (substitutional additive cluster of class)
    Multiplicative (multi-jectivemultiplicative cluster of class)

Reciprocal Reversibility
  Symmetrical
    Additive (additive cluster of symmetrical relations)
    Multiplicative (binary multiplicative cluster of relations)
  Asymmetrical
    Additive (additive cluster of asymmetrical relations)
    Multiplicative (multiple multiplicative cluster of relations)

Based on the above, Piaget thought that children at the stage of concrete operations, who have attained reversibility and conservations in thinking, should be able to perform logical operations of the following five groups (Zhu and Lin 1991):

① **Combinability** (For example, A < B, B < C can be combined into a new relationship A < C)
② **Reversibility** (For example, A + B = C, C − B = A)
③ **Associativity** [For example (A + B) + C = A + (B + C)]
④ **Identity** (Any operation has an opposite operation that can combine with it to form "zero operation", such as A − B = 0)
⑤ **Tautology** (Repetition of quality without changing the property, that means A + A = A)

The above analysis shows that at the stage of concrete operations, nearly all contents of operations are directly imported from formal logic and are related to the general development of logical thinking. (This is closely related to the fact that the concept of "operations" itself is introduced directly from formal logic.) None of the content is related to the development of imagery thinking or intuitive thinking, not even the most basic one. As an extremely important stage of children's cognitive (thinking) development, the stage of concrete operations (children at this stage are of 7–11 or 12 years of age, still in their primary school years) comprises merely the development of logical thinking, but without the development of

imagery thinking and intuitive thinking. Is it not then very strange and ridiculous? If such a theory is employed to guide the education of the whole primary school stage, can we really train talents with real creative minds? Unfortunately, until now, the majority of secondary and primary schools in the world, including those in China, still regard Piaget's stage theory of children's cognitive development as the golden rule.

2.3.3.4 Determining the Level of Cognitive (Thinking) Development with only the Level of "Operations" Involves Merely the Advanced Development of Logical Thinking at "The Stage of Formal Operations" While that of Imagery Thinking and Intuitive Thinking is Excluded

As mentioned in Sect. 2.1 part 4 of this chapter, the stage of formal operations has several basic characteristics, which include separation of the forms and contents of thinking; ability to perform various kinds of logical reasoning with hypothetical propositions; and attainment of another two typical formal operation structures (combinatorial system based on bi-propositional operations and INRC quaternary conversion group). Everyone who have studied logic and mathematical logic would be able to spot at a single glance that nearly all of Piaget's discussion in this part is directly related to logic (for example, propositions, hypotheses, judgments, inferences, conjunction, disjunction and implication) or mathematics (such as the various combinatorial systems of operation and the INRC quaternary conversion group or other conversion group), and there is little about psychology. Thus, many readers come up with the doubt: "Is this part related to the issues of thinking and psychology?" We can certainly view that part as meaning to be the method of cultivating the necessary capability of advanced abstract logical thinking, which means regarding it as a necessity for the advanced developmental stage of logical thinking. If this be so, we can demand, with equal reason, the introduction of the necessary capabilities for the advanced developmental stages in imagery thinking and intuitive thinking. This is because, for a person of real talent with genuine creative thinking ability, advanced abilities in logical thinking, imagery thinking and intuitive thinking are equally important, and none is dispensable. (As mentioned above, masters such as Einstein and Arnheim even put more focus on the latter two.) It is really unfortunate that such an important issue was once again neglected by Piaget.

What then is the reason for this repeated neglect of imagery thinking and intuitive thinking? Is it because, when compared with logical thinking, imagery thinking and intuitive thinking are not divided into two stages with a basic level and an advanced level, but are more primitive with only one single level? No. Logical thinking can be divided into a lower "empirical logical thinking" and an advanced "theoretical logical thinking" (theoretical logical thinking is just the same as abstract logical thinking, which children should master and do master during the stage of formal operations) by considering whether the cognitive subject relies on

concrete objects when he makes judgments and inferences with language concepts (mental processing materials). Similarly, imagery thinking can be divided into "reconstructed imaginations" (general imagery thinking) and "creative imaginations" (advanced imagery thinking) by considering whether the cognitive subject creates original and unique property representations of new objects as a result of his reconstruction and processing of different objects' property representations with association and imagination. Intuitive thinking can also be divided into "general intuitive thinking" and "complex intuitive thinking" (that is, advanced intuitive thinking) by considering whether the cognitive subject employs simple relation representations of objects (such as relation representations concerned only with flat surface or spatial locations) or complex relation representations of objects (for example, relation representations that concern human relationships or logical and semantic relationships between objects) as their mental processing materials in carrying out intuitive thinking.

This proves that it is not by accident that imagery thinking and intuitive thinking are neglected once again at the stage of formal operations. Their repeated neglect is the result of Piaget's deep-rooted academic bias of focusing on logical thinking and downplaying representational thinking. As stated, this is the greatest flaw and error in his academic thought. This error has introduced an irreparable defect into Piaget's stage theory of children's cognitive development, and it is a pity to see that his "stage theory of children's cognitive development" is equivalent to a "stage theory of children's logical thinking development". To recapture the true colour of Piaget's stage theory of children's cognitive development and prevent it from giving the public (and even the psychology circle) the faulty belief that it is how children's cognition (thinking) should develop, I sincerely hope that Piaget's stage theory of cognitive development can be renamed by such a term (or at least to understand its true meaning in this way). The above analyses prove that the new name (that is, stage theory of children's logical thinking development) is the most faithful way of capturing the original and true meaning of Piaget's stage theory of children's cognitive development.

2.4 Practices of Education Reform: Questioning Piaget's Division of "Children's Cognitive Development Stages"

In the section above, the research outcomes of modern thinking theories (especially those of creative thinking theories) were used to make a serious and detailed analysis of "operations", which is Piaget's division criterion for dividing or distinguishing children's cognitive development stages. The previous section also pointed out the theoretical lopsidedness of this division criterion and the irrationality and unscientific nature of its resulting division. In the following, our more than 5-year experience in the innovative experiment on leapfrogging development approach in language teaching will be used to examine the gap between Piaget's stage division and practices of the current education reform.

The overview, outcomes and important experiences of the Leapfrogging Development Experiment have been recounted in Chap. 1 of this book, and so they will not be repeated here. It should be emphasized that this innovative experiment is web-based and that it achieved progress acceleration through a dynamic integration of character recognition, reading and writing (rather than separating them as in traditional teaching) by information technology. The experiment is named "Leapfrogging Development Experiment" because the teaching effect and efficiency required to attain the targets of the experiment are at least double those needed in reaching the traditional targets.

As mentioned, the experiment aims mainly at students in primary 1 and 2. The experiment commenced at the beginning of the new term in September 2002, and the students were all about 6 years old at that time. Tests and assessments were made near the end of the first and second academic year (the end of the second and fourth semester) to examine the effect and outcomes of the experiment. At the end of the second academic year, most students had just turned 8 years old. That is to say, students in the experimental classes were around 6–8 years old at the time of the experiment. They were at the end of Piaget's pre-operational stage or at the beginning of the stage of concrete operations. Originally, when the students were at that stage (which also means at the end of stage 2 and the beginning of stage 3), it might seem that a comparative analysis should have been made between Piaget's children's cognitive development level and the actual level attained by the experimental class students at this stage, so as to find out if there were any problem and to gather experience. Yet, as the actual cognitive development level of the students enrolled in our experimental classes with leapfrogging development was generally higher than that of the control classes, we postponed the comparative analysis to the next cognitive development period—that is, to the end of stage 3 and beginning of stage 4, rather than the original end of stage 2 and beginning of stage 3 period. This also meant comparing the cognitive development level of children at the end of the stage of concrete operations and the beginning of the stage of formal operations (this is equivalent to the expected cognitive development level of 10-year-old children) with that actually attained by students in our experimental classes. As mentioned above, students in our experimental classes were only 6–8 during the experiment. This means that, according to Piaget's theory, the expected cognitive development level of 10-year-old children was used to make a comparison with that of our experimental class students.

As stated in Sect. 2.1 part 3 of this chapter, children at the stage of concrete operations have five basic characteristics in their cognitive development:

① **Concreteness**. This is the major basic characteristic of the stage of concrete operations (with the formation of abstract concepts at this stage, children have acquired the ability of logical thinking. However, this ability is still at its preliminary stage and needs the support of concrete objects).
② **Possess conservations in thinking** (But some conservations can only be attained at the later stage of this stage)
③ **Possess reversibility in thinking**

④ **Possess transitivity in thinking**
⑤ **Frequent disequilibrium in cognition**. This shows that at this stage (especially at the latter half of the stage), children have a stronger interest and need in exploring the causal relationships between objects.

As mentioned in Sect. 2.1 part 4 of this chapter, children at the stage of formal operations have the following three basic characteristics in their cognitive development:

① **Commencement of separation of form of thinking and content of thinking**
② **Capable of carrying out various kinds of logical reasoning with hypothetical propositions**
③ **Possess specified structure of operation**

In these three characteristics, ① involves the forms of operations, ② involves the contents of operations, and ③ involves the structures of operations. This shows that by focusing on the development of children's cognitive ability, the major characteristic of the stage of formal operations can be summarized in one phrase: "**Logical reasoning based on hypothetical propositions with separation of form and content**".

Piaget's theory states that children's cognitions develop in a lower to higher level sequence. Children must go through the developmental stages one by one without skipping any. This clearly points out that in children's cognitive development, the expected highest requirement of one stage is the expected basic requirement of its following stage. For the stage of concrete operations, its highest requirement is the basic requirement for the stage of formal operations. The above analysis of the "major characteristics of the stage of formal operations" clearly reveals that the basic requirement of the stage of formal operations (which is also the highest requirement of the stage of concrete operations) must be "logical reasoning based on hypothetical propositions with separation of form and content".

It has been pointed out that the highest requirement in the latter stage of concrete operations is equivalent to the expected cognitive development of a 10-year-old child. "Highest requirement" refers to the greatest extent which the cognitive ability of children can reach at this cognitive development stage (or at this age group). This clearly shows that **"logical reasoning based on hypothetical propositions with separation of form and content" is the highest cognitive development requirement which can only be attained by 10-year-old children**". This is a completely logical conclusion deduced in strict accordance with Piaget's theory. However, is this conclusion scientific? That is to say, is this resulting conclusion of Piaget's criterion for dividing children's cognition development stages really objective and realistic?

In order to make a comparison between the actual cognitive development level acquired by the experimental class students and the result of Piaget's theoretical analysis, a method for collecting related information that can realistically reflect the thinking achievements of students must first be found. There are various methods: conversation, experiment, test, clinical method, etc and Piaget chose to use

his own unique "clinical method". This clinical method depends mainly on verbal conversations and is supplemented by direct observation and physical operations. It can also be carried out on a basis mostly on physical operations supplemented with observation and questions. Whichever of these two methods is employed, the best outcome can only be gained with the dynamic integration of physical operations, verbal questioning and direct observation.

Piaget's clinical method has both pros and cons. For example, some questions may put pressure on the testee or do not interest him, so he refuses to answer it or just muddles through it, which results in a failure to gather realistic test data. Other than that, some questions may be implying and suggesting, which would also affect the authenticity of the test result. In light of all these, we hope to collect the thinking achievements that children produced consciously and willingly in an environment without any external pressure and restriction. These thinking achievements will be used as the basis for finding out the students' development in cognitive ability and in conducting a comparative analysis with the theoretical "highest requirement" ("Highest requirement" here refers to the aforementioned "**highest cognitive development requirement which can only be attained by 10-year-old children**", which is deduced in accordance with Piaget's division of children's cognitive development stages). After consideration and comparison of many different aspects, it is firmly believed that "the selected pieces of online exercises by experimental class students" best suit our requirements as mentioned above. This is because these online exercises were posted consciously and willingly by the students as they would like to communicate with the teachers or tell the teachers their innermost feelings (rather than controlled composition writing). These exercises were collected and published by teachers without any change in the wordings, and thus can reflect most faithfully the students' ideas and cognitive development status.

Following are the exercises of some of the experimental class students and our comments. (On the first line is the name of the student, and from the second line onward are extracts from the exercises. Words in brackets are added by the author to facilitate reading.)

Student 1: Xian Meng Jia
Extract of the exercise: "Through lots of games, I learnt to understand forest signs and how to deal with enemies, how to take care of the wounded, this is actually a military training to me[1]".

Explanations and comments: The school had arranged a spring outing to Nan Ao (a tourist spot near Shenzhen) and played games there. The composition of Xian Meng Jia describes the whole course of this activity, and the above extract is its last paragraph. In this paragraph, Xian induced the general conclusion, "this is actually a military training to me" through the military training-related examples of "learnt to understand forest signs", "how to deal with enemies" and "how to

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[1]The student made a grammatical mistake in his original Chinese composition here concerning the usage of "我" (literally means "me") and "我的" (literally means "mine").

take care of the wounded". This shows that Xian had already mastered inductive reasoning, which moves from specific facts to general conclusion.

Student 2: Li You Xin

Extract of the exercise: "My favourite people are: Father and mother…..Although they are usually very strict to me, but I know that it is for my own good. Under their guidance, I get known to lots of logic, learnt lots of knowledge, in future, I should show even more respect to them, and be a good child who obeys her parents".

Explanations and comments: The extract actually involves three examples of categorical deductive reasoning based on a proposition.

[Reasoning 1]: All strict demands urge people to improve,

(Proposition 1, universal categorical judgment, major premise)

My parents have strict demands on me,

(Proposition 2, singular categorical judgment, minor premise)

Thus, my parents urge me to improve. (Conclusion)

[Reasoning 2]: All people who urge me to improve cherish me and care for my well-being.

(Proposition 1, universal categorical judgment, major premise)

My parents urge me to improve.

(According to the conclusion of reasoning 1)

(Proposition 2, singular categorical judgment, minor premise)

Thus, my parents cherish me and care for my well-being. (Conclusion)

[Reasoning 3]: Anyone who wants to get known to logic must obey their parents.

(Proposition 1, universal categorical judgment, major premise)

I want to get known to lots of logic.

(Proposition 2, particular categorical judgment, minor premise)

Thus, I must obey my parents (be a good child who obeys her parents). (Conclusion)

Student 3: Chen Yao

Extract of the exercise: "The annual "May 1" Festival has came, my father had already planned a trip back to the hometown Chaozhou in these 7 consecutive public holidays, because the shrine festival, which is held every 20 years, of their hometown will be held this year, so we must rush back to the hometown on April 30 of the solar calendar. I feel very unhappy, originally I would be participating in the ancient poem recitation competition today, I had prepared for it for a long time, and it is also a rare chance for me to be a little hostess! But my father must have me take a leave, or else I am unfilial. Succumbing to my father's authority, I could only agree with his (opinion) and took a leave, but I feel very bad".

Explanations and comments: This paragraph involves two types of reasoning, hypothetical reasoning and categorical reasoning.

[Hypothetical reasoning]: Not attending the shrine festival means unfilial,

(Proposition 1, hypothetical reasoning with sufficient condition, major premise)

I am not an unfilial person,

(Proposition 2, singular categorical judgment, minor premise)

Thus, I should attend the shrine festival. (Conclusion)

[Categorical reasoning]: All trivial matters must submit to important matters,

(Proposition 1, universal categorical judgment, major premise)

Comparing with the shrine festival, participating in ancient poem recitation and be a little hostess are trivial matters,

(Proposition 2, singular categorical judgment, minor premise)

Thus, I can only let the former submit to the latter. (Conclusion)

Even though the little author Chen Yao (6 years old) was not happy, she recognized the correctness of the result of logical reasoning. So she acted rationally and was able to control her emotions rather than letting them affect her. This is difficult even for adults.

Student 4: Yuan Bo

Extract of the exercise: "My eyesight becomes poorer, I must do more eye exercises, and pay attention to protect my eyes….In future, I must protect my eyes better, use my eyes scientifically, and lay a good foundation to my future studies".

Explanations and comments: This extract involves one example of hypothetical reasoning and one of categorical reasoning.

[Reasoning 1]: If we lack eye exercise and care, our eyesight will become poorer,

My eyesight becomes poorer,

Thus, my poorer eyesight may have resulted from a lack of exercise and care.

(hypothetical reasoning)

[Reasoning 2]: In order to protect our eyes well, we need to use our eyes scientifically and do more eye exercises,

I want to protect my eyes well,

Thus, in future, I must use my eyes scientifically and do more eye exercises.

(categorical reasoning)

[Reasoning 1]:	If we lack eye exercise and care, our eyesight will become poorer, My eyesight becomes poorer, Thus, my poorer eyesight may have resulted from a lack of exercise and care.	(hypothetical reasoning)

[Reasoning 2]:	In order to protect our eyes well, we need to use our eyes scientifically and do more eye exercises, I want to protect my eyes well, Thus, in future, I must use my eyes scientifically and do more eye exercises.	(categorical reasoning)

Student 5: Zhang Jun Hao

Extract of the exercise: "My little brother was playing beside me. Suddenly, my little brother let out "wow" and started crying, the whole family rushed to see him. May be my little brother wanted us to pay attention to him, he had reached his goal, and thus he laughed. Don't you think he was cunning? My little brother used crying as a method to get others' attention and to reach his goal, he was really quite cunning".

Explanations and comments: This extract involves an example of two-limbed hypothetical reasoning (its major premise is a two-limbed hypothetical judgment) and an example of categorical reasoning).

[Reasoning 1]: Pretending or using a not rightful strategy means playing a trick, My little brother pretended to be crying, Thus, my little brother was playing a trick.

(two-limbed hypothetical reasoning)

[Reasoning 2]: Using tricks to achieve any particular goal is cunning, My little brother used trick to get others' attention, Thus, my little brother was rather cunning.

(categorical reasoning)

Student 6: Tang Tian

Extract of the exercise: "Eastern Wu had ordered Commander-in-Chief Lu Xun to lead a large army of a hundred thousand soldiers to attack Shu, Liu Bei asked for a strategy to defeat the enemy. Zhuge Liang said, "Sun Quan has a senior general Zhou Tai, who is extremely brave and fierce, but, he dislikes Lu Xun the most, and also has an unyielding character. He will definitely attack (in a hurry), and Lu Xun will definitely failed to stop him, thus, we can lay an ambush to annihilate him".

Explanations and comments: This is the beginning paragraph of the first chapter, "Strive for Supremacy: Shu and Wu", of Tang Tian's novel, "*New Romance of the Three Kingdoms*". From 9 April, 2001 to the end of May that year, in just

1-month time, Tang had written five chapters for his *New Romance of the Three Kingdoms*, amounting to more than 9500 words. At the end of primary one, he had composed seven chapters which amounted to more than 17, 000 words. His work displays rich imagination and higher level logical thinking. This paragraph involves the following complex logical reasoning (the first two are categorical reasoning, and the third one is a two-limbed hypothetical reasoning).

[Reasoning 1]: All brave and fierce generals press for victory and will attack in a hurry,
Zhou Tai is a brave and fierce senior general,
Thus, Zhou Tai will definitely attack in a hurry.   (categorical reasoning)

[Reasoning 2]: Anyone who dislike a particular person will refuse to listen to the advice of that particular person,
Zhou Tai dislikes Lu Xun the most,
Thus, Zhou Tai will certainly refuse to listen to Lu Xun's advice (definitely failed to stop him).   (categorical reasoning)

[Reasoning 3]: If we lay an ambush and the enemy comes in a hurry, we can annihilate the enemy,
Zhou Tai will definitely come in a hurry, (according to the conclusions of reasoning 1 and 2)
Thus, the Shu army can surely annihilate the Wu army by laying an ambush.   (two-limbed hypothetical reasoning)

Student 7: Huang Xu

Extract of the exercise: "The cunning fox caught the cock as soon as it jumped up, as it was trying to eat the cock, the cock said, "Bro fox, you break your words. But, it's good if you eat me, I have bird flu anyway, it will prevent me from suffering then". The fox heard it, believed it, and put down the cock and rushed to the

river to wash its hands, it was afraid that it would be infected, and never dare to come for the cock again. The clever cock used wisdom[2] to defeat its enemy".

Explanations and comments: When Huang was writing this piece, there was bird flu near Shenzhen in Hong Kong. Huang Xu used this instance to compose this creative and good work to "give some ideas to the cock". The above extract involves the following three examples of reasoning (two of categorical reasoning and one of hypothetical reasoning).

[Reasoning 1]: All kinds of flu are infectious,
                I had bird flu,   (categorical reasoning)
                Thus, I will infect it to others.

[Reasoning 2]: Infectious diseases will end-
                anger the lives of others,
                I will infect others,   (categorical reasoning)
                Thus, I can endanger the lives
                of others.

[Reasoning 3]: If I tell the fox that I have
                infectious disease,it will stay
                way from me because it afraid,   (hypothetical reasoning)
                Now, I tell the fox that I have
                infectious disease,
                Thus, the fox will stay away.

Student 8: Xiao Feng

Extract of the exercise: "My little cousin is only one, he wears two pigtails, round eyes, has a face like a red apple, white and neat teeth, and has sweet voice when speaking. She is very politely, she will address female as aunt when she meets them, and male as uncle. When she came to my home to play last time, I taught him to recognize the characters "大" [literally means "big"] and "太" [literally means "excessive"], she remembered immediately that "大" has one dot less. We all said that she is a clever child".

Explanations and comments: The author of this piece was only six, and the cousin in the writing was only about one. Children do not tell lie and Xian Feng's description of his 1-year-old cousin's behaviour is real and believable. This reveals that (at least some) infants of about 1-year old who can speak have already acquired the basic ability to use language concepts for abstraction and generalization, because the cousin "will address female as aunt when she meets them, and male as uncle". Although it is rather rare for children of about one to acquire

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[2]The student made a vocabulary mistake in his original Chinese composition here, misplacing "智慧" (literally means "wisdom") with "知慧".

such language generalization ability like Xiao Feng's cousin, such ability is not rare in children who are a little bit older. In fact, many children of 2–3 years old will address young men as "big bro", young ladies as "big sis", and old people as "grandpa or grandma". This shows that these children of two or three have already mastered the basic ability to use language concepts for abstraction and generalization, and that they have also acquired the basic ability to make judgments for he (she) knows that:

If a person is a male and young, we should use
"bro" to address him,   (hypothetical
If a person is a female and young, we should use   reasoning with
"sis" to address her,   sufficient necessary
If a person is a male and old, we should use   conditions)
"grandpa" to address him,
...

An even more surprising example was experienced personally by the author of this book. I have a granddaughter who is now 11 years old. When she was 3.5-year old, an unforgettable incident happened. It was a Sunday. My son (who is also the uncle of my granddaughter) joked with my granddaughter. He held a big piece of chocolate in his hand and said, "Call me papa and I'll give you the chocolate". At the beginning, my granddaughter refused to do so, but eventually she could not refrain from the temptation of the chocolate and called him "papa" once. As soon as she finished the chocolate, she gazed at her uncle and said, "You are my uncle, not papa. There is only one papa in one home, not two". (Author's note: "There is only one papa in one home, not two" is an abstract judgment that this child of three and a half made.) Her uncle was unhappy to hear that and thought that she was too crafty in changing her words just as she finished the chocolate, and returned, "I'll never buy you chocolate anymore". My granddaughter heard it and immediately rebutted, "If you really want to be a papa so much, why don't you find a girlfriend and have a child". I was sitting by their side at that time and was greatly surprised to hear her words. They seemed simple, but they involved a rather complex piece of hypothetical reasoning: "If you want to be a father, you have to have your own child; If you want to have your own child, you need to have your own wife first; If you want to have a wife, you need to get a girlfriend first". This is a complex reasoning process which involves several hypothetical propositions. I was too surprised to believe that a child of three and a half had voiced them. This shows that in our age, some pre-school children not only master the basic ability to employ language concepts in making generalization and judgments, but also have a certain capability in logical reasoning based on hypothetical propositions.

There are still numerous online exercises and daily examples like the above. The case of a 3.5-year-old child possessing basic capability of generalization,

judgments and reasoning may be viewed by some as an individual case or exceptional case. However, the pieces of selected online exercises produced by the experimental class students in primary one and two should be sufficient to prove that with appropriate education, children of 6–8 are fully able to master this capability—including the ability of logical reasoning based on hypothetical propositions. Yet, according to Piaget's theory, such **"logical reasoning based on hypothetical propositions with separation of form and content"** is regarded as **"the highest cognitive development requirement which can only be attained by 10-year-old children"**. But the reality is an embarrassment to that authoritative theory.

The above daily examples and online exercises which faithfully reflect the inner voice and wisdom of students are intended to show that in Piaget's children's cognitive development theory and especially in the resulting stage division of his division criterion, there are at least three defects:

1. Imposing a Mechanical Fixed Division of Children's Cognitive Development Stages. Putting Too Much Emphasis on Innate Genetic Factors while Neglecting the Influence of Language Environment and Effect of Education

This view is especially harmful in the Information Era. It is common sense that with the popularization of television, multimedia and Internet, people acquire information and knowledge quicker and easier. The quality and quantity of the acquired information and knowledge greatly improved. There is also an obvious acceleration in the progress of children's cognitive development. Piaget failed to recognize that although the stages and order of this development are unchangeable, they can be greatly compressed and started much earlier with the support of appropriate education and in an information technology environment. Development stages are not unchangeable in length of time. If children's cognitive development is viewed within Piaget's mechanically divided fixed age groups (0–2, 2–6, 7–10, 11 or 12 onwards), great restriction and limits will be imposed on our basic education, especially primary education.

2. Believing that at the pre-operational stage (2–6 years old), there is only representation-based thinking but no language concept-based logical thinking. Believing that there is no hypothetical proposition-based abstract logical thinking at the stage of concrete operations (7–10 years old), but only representation-based thinking and basic logical thinking that relies on concrete objects

That is to say, the language foundations of pre-school children aged 5–6 are still very weak, and consequently these children do not have sufficient language concepts to support abstract logical thinking. A direct conclusion from this is—in teaching language subjects (and other subjects) in junior and middle primary grades (primary 1–4), emphasis should only be put on visualized teaching with images and cultivation of imagery thinking based on representation rather than cultivation of abstract logical thinking. Even when it is in the senior primary

grades (primary 5–6), cultivation can still only be focused on basic concrete object-dependent logical thinking rather than advanced abstract logical thinking. Such a viewpoint is extremely harmful to language teaching in primary schools and the development of language ability in primary school students. It is well known that language and thinking are inseparable. On the one hand, language is the material shell of thinking. Humans cannot perform advanced logical thinking without language. On the other hand, thinking ability has a decisive effect and restriction on the formation and development of language ability. If primary school students are still at the stage of basic concrete object-dependent logical thinking in their senior primary grades (primary 5–6), then their reading and writing abilities will surely be poor. (In the following, the research outcomes of modern child psychology and child linguistics will be used to prove that that viewpoint of Piaget is completely inconsistent with the reality.)

3. Being concerned only with the development of logical thinking ability in the process of children's cognitive thinking while completely neglecting that of representation-based thinking ability. Factitiously separated logical thinking and representational thinking, which is detrimental to the cultivation of creative thinking in children

It has been pointed out in Sect. 2.3 of this chapter that when Piaget used "operations" as the criterion for dividing children's cognitive development stages, he was actually employing "logical thinking" as the criterion while not taking into consideration any representation-based thinking. (Representation-based thinking includes imagery thinking and intuitive thinking.) In fact, human's language concept-based logical thinking and representation-based thinking are interdependent and inseparable, and they develop concurrently. The above online exercises of the experimental class students also show that the outstanding pieces among them are usually the products of a better integration of logical thinking and representational thinking. Separating these two types of thinking factitiously (or even making them hostile to each other) is not only harmful to the development of representational thinking, but also to that of logical thinking. Without sufficient development in logical thinking and representational thinking (that means imagery thinking and intuitive thinking), creative thinking and creative talent are completely out of the question. Thus, it is vital for us to drop Piaget's viewpoint which focused on logical thinking but neglected representational thinking, and abandon using "operations" as the standard for dividing children's cognitive development stages. A dynamic integration of logical thinking and representational thinking (or more precisely, a dynamic integration of logical thinking, imagery thinking and intuitive thinking) should commence seriously from the very beginning of primary school (and even since the junior primary grades) in language teaching and also in the teachings of other subjects. It is only in this way that basic education can act as a foundation for the cultivation of a large group of innovative talents with extremely creative minds.

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Chapter 3
New Theory of Children's Thinking Development

3.1 Background of the New Theory of Children's Thinking Development

In Sect. 2.3.3 of Chap. 2, it was pointed out that in determining the major principles for the division criteria of children's cognitive development stages, two factors should be considered at the same time: ability to perform mental processing and materials for mental processing. Ability to perform mental processing is the ability to carry out interiorized psychological operations. It is the manifestation of an integrated ability that involves mental processing methods, use of mental processing strategies and storage of mental processing (that is, memory). Mental processing materials refer to symbolic representative systems, such as representations and concepts.

Piaget only took into consideration the ability to perform mental processing. He applied polarized understanding to it, which resulted in a seriously one-sided theory. Piaget's polarized understanding can be seen in his regarding the ability to perform interiorized psychological operations as one of the abilities of logical thinking (that is, the interiorized psychological operations that employ language concepts for processing). The ability of imagery thinking and intuitive thinking (that is, the ability to use the representations of properties and relations in psychological operations) was completely ignored, and interiorized psychological operations were also not viewed as the sum of the above three thinking abilities. The basic thinking forms of human are logical thinking, imagery thinking and intuitive thinking, no more and no less (He 2000). Thus, to reflect children's cognitive development objectively and realistically, the ability to perform interiorized psychological operations should include these three abilities at the same time, or else it will result in serious one-sidedness. Piaget committed his biggest theoretical mistake on this point.

It is well known that in the previous century, there were two scholars who conducted the deepest investigation and made the greatest contribution to the division of children's cognitive development stages: Piaget and J.S. Bruner. Piaget focused on the first factor of thinking ability, interiorized psychological operations and added appropriate limitations (reversibility and conservations) to them to create a new concept called "operations" (Actually, operations are not a new concept. They are only "interiorized psychological operations" with reversibility and conservations). Based on the concept of "operations", Piaget created his own stage theory of children's cognitive development.

Different from Piaget, Bruner held on to the second factor of thinking ability, mental processing materials, which included the symbolic representative systems of representations and concepts. On this basis, Bruner emphasized the concept "representation".

With the concept of "representation" (it is indeed the symbolic representative system, that is, mental processing materials), Bruner established his "Stage Theory of Children's Intellectual Development" (Zhang 1999). He believed that such development is reflected by the change of representative systems. "Representative systems" refers to the methods by which the cognitive subject "represents" (or "reproduces") knowledge and experiences about the external world. Children of different intellectual development levels used different methods to represent or reproduce the knowledge and experiences about the external world. Bruner believed that there were three such methods. They emerged and developed in sequence from the children's infancy to adolescence. They are: "enactive representation" mode, "iconic representation" mode and "symbolic representation" mode. Accordingly, children's cognitive or thinking development has to go through the following three stages:

Stage of enactive representation (0–2 years old)—At this stage, motions are used as the major representations of the cognitive subject's knowledge and experiences about the external world. It is equal to Piaget's sensori-motor level.

Stage of iconic representation (3–11 or 12 years old)—At this stage, the concrete images or representations of objects are used as the major representations of the cognitive subject's knowledge and experiences about the external world.

Stage of symbolic representation (11 or 12–15 years old)—At this stage, artificial symbolic systems are used as the major representations of the cognitive subject's knowledge and experiences about the external world. Language is the most important symbolic representation system, though it is not the only system (gestures, postures and semaphore also belong to this system).

Bruner's stage of enactive representation is equal to the sensori-motor level of Piaget. His stage of iconic representation equals the "pre-operational stage" + "the stage of concrete operations" and the stage of symbolic representation equals the stage of formal operations. It can be seen that though Bruner and Piaget used different division criteria, their division results are similar and share the same nature. This is because both of them committed the same mistake—one-sidedness. They only took into consideration one of the factors. Although Bruner did not polarize

his chosen factor, he did make a similar mistake to that of Piaget—isolating and separating his chosen factor (mental processing materials, that is, symbolic representation system), and failed to recognize clearly the true nature of representation.

As stated in Sect. 3.3 part 3 of the previous chapter, using the concrete images of objects as mental processing materials is the basic characteristic of "animalistic thinking", while the basic characteristic of human thinking is using "representation" and "concepts" (that is, symbolic representations) as mental processing materials. As 1) Bruner's "stage of enactive representation" is equal to Piaget's "sensori-motor level" and "the stage of animalistic thinking", and the mental processing materials at this stage can only be "the concrete images of objects"; 2) Bruner's "stage of iconic representation" is equal to Piaget's "pre-operational stage" + "stage of concrete operations" and 3) Bruner's "stage of symbolic representation" is equal to Piaget's "stage of formal operations", and the metal processing materials at this stage are "representations" and "concepts" (that means symbolic representations), the scientific and standardized representation methods of human thinking should be "**iconic representation**", "**representational representation**" and "**conceptual representation**" (or "**symbolic representation**").

However, in his "stage theory of children's intellectual development", Bruner proposed the new "enactive representation", which meant the same as the above standardized "iconic representation". His "iconic representation" is equal to "representational representation" of the above.

Why would Bruner press on to create such a term as "enactive representation" in substitution for the more standardized term "iconic representation"?

In fact, the original meaning of representation (which means indications and symbols) refers obviously to some kind of symbolic signs that the brain uses in reflecting the cognitive subjects' knowledge and experiences about the external world. Motions are explicit behaviours made by the body and are sensible through the sense organs. They are definitely not the kind of symbolic signs that are in the brain. Thus, the phrase "enactive representation" is illogical and it does not match the real meaning of "representation". Bruner failed to recognize clearly the nature of "representation". It is even more disappointing that he had isolated and separated the three types of representations, making them unrelated. Actually, "representational representation" and "language representation" (that is, conceptual representation or symbolic representation) are interdependent. They support each other and cannot be separated (He 2000). By artificially dividing children's intellectual development into the sequence of "enactive representation" (which should be "**iconic representation**" in standardized terms), "iconic representation" ("**representational representation**" in standardized terms) and "symbolic representation", Bruner carried the undertone that at a particular developmental stage, children have representation that depends mainly on representations or symbols; or even that they solely and purely have representational representation or symbolic representation. This is in complete contradiction with the actual situation (detailed argument can be found in reference He 2000). In fact, after children have acquired language, "representational representation" and "conceptual representation" (or "symbolic representation") always exist and develop together. When

conceptual representation is at its lower stage, representational representation is also at its lower stage and vice versa. All in all, different representation systems should be viewed as interconnected and supportive of each others. They should not be isolated or separated.

3.2 Basic Contents of the New Theory of Children's Thinking Development

Integrating the above analysis and together with the two factors of thinking ability, we proposed a new theory of children's thinking (cognitive) development. According to this theory, the stages of children's thinking (cognitive) development should be divided as follows:

1. **Stage of animalistic thinking** (birth—before possessing basic language ability)
2. **Stage of elementary thinking** (beginning to possess basic language ability—beginning to possess proficient oral ability)
3. **Stage of intermediate thinking** (beginning to possess proficient oral ability—before the formation of comprehensive thinking quality)
4. **Stage of advanced thinking** (after the formation of comprehensive thinking quality)

Thinking here includes logical thinking, imagery thinking and intuitive thinking. Thinking quality is defined by the famous psychologists Zhu Zhi Xian and professor Lin Chong De, which includes five aspects: profundity, flexibility, originality, agility and criticality (Zhu and Lin 1991). It does not refer to Piaget's simple thinking quality, which only includes reversibility and conservations.

The above division of children's thinking development stages raises the problem of how to understand correctly and define scientifically "beginning to possess basic language ability" and "beginning to possess proficient oral ability". To provide a concise answer to this, we need to first understand the occurrence and development of language in children. According to a substantial number of experiments and researches on the occurrence and development of language in children which were conducted both inside and outside our country (Piaget 1972; Zhu 1998; Li 1995; Li and Chen 1998), we believe that children roughly go through the following four periods from their birth to their "beginning to possess basic language ability":

1. **Vocalization practice period** (birth to around 6-months old): During this period, infants do not possess any verbal ability, which means that they are unable to say or understand any word. They can only produce different sounds. At the beginning, these sounds are comparatively monotonous, and they gradually acquire more variety through imitation. During this period, these sounds only express the infants' feelings of hunger, thirst, happiness and pain, or some

specific wants and needs. They are still not phonetic symbols that represent specific meaning (concept), and so, they belong to the first signal system rather than to the second.

2. **Language preparation period** (7–11 or 12 months old): Though infants remain unable to utter words during this period, they begin to have preliminary understanding of discourses (for example, when infants heard "Give the apple to Mommy", they were able to response by giving the apple to their mothers Li and Chen 1998). Apart from that, infants are able to communicate with adults through simple body language (such as lifting up their hands to signify that they want the adults to hold them up, making sucking actions with their mouths to show that they want to have milk). The researches of reference (Li and Chen 1998) found that infants in the latter half of this period are able to roughly understand (that means they basically understand the meaning but are unable to utter it) about 200 words, of which noun and verb each comprise nearly half. **The second signal system begins to be established during this period, and the infants start to attain basic language ability in the latter half of this period, that is, when they are around 11- or 12-months old.**

3. **Language development period** (1 to around 2.5 years old): Children are already able to actively participate in verbal communication activities during this period, which means that they can listen and utter. However, the language they used is still immature and incomplete. It is the special language of young children. The development of this special language can be divided into three sub-stages: holophrastic sentences, two-word sentences and telegraphic sentences. The viewpoints of the theories of semantic perception (see also reference He 2004) suggest that children inherently possess semantic perception ability, which is the ability to perceive and identify the sounds and meanings of words. As stated before, this is also proved by the researches in reference (Li and Chen 1998)—though infants in the language preparation period (7–12 months old) are unable to utter the words, they already have basic understanding of them (they understand about 200 words and are able to understand relatively simple sentences). When infants are in the language development period, they continue to use fragmented or telegraphic sentences rather than complete and coherent sentences to express themselves. This is not caused by problems in the semantic understanding of the whole sentence, but by the infants having mastered only a very limited number of words and grammar rules by then. For example, in expressing the complete sentences "I want Mama to hug me" and "Sister, please play the car car with me", young children at different age periods have the following three ways of expression:

Children who are about 1–1.5 years old usually say "hug" (or "hug hug"), "car" (or "car car"). They are at the stage of holophrastic sentences;
Children who are about 1.5–2 years old usually say "Mama hug", "play car car". They are at the stage of two-word sentences;
Children who are about 2–2.5 years old usually say "Me, Mama hug", "Sister play car car". They are at the stage of telegraphic sentences.

These holophrastic, two-word and telegraphic sentences are ambiguous and even incomprehensible if they are heard in isolation. Yet, with a specific interaction background (that means within a certain context and with the gestures, facial expressions and postures), the children will have no problem in communicating with others through these incomplete sentences, because the three ways of expressions above all convey the same and complete semantic meaning of "I want Mama to hug me" and "Sister, please play the car car with me".

4. **Language maturation period** (2.5–4.5 or 5 years old): After they are 2.5 years old, children's verbal ability shows rapid development with gradual increase in practice activities (such as playing and studying) and expansion of communication range with others. Children's mastery of their native spoken language becomes more and more skillful and perfect. In the late 1980s, psychologists of our country collected statistical data about the number of oral vocabularies mastered by more than 2000 pre-school children across 10 provinces. The result is as follows: **Children of 3–4 years old mastered 1730 common words, of 4–5 years old mastered 2583 common words and of 5–6 years old mastered 3562 common words** (Zhu 1998). At the same time, children also gradually gained a better mastery of the language rules and linguistic phenomena of their native language (Li and Chen 1998). Linguist Li Yu Ming carried out in-depth research on the linguistic subsystem "interrogative sentence system" in the language development of infants and children of 1–5 years old in our country (Li and Chen 1998). The subsystem "interrogative sentence" was especially chosen as the subject of research because this very complex but commonly used subsystem contains 30-odd interrogative sentence patterns. (It includes various types such as general questions, special questions, rhetorical questions and affirmative questions in rhetorical forms) Examining this subsystem generates high representativeness. This subsystem was chosen for the research society. By understanding and answering questions, children can swiftly improve their abilities in various aspects, such as understanding discourses, reconstructing knowledge and also because "questioning" is the major strategy by which individuals perform information exchange with experiences and expressing thinking and feeling. This means that "questioning" plays a decisive role in children's formation and development of cognitive structures, as well as their establishment of normal interpersonal relationships. Thus, learning and mastering interrogative sentences carry special importance and representation in children's development of language and thinking.

The research of Li Yu Ming concluded that "**The children's interrogative sentence system enters maturity after 3 years of age. During this period, various interrogative sentence patterns gradually emerge. There is a large surge in the use of rhetorical questions and specified question tags in a non-interrogative sense, and a gradual smoothing of syntactical organization. After 4 years old, the extensive use of reason questions indicates that**

children's sense of causal relationship is gradually strengthening. There are also more "solution-seeking" questions. This indicates that the children's interrogative question function has already matured, and the important task in future is to develop the use of interrogative questions." Although the research of Li Yu Ming only focused on the subsystem of interrogative sentences, this subsystem, as mentioned, carries special importance and representation in children's development of language and thinking. Thus, the process of learning and mastering this subsystem should be able to reflect to a great extent children's process of learning and mastering their whole native language. In other words, based on the conclusion of Professor Li Yu Ming's research, it can be believed that **After 4 years of age, children's mastery of the various sentence patterns of their native spoken language has gradually become perfect and mature. Further development in future will mainly focus on "pragmatics"**. In fact, the whole modern linguistic circle (both Chinese and international) admit this basic fact: "Children of 4 or 5 years of age of any race are able to master without teaching their native spoken language, which includes an enormous variety of grammar rules". (The only outstanding question is "why children are able to master their native spoken language without teaching and within only a few years"; about which the linguistic circle entertains different arguments and explanations.)

In summary, the above analysis reveals that "beginning to possess basic language ability" occurs in the latter half of children's "language preparation period", that is, when they are about 11 or 12 months old; and "beginning to possess proficient verbal ability" occurs in the latter half of children's "language maturation period", that is, when they are about 4.5 or 5 years old.

As to the issues of defining and measuring "thinking quality", and how the teaching of different subjects in primary and secondary schools can be used to cultivate thinking qualities in children and enable gradual idealization and perfection of these qualities, detailed discussion can be found in the related works of Professors Lin Chong De and Zhu Zhi Xian (in reference Lin 1992; Zhu and Lin 1991), and it will not be repeated here. In the works of Professors Lin and Zhu, there is no definite timeframe based on expectations of when a more perfect thinking quality will be formed. This is because they believed that the formation of perfect or ideal thinking quality in teenagers is not determined by heredity, but to a large extent by the teaching methods of their teachers in primary and secondary schools. With appropriate education, this perfect thinking quality can be formed much earlier. In contrast, it may be formed much later or even be long delayed. We believe that this understanding and attitude of Professors Lin and Zhu is truly related to dialectic; and that Piaget's fixed division of children's cognitive development stages is related to complete ignorance of the influence of education and environment, and that it is subjective and mechanistic, and fails to attain to the viewpoint of dialectic.

3.3 Implications of the New Theory of Children's Thinking Development for Language Education Reform

It should be emphasized that our proposal for a new theory of children's thinking development is not intended purely at a theoretical investigation. More importantly, we hope to efficiently enhance children's thinking and language development by having a realistic understanding of the objective laws of children's thinking development. Language is the material shell of thinking and the two of them are indivisible. A scientific understanding of thinking development and its relation with language provides the essential condition for the teaching of native language (that is, our mother tongue education, which is also our Chinese language education). A scientific and objective understanding will greatly enhance the language education. The alternative is that the quality and efficiency of language education will be severely reduced and the progress of language education reform will be delayed and blocked. It is very disappointing that to our Chinese language teaching, Piaget's "stage theory of children's cognitive development" (as mentioned, it is actually a "stage theory of children's logical thinking development") is not having a proactive and positive effect, but a passive and negative one.

3.3.1 Conclusions Regarding Mother Tongue Learning Deduced Directly from Piaget's Stage Theory of Children's Cognitive Development

As mentioned, Piaget's stage theory of children's cognitive development stated that children at the pre-operational stage (2–6 years old) only possess representation-based thinking and do not have language concept-based logical thinking; children at the stage of concrete operations (7–10 years old) only have basic logical thinking which depends on concrete objects, and do not possess abstract logical thinking involving hypothetical propositions. Language is the material shell of thinking, and the development of thinking and that of language are closely connected. Thus, from the above, the following conclusions about mother tongue learning can be deduced naturally and directly: **"Pre-school children aged 5–6 have a very weak mother tongue foundation. They still have not acquired enough vocabularies and do not possess the variety of sentence patterns to support logical thinking; Primary school children aged 7–10 normally are unable to produce writings with a certain degree of abstractness and generality."**

This is because:

(1) **Pre-school children aged 5–6 do not possess language concept-based logical thinking, and thus they lack sufficient vocabularies to support the mental processing of logical thinking, such as analysis, integration, abstraction and generalization**

Vocabularies consist of content words and function words. There are only a small number of function words, and most vocabularies are content words. Each content word represents one concept, and concepts are the necessary materials for the above mental processing of logical thinking. Thus, if children in this age group possess sufficient vocabularies (that means concepts), they would not lack basic language-based logical thinking.

(2) **Pre-school children aged 5–6 do not possess language concept-based logical thinking, and thus they lack the variety of sentence patterns to support the judgments and reasoning of logical thinking**

A judgment is a declarative sentence, and reasoning builds on judgments. Reasoning includes various types, namely, categorical reasoning, hypothetical reasoning and complex reasoning. Thus, mastery of more sentence patterns is vital for performing the judgments and reasoning of logical thinking. If children in this age group possess sufficient sentence patterns, they would not lack basic language-based logical thinking.

(3) **Children below 10 years old only possess basic logical thinking based on concrete objects. It is impossible for them to have abstract logical thinking on hypothetical propositions. Thus, children in this age group are still unable to produce writings with a certain degree of abstractness and generality**

Writing involves the author's ability in language expression and his various thinking abilities (including logical thinking, imagery thinking and intuitive thinking); and abstractness and generality in the content of the writings are mainly determined by the abstract logical thinking ability of the author. As primary school students in the lower and middle grades (below 10 years old) only possess basic logical thinking based on concrete objects and do not have abstract logical thinking on hypothetical propositions, it is normally very difficult for them to compose writing with a certain degree of abstractness and generality.

3.3.2 The Conclusions of Mother Tongue Learning Deduced Directly from Piaget's Stage Theory of Children's Cognitive Development are not objective, realistic and scientific

If we believe that Piaget's stage theory of children's cognitive development is scientific, we should conduct our mother tongue (Chinese) education in accordance with the logical conclusions deduced above (**"Pre-school children aged 5–6 have a very weak mother tongue foundation. They still have not acquired enough vocabularies and do not possess the variety of sentence patterns to support logical thinking; Primary school children aged 7–10 normally are unable to produce writings with a certain degree of abstractness and generality."**). The language education of our country has been doing that for many years, and has continued to regard and carry out thoroughly the above conclusions as a golden rule.

But what is the actual situation? As mentioned above, in the late 1980s, psychologists of our country collected statistical data about the number of oral vocabularies mastered by more than 2000 pre-school children across ten provinces. The result showed that: children of aged 3–4 mastered 1730 common words, those aged 4–5 mastered 2583 common words, and those aged 5–6 mastered 3562 common words. This reveals that pre-school children aged 5–6 have **already mastered ample vocabularies** (rather than **a lack in sufficient vocabularies**) to support the mental processing of logical thinking, such as analysis, integration, abstraction and generalization.

At the same time, children also gradually gain a better mastery of the language rules and understanding of the linguistic phenomenon of their native language. As mentioned, Professor Li Yu Ming focused on the "interrogative sentence system" and carried out in-depth research on the language development of infants and children aged 1–5 in our country. It was pointed out that as the "interrogative sentence system" has special importance and representation in children's development of language and thinking, the conclusion of Professor Li's research allows the notion that: "After 4 years of age, children's mastery of the various sentence patterns of their native spoken language gradually become perfect and mature. Further development in future will mainly focus on "pragmatics". This proves that pre-school children aged 5–6 have **already mastered a variety of sentence patterns** (rather than **a lack in variety of sentence patterns**) to support the judgments and reasoning of logical thinking.

Apart from that the selected online exercises of primary 1 and 2 experimental class students in Sect. 2.4 of Chap. 2 also prove that with appropriate education, children aged 6–8 (below 10) are able to possess elementary ability to use language concepts in carrying out abstraction, generalization and making judgments. They can also possess certain ability in performing abstract logical thinking involving hypothetical propositions (and even the ability to perform more complicated and advanced complex reasoning). Up till now, our 100-odd experimental schools have published tens of collected texts from primary 1 and 2 students. (They are all aged about 6–8.) These collected writings contain lively and vivid descriptions of the detail of rich associations and imaginations. They also contain numerous convincing argumentative writings with clear standpoints, sufficient evidences and with a certain level of abstractness and generality. (About ten young authors who produced more pieces have even published their own personal collection.) This proves that with appropriate education, primary school students aged 7–10 can certainly produce writings with a certain degree of abstractness and generality, which shows that they possess abstract logical thinking (rather than its being **normally very difficult for them to compose writing with a certain degree of abstractness and generality**).

The above facts sufficiently prove that Piaget's conclusions on the mother tongue learning of pre-school children and primary students aged 7–10 are in complete contradiction to the objective reality and are untenable. They would pose serious restrictions on the reform and development of our Chinese language education.

3.3.3   The Serious Negative Impact that Piaget's Stage Theory of Children's Cognitive Development has produced on Chinese Language Education in Our Country

The low quality and efficiency of our traditional Chinese language education is the result of the direct influence of Piaget's theory. His theory has extensively and profoundly influenced our Chinese language education. Nearly every aspects of the language education have been impacted.

For example, for many years, our primary one Chinese language education has put **emphasis on starting with character recognition** ("concentrated character recognition" in the 1960s, "phonetic character recognition, accelerated development in reading and writing" in the 1980s, and even the "new three-characters primer character recognition teaching method" in recent years all placed emphasis on this) and rejected the method of starting with reading and writing. This emphasis has its basis in Piaget's stage theory of children's cognitive development; Piaget's theory stated that the development of thinking and language of children below 6 (that is, pre-school children) is at the "pre-operational stage"–children at this stage only possess representation-based thinking, but without language concept-based logical thinking. As mentioned before, conclusions deduced from Piaget's theory assert that pre-school children in this age group lack vocabularies and sentence patterns. Thus, teaching primary one student can only be started word by word and phrase by phrase rather than directly starting with reading and writing, or else the law of children's thinking and language development would be violated.

Another example is that Chinese language education in our country has been strictly following this teaching sequence: **Character recognition is the major focus of primary one education, and attention is placed on reading comprehension starting from the second semester of primary two. Phrase and sentence composition is taught in primary three, and paragraph and short passage composition is not taught until primary four**. Thus, according to Piaget's age group-bounded stage theory of thinking and language development, it is an inconceivable fantasy for "primary two and three students to be capable of reading novels and composing fluent writings with structural integrity". (Yet, our teaching experiences in more than 100 different types of experimental schools have proved that primary two and three students are able to do all of these things.)

There is still a further example. In recent decades, an unwritten rule has nearly been formed in primary school's Chinese language education (and also in the education of other primary school subjects): **Emphasis should normally be placed only on visualized teaching with images and imagery thinking in junior and middle primary grades (that is, before primary four). Logical thinking will only be touched on until senior primary grades (primary 5–6), and such logical thinking is still of "the basic concrete object-dependent" type rather than abstract logical thinking involving hypothetical propositions**. This is because,

according to Piaget's theory, children enter into "the stage of concrete operations" only after seven. Thus, if you would like to combine the cultivation of imagery thinking and logical thinking in language education right in the junior and middle primary grade (and especially in primary one and two), or if you would like to cultivate basic concrete object-dependent logical thinking as well as abstract logical thinking involving hypothetical propositions in the senior primary grades (primary five and six), you would be regarded as a deviant, as violating the spirit of science. There are still numerous rules and regulations like this, and most of them are related to Piaget's theory.

Actually, Piaget's stage theory of children's cognitive development results in mother tongue education with extremely low quantity, efficiency, quality and cost-effectiveness not only in our country, but also in all the other countries in the world. This is because, at present, Piaget's stage theory of children's cognitive development is still the leading educational psychological theory of basic education in the world. While the academic circles have fully recognized and praised the positive effect of Piaget's theory, it has failed to make a serious analysis and critique of the negative impact of the theory. This is the root of low quantity, efficiency, quality and cost-effectiveness in mother tongue education. For many years, Piaget's theory has received both praise and criticism, but there has been more praise than criticism. Enlightening works that hit on the crucial point of the theory are rare. More than that some even blindly worship this international authoritative theory and do not dare to raise any doubt upon it. It is now time to bring a sweeping change to this situation. Let us advance with time and use our creativity rather than relying on the labour of our predecessors. We should especially do so at this present time, as it is now the great historical moment when all people in our country are joining hands to "construct an innovative country".

By critically adapting Piaget's stage theory of children's cognitive development, and taking into consideration the new progress in brain science researches and the new characteristics of children's thinking and language development in the information era, the New Theory of Children's Thinking Development provides the above-described new division of children's thinking and language development, and gives an interpretation of the development processes of thinking and language that basically conform to the actual situation of modern children.

3.3.4 Theoretical Support of the New Theory of Children's Thinking Development for the Leapfrogging Development Approach in Language Education

As the New Theory of Children's Thinking Development has a more scientific and objective understanding of the stages of children's thinking and language development, and of ways of dividing those stages, it will act as an important guide to native language (i.e. Chinese) education. It will provide a solid theoretical

foundation for leapfrogging development of native language education (i.e. substantial increase in the quality and efficiency of mother tongue teaching).

Based on the above analysis, it is believed that the New Theory of Children's Thinking Development is able to provide at least the following three theoretical supports to accelerated development in language education:

1. Primary one students (about 6 years old) who have just entered school are not unprepared for mother tongue learning. Instead, they have already acquired a very strong foundation of vocabularies and sentence patterns

As stated, researches by psychologists of our country in the late 1980s confirmed that pre-school children aged 5–6 mastered more than 3500 oral vocabularies (Zhu 1998). Professor Li Yu Ming's in-depth research on the learning and mastery of the "interrogative sentence subsystem" also revealed that, in our country, children above 4 years old had a rather perfect and mature mastery of the various sentence patterns of spoken Chinese (Li 1995). We believe that these two facts about pre-school children's (aged 5–6) mastery of the "vocabularies" and "sentence patterns" of spoken Chinese are extremely important, and they are also the objective basis which makes accelerated development in language education possible. For Chinese "vocabularies", its teaching aims normally include the mastery of the sound, form and meaning of a character. As pre-school children aged 5–6 have already mastered more than 3500 oral vocabularies, this also means that the children have mastered the sound and meaning of these 3500-odd vocabularies as well. (It is only the Chinese characters of these vocabularies that they were still unable to recognize and write.) This has greatly reduced the difficulties in vocabulary teaching in language education. Other than that, as pre-school children aged 5–6 have mastered a variety of their mother tongue's sentence patterns, if hanyu pinyin is taught first and is marked in the texts and extended reading materials, students themselves will be able to read and understand these texts and materials without difficulty. Thus, in a lesson, the teacher can devote less time to instruct the students that how to write the Chinese characters, and by letting the students practice writing the characters appropriately and carrying out necessary explanation to the important and difficult points in the text, the teacher will be able to achieve the basic teaching aims of the text.

In this way, much of the time in a lesson can be reserved for students to carry out extended reading, and this provides the vital condition for accelerated development in language education. In fact, by marking hanyu pinyin in the reading materials, primary one students will be able to read without any difficulty popular literature, including the simplified version of *Romance of the Three Kingdoms* and the usual poems and prose of the Tang and Sung Dynasties. Usually, in the first semester, hanyu pinyin is marked for every character in the extended reading materials. In the second semester, hanyu pinyin markings can be greatly reduced (only marked for a few difficult characters), and in the third semester, pinyin markings only apply to a few individual characters. No marking will be needed in the fourth semester. Together with the increasing amount of extended reading, there will be a leap in students' reading ability. This is the objective basis for primary one students to read novels generally without difficulty.

It can be seen that **extensive extended reading in each lesson is one of the vital conditions for accelerated development in language education**. To ensure that these materials are effective in consolidating, deepening and widening the teaching aims, the following four requirements are necessary in collecting the materials:

① **The contents and themes of the extended reading materials must be closely related to those of the texts**

② **The genres of the extended reading materials must be similar to those of the texts**

③ **The difficulty level of the extended reading materials must correspond to the cognitive development level of its student users**

④ **The extended reading materials must be scientifically and politically correct, and be rather interesting, stimulating and informative**

2. "Use-centred Language" is the fundamental way and method for children to learn and master language swiftly

As mentioned, children of all races are able to fluently master their native spoken language in just a few years (before 4–5 years of age) without teaching. The above description of children's learning process for language reveals that this is not only because humans inherently possess a language centre in the brain (such as "Broca's area", which controls verbal expression, and "Wernicke's area" which controls understanding of language), but also because children learn language through interpersonal communication, that is, learning language through application. The aim of learning language is communication (that means communicating thoughts and feelings), and this is also the aim of learning to write. Thus, immediate application is needed after learning. The freshly learned language and words must be used immediately to communicate thoughts and feelings. One should apply them boldly, even if one has only mastered very few vocabularies and only knows very little about the grammar rules of his native language. A very typical example of learning language in this way is children in the "language development period" (about 1–2.5 years old). During this period, children try hard to communicate their thoughts and feelings. Though they can only speak incomplete sentences (telegraphic sentences) or only two words (two-word sentences) or even one word (holophrastic sentences), they try to express the whole of their meanings by aiding their words with contexts, gestures, postures and facial expressions.

It should be emphasized that

① **Children learn language entirely through application. Even if they have learned just a word, a phrase or an incomplete sentence, they will use it immediately to express their thoughts and feeling**. Through this immediate application, children are able to quickly find and correct the mistakes they have made in pronunciation, writing, grammar and semantic understanding. This also enables a surge in their linguistic knowledge about pronunciation, words and phrases, sentence patterns, grammar rules and even semantics and pragmatics.

② **Even when the children are at the stages of using holophrastic sentences, two-word sentences or telegraphic sentences, they are not merely practising to use a particular word, phrase or sentence pattern, but are trying hard to use these single words, phrases and incomplete sentences to convey the actual meaning of a complete sentence**. The actual meaning of a complete sentence refers to a specific objective object's properties, states, movement changes and relations with other objects that people would like to convey through that particular sentence. In other words, people want to convey semantic relations, such as "what is it", "how is it", "what to do", "how to do", "who does it", "when to do it", "why do it". The examples given before show that when children utter a single word, a phrase or an incomplete sentence, like, "Car car" (holophrastic sentence), "Play car car" (two-word sentence) or "Sister play car car", there is already the actual meaning of a complete sentence, that is, "Sister, please play the car car with me", in their minds (that means in their language centres).

The above two emphases can be summarized as one: **Children's process and method of learning language are entirely "language-use-centred". They learn it as they would like to use it, and once they have learned it, they use it immediately; and they also strive to use it within a certain context**. Thus, vocabulary and sentence patterns cannot be learned in isolation without the context, and the "language analysis-centred" method should not be used in teaching and learning language. This is because these would violate the children's law of learning language. To conclude, **"use-centred language" is the fundamental method for children to learn and master language swiftly, while "analysis-centred language" is the way and method for *linguists* to study languages. The two should not be mixed together**.

③ **To carry out "use-centred" language education in the junior primary grades (primary one and two), the traditional teaching method should be changed**. Character recognition, reading and writing should not be isolated and separated as they have been in the past. Efforts should be made to integrate the three of them in a united teaching process: No pure character recognition lesson, reading lesson or writing lesson should be given in primary one and two. After instructing the section on **character recognition**, the teacher should turn into the extended reading section immediately (All reading materials should be marked with hanyu pinyin so as to clear the children's obstacles in reading). After this **reading** section, students should be asked to typewrite their understandings, reflections and feelings of the texts and extended reading materials on computer (**writing** with computers). This fosters a dynamic integration of character recognition, reading and writing. It enables students to immediately use the words, phrases, sentences, passages and linguistic phenomena that they have just learned, and is a true practice of "use-centred language". As stated in Sect. 1.3.3 of Chap. 1, without writing, the dynamic integration of character recognition, reading and writing will not come true and the "use-centred language" teaching approach will thus vanish like a bubble. Here, "**computer typewriting**" is not merely a writing tool to substitute for handwriting.

It is, more importantly, a teaching strategy that enables a dynamic integration of character recognition, reading and writing, as well as a cognitive tool that enhances serious thinking, independent investigation and high-level psychological processing in every student. This is also the objective basis that enables primary one students to compose fluent writings with structural integrity. This reveals that **using computer typewriting in every lesson to enable a dynamic integration of character recognition, reading and writing is another vital condition for accelerated development in language education**.

It should be explained here that using computer to typewrite compositions in substitution for handwriting does not mean to weaken or cancel training in writing. In our leapfrogging development experiments, primary one and two students' training in writing is still conducted in strict accordance with the requirements of the new curriculum. (The characters of the lesson stated in the new curriculum were taught through writing training, such as writing the word lattice fields and "writing in the air". This training is carried out seriously.) It only means that substantial advancement is not required in the ability to handwrite characters as in the abilities to read and compose. In other words, the requirement for handwriting ability (handwrite 2500 Chinese characters) is achieved gradually by dispensing the training across different grades throughout the whole primary school years in accordance with the requirement of the new curriculum.

It is common sense that composition ability is determined by language expression and thinking ability. The New Theory of Children's Thinking Development believes that **primary one and two students' verbal expression ability and thinking ability have already created the objective condition for them to compose fluent writings with structural integrity. Thinking ability here refers to language concept-based logical thinking ability as well as representation-based thinking ability (and representation-based thinking includes imagery thinking and intuitive thinking). It does not refer to that of Piaget's theory, which assumes that primary one and two students still merely possess representation-based thinking ability**. At present, most primary one and two students are unable to write compositions, mainly because they are restricted by their ability to handwrite Chinese characters. To handwrite a fluent passage, one must be able to handwrite more than 2000 Chinese characters. However, for students who have just entered school (that is, primary one and two students), learning to handwrite more than 2000 Chinese characters in about a year is nearly impossible (substantial increase in the students' homework will result if they are forced to do this). Yet, teaching primary one and two students to type, especially by combining the training to recognize the keyboard with the capital letters of hanyu pinyin and training to type with pinyin, is an easy task. The students would be able to type as long as they are able to read a character. In this way, great advancement can be made in primary one and two students' writing and reading abilities at the same time, which enables real accelerated development in primary school language education.

3. Cultivation of language ability and thinking ability (especially creative thinking ability) should be integrated dynamically

The authors of Marxist and Leninist classics believed that "**language is the material shell of thinking**". That is to say, on one hand, language is the foundation of thinking and there would be no high-level development of abstract logical thinking without language. On the other hand, as language ability is not completely innate, but also acquired (for example, grammar rules can only be gained through learning), which means that it is connected with the cognitive processes of the individual. Thus, thinking ability, which belongs to the cognitive domain, in turn places a great restriction on the development of language ability. That is why language and thinking are naturally inseparable, and why the development of language ability (including listening, speaking, reading and writing) and thinking ability are closely related. Integrating the cultivation of language ability and thinking ability (especially creative thinking ability) will not increase students' homework burden, but achieve an ideal effect in which the two abilities supplement and enhance each other, and yield a greater effect in less time. Contrarily to this, if the two abilities are put in confrontation, this will be harmful both to the cultivation of language ability and to the development of thinking ability.

It should be clearly pointed out here that according to Piaget's theory, children below 6 only possess representation-based imagery thinking, and they would not possess abstract logical thinking involving hypothetical propositions until they are 11 or 12. Traditional language education has been strongly influenced by this view, and as a result—as mentioned before—In the junior and middle primary grades (primary 1–4), usually only visualized teaching with images is used while cultivation and training in logical thinking are neglected. In senior primary grades (primary 5–6), although the cultivation of logical thinking in language education is put into consideration, it remains within the confines of concrete object-based basic logical thinking and does not dare to touch on advanced abstract logical thinking involving hypothetical propositions. The new theory of children' thinking development, however, has a very critical attitude towards this traditional language education concept. It is believed that it is flawed and is extremely harmful to the logical thinking development (as well as that of creative thinking) of the children and teenagers of our country. It will put great restriction and limits on the growth of the innovative talents of the younger generation. As the online exercises of our primary one and two experimental class students and daily examples shown in Sect.2.4 of Chap. 2 have already proved: advanced abstract logical thinking involving hypothetical propositions (including multilevel complex reasoning) is acquired not only by teenagers above 11 years old, but also by most children aged 6–8; they can acquire this ability through a scientific teaching approach. Thus, the new theory stresses that not only should the cultivation of language ability and thinking ability (especially creative thinking ability) be integrated, but they should also by integrated right from primary one or two (integration should never be left until primary four or five), or else the golden chance would be missed and harm would be brought to the children, which ultimately results in an irreplaceable heavy loss to the nation.

The above analyses reveal that **extensive extended reading** and **typewriting with computers** in every lesson are the two vital prerequisites for accelerated development in language education.

For the first prerequisite: it is obvious that extensive extended reading in a lesson requires the support of rich extended **reading materials** and sufficient **reading time**. Reading materials concern the collection and treatment of teaching resources, and reading time is determined by the teacher's organization and control of the lesson's teaching schedule (i.e. how the teacher carries out the lesson's instructional design). Thus, to ensure a successful implementation of extended reading in every lesson, "teaching resources" and "instructional design" are the two keys that teachers should firmly maintain.

For the second prerequisite: as stated, computer typewriting is the "use-centred language" teaching strategy that enables a dynamic integration of character recognition, reading and writing, as well as the cognition tool that enhances serious thinking, independent investigation and high-level cognitive processing in every student. Thus, typing ability (that means the ability to use standard fingering to type with computers) of primary students is extremely important and influential for language education, especially for primary one and two students. This is a new topic that the Internet era has introduced to language education in primary schools, and it is also a serious challenge to traditional educational ideology and teaching concepts. It is worthwhile for the primary school language education circle, and even the whole basic education circle, to pay serious attention and reflect on it. It is also important that the primary school students' computer typing skills should not be taught by language teachers in the language lessons, but by information technology teachers in collaborating information technology lessons.

Apart from that the following should also be noted: while integrating the cultivation of language ability into the training of students' thinking ability, consideration should not be put solely on language concept-based logical thinking or representation-based imagery thinking and intuitive thinking. These three basic thinking forms of human (that is, logical thinking, imagery thinking and intuitive thinking) should be closely integrated. In fact, according to the "theory of creative thinking" (He 2000), for children who have mastered their native spoken language, these three forms of thinking are naturally interdependent, inseparable and supportive of each other. To ensure a successful concurrent cultivation of language ability and thinking ability (especially creative thinking ability) in language education, language teachers must have a profound mastery of the teaching methods and strategies for innovative thinking, that is, creative thinking. As the teaching methods and strategies of creative thinking are related to the "New Theory of Children's Thinking Development" and require the guidance of the "theory of creative thinking", specialized discussion on the "cultivation of creative thinking in language education" is provided in Chap. 6. Discussions in Chap. 4 are devoted to how to implement the idea of "**use-centred language**" and carry out innovative primary school language education that **starts with reading and writing** (**rather than starting with character recognition as in traditional teaching**), so as to achieve accelerated development in language education.

3.3.5   *The Scientific Quality and Validity of the Theoretical Support that the New Theory of Children's Thinking Development Provides to Accelerated development in Language Education*

When the web-based innovative experiment on an leapfrogging development approach in language teaching was introduced in Sect. 2.3.3 of Chap. 2, the following three major factors of success were pointed out

(1) **The Internet provides rich and high-quality teaching materials that enable extensive extended reading**
(2) **Isolation and separation of character recognition, reading and writing in traditional teaching is altered**
     These three are integrated dynamically in the information technology environment, achieving the important reform of "use-centred language" teaching.
(3) **Breaking through the restrictions of traditional concepts to promote innovation in education theory. Attempts to integrate training in language ability and thinking ability (especially creativity thinking) in junior primary school grades**

And in this section, the three theoretical supports that the New Theory of Children's Thinking Development provides to leapfrogging development in language education are:

(1) **Primary one students (about 6 years old) who have just entered school are not unprepared for mother tongue learning. Instead, they have already acquired a very strong foundation of vocabularies and sentence patterns**
(2) **"Use-centred language" is the fundamental way and method for children to learn and master language swiftly**
(3) **Cultivation of language ability and thinking ability (especially creative thinking ability) should be integrated dynamically**

Comparing the three factors stated in Chap. 2 Sect. 2.3.3 and the three theoretical supports raised in this section, it is obvious that the second and third points in the first set are completely in line with the second and third points in the second set; There is only an apparent difference between the first of each set of points (The former emphasizes that the Internet provides rich and high-quality teaching materials that enable extensive extended reading; the latter emphasizes that primary one students possess a strong foundation of vocabularies and sentence patterns for mother tongue learning). But this difference is only apparent. This is because **the objective basis that enables extensive extended reading in junior primary school grades (primary one and two) is indeed the first theoretical support that the New Theory of Children's Thinking Development provides to accelerated development in language teaching**. That is to say, primary one students (about 6 years old) who have just entered school are not unprepared for mother

tongue learning. Instead, they have already acquired a very strong foundation of **vocabularies and sentence patterns**. As mentioned, pre-school children aged 5–6 have mastered **3562** verbal vocabularies and are able to use a variety of sentence patterns fluently, including those more complex sentence patterns. This proves that they have already mastered the sound and meaning of these 3500-odd vocabularies, but are only unable to recognize and write the related Chinese characters. **Other than that** as pre-school children aged 5–6 have mastered various sentence patterns of their mother tongue, if hanyu pinyin is taught first and its signs are marked in the texts and extended reading materials, students themselves will be able to read and understand these texts and materials without difficulty.

The fact that the two sets of points (number 2 and 3 in each set) are completely in line implies that: the second and third theoretical supports that the New Theory of Children's Thinking Development provides for accelerated development in language education have already been proved by the two success factors of the Leapfrogging Development Experiment in language education. The above analysis also makes it clearer that even the remaining first success factor also indeed depends on the first theoretical support given by the new theory to accelerated development in language education.

As the web-based leapfrogging development experiment in language education described in Sect. 2.3.3 of Chap. 2 has been conducted for nearly 10 years and the number of schools enrolled in the experiment has increased from 1 to more than 130, the successful experience mentioned in that section has already been seen in more than 100 of our experimental schools. This proves that the scientific quality and validity of the New Theory of Children's Thinking Development stated in this book, and especially the theoretical supports it provides for accelerated development in language teaching, are not only tested and proved by the experience of the few experimental schools in our first round experiment, but also by that of our 100-odd experimental schools which have been conducting the experiment for more than 5 years.

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Chapter 4
Innovative Language Education Theory Based on the New Theory of Children's Thinking Development

Based on the New Theory of Children's Thinking Development, an innovative set of education theory for **primary school language subject** is formed. This theory consists of new **education ideology, education concepts, instructional design, teaching modes, teaching methods and strategies** for language education. The following discussion on the innovative language education theory based on the New Theory of Children's Thinking Development will circle around these five aspects.

4.1 The Education Ideology of the Innovative Language Education Theory

The education ideology of the innovation language education theory based on the New Theory of Children's Thinking Development is: Language education must be "language use-centred" rather than "language analysis-centred" or "phrase explanation-centred".

This is because the New Theory of Children's Thinking Development believes that "use-centred" is the fundamental way and method for children to learn language swiftly. The theory put special stress on the following two points:

① **Children learn language entirely through "social intercourse", that is, through application. Even if they had learned just a word, a phrase or an incomplete sentence, they will use it immediately to exchange and communicate with others**. Through this immediate application, children are able to quickly find and correct the mistakes they made in pronunciations and semantic understandings. This also enables a surge in their linguistic knowledge, such as vocabularies, sentence patterns, grammar rules and pragmatics.

② **Even when the children are at the stages of using holophrastic sentences, two-word sentences or telegraphic sentences, they are not merely practising to use a particular word, phrase or sentence patterns, but are trying hard to use these single word, phrase and incomplete sentence to convey the actual meaning of a complete sentence (that is, the semantic relations of the sentences)**. When children utter a single word, a phrase or an incomplete sentence, like, "Car car" (holophrastic sentence), "Play car car" (two-word sentence) or "Sister play car car", there is already the complete semantic meaning of "Sister, please play the car car with me" in their minds (that means in their language centres).

The above two emphases can be summarized into one: "Use-centred" is children's method of learning language. They learn it as they would like to use it, and they also strive to use it within a certain context. Thus, vocabulary and sentence patterns cannot be learned in isolation without the context, and "language analysis-centred" or "phrase explanation-centred" method should not be used in teaching and learning language, because these violate the children's law in learning language. "Use-centred" is the fundamental way and method for children to learn language swiftly, while "language analysis-centred" is the way and method for linguists to study languages. The two of them shall not be mixed together. Although it is obvious that in the "use-centred language" teaching process, appropriate and necessary "phrase explanation" are required, it should be kept in mind that these "phrase explanation" are needed for better implement of "use-centred language" teaching. In other words, "phrase explanation" is only a subordinate to "language application", which is the major target of teaching (mother tongue education stresses that the teaching target "language application" should be implemented through "reading" and "writing", which means "reading comprehension" and "written expression", and in which "written expression" is emphasized). Phrase explanation should not be made the key point and major content of teaching in every lesson, and more importantly, it should not be separated from "reading comprehension" and "written expression" and made the major teaching target of the lesson. These should be firmly kept in mind.

4.2 The Education Concepts of the Innovative Language Education Theory

The education concepts of the innovation language education theory based on the New Theory of Children's Thinking Development stress the followings:

① **Primary school language education should starts with reading and writing rather than character recognition**

As mentioned in Chap. 3, for many years, our primary one Chinese language education has put **emphasis on starting with character recognition** ("concentrated character recognition" in the 60s, "phonetic character recognition, accelerated development in reading and writing" in the 80s, and even the "new

three-characters primer character recognition teaching method" in the recent years all placed emphasis on this) and rejected starting with reading and writing. This emphasis has its base on Piaget's stage theory of children's cognitive development for the theory stated that the development of thinking and language of children below six (that is, pre-school children) are at the "pre-operational stage"—children at this stage only possess representation-based thinking, but without language concept-based logical thinking. The conclusions directed from this theory believe that pre-school children have a serious lack of vocabularies and sentence patterns. Thus, teaching primary students can only be started word by word and phrase by phrase rather than directly starting with reading and writing, or else the law of children's thinking and language development will be violated. Yet, such method is a wrong. It is unscientific and violates the law of children's language and thinking development. As stated before, the statistical data collected in the late 80s by our country's psychologists about the number of verbal vocabularies pre-school children mastered reveals that children aged 5–6 had 3562 common words—this proves that pre-school children aged 5–6 have already mastered rich verbal vocabularies. Apart from that, the conclusions of Professor Li Yu Ming's research allow the notion that children above four have a more perfect and mature mastery of the various sentence patterns of their native spoken language. This strong mother tongue foundation (including that of vocabularies and sentence patterns) of the pre-school children provides the sufficient and necessary condition for our innovative primary school language education which **starts with reading and writing** (Because only by learning hanyu pinyin and marking them in the popular literatures, children themselves will basically be able to read them. Likewise, after learning hanyu pinyin, children will be able to get familiarize with the keyboard by combining their knowledge of pinyin with that of the capital letters. With this, they will quickly learn to typewrite nursery rhymes and create riddles and short passages with the computers—this is also because "computer typewriting" is very interactive and is able to produce a sense of accomplishment in children easily. Children become obsessed with it as with game consoles).

② Children in junior and middle primary school grades are not unable to compose, or are merely able to compose simple narrative or imaginative writings. They can indeed compose writings with a certain degree of ideological contents, abstractness and generality

As mentioned, Chinese language education in our country has been strictly following this teaching sequence: character recognition is the major focus of primary one education, and attention will be placed on reading comprehension starting from the second semester of primary two. Phrase and sentence composition will be taught in primary three, and paragraph and short passage composition will be taught until primary four. Thus, according to Piaget's age group-bounded stage theory of thinking and language development, it is an inconceivable fantasy for "primary two and three students to be capable of reading novels and compose fluent writings with structural integrity". Yet, our teaching experiences in more than 100 different types of experimental schools proved that most primary two and three students are able to do all of these. The selected online exercises of primary

1 and 2 experimental class students in Sect. 2.4 of Chap. 2 also prove that with appropriate education; children **aged 6–8** are able to possess elementary ability to use language concepts in carrying out abstraction, generalisation and making judgments. They can also possess certain ability in performing abstract logical thinking on hypothetical propositions (and even ability to perform more complicated and advanced complex reasoning). Up till now, our 100-odd experimental schools had published tens of collected works from primary 1 and 2 students (They all aged about 6–8). These collected works contain numerous lively and vivid descriptions with rich associations and imaginations. They also contain numerous convincing argumentative writings with clear standpoint, sufficient evidences, and with a certain level of abstractness and generality (the ten-odd little authors who produced more pieces had even published their own personal collection)—this proved that with appropriate education, primary school students aged 7–10 can definitely produce writings with certain degree of abstractness and generality, which demonstrate abstract logical thinking

③ **Visualized teaching should not be the sole emphasis in language teaching of the junior and middle primary school grades. There should be appropriate instruction on abstract logical thinking and a dynamic integration of the cultivations of representation-based thinking and language concept-based logical thinking**

It has been pointed out that in the recent decades, an unwritten rule has nearly been formed in primary school's language education (and also in the education of other primary school subjects): emphasis should normally be placed only on visualized teaching with images and imagery thinking in junior and middle primary grades (that is, before primary four). Logical thinking will only be touched on until senior primary grades (primary 5–6), and such logical thinking is still "the basic concrete object-dependent" one rather than abstract logical thinking on hypothetical propositions. This is because according to Piaget's theory, children enter into "the stage of concrete operations" only after seven. Thus, if you would like to combine the cultivation of imagery thinking with that of logical thinking in language education right in the junior and middle primary grades (and especially in primary one and two); or if you would like to cultivate basic concrete object-dependent logical thinking as well as abstract logical thinking on hypothetical propositions in the senior primary grades (primary five and six), you would be regarded as a deviant and as violating scientism.

In fact, Piaget's stage theory of children's cognitive development does not only result in mother tongue education with extremely low quantity, efficiency, quality and cost effectiveness in our country, but also in that of all the other countries in the world. This is because at present, Piaget's stage theory of children's cognitive development is still the leading educational psychology theory of basic education in the world. While the academic circles fully recognized and praised the positive effect of Piaget's theory, it fails to have a serious analysis and critique of the negative impact of the theory. This is the root of low quantity, efficiency, quality and cost effectiveness in mother tongue education.

4.3 The Instructional Design of the Innovative Language Education Theory

4.3.1 Handling the Four Relations Correctly

The guiding ideology of the instructional design of the innovation language education theory based on the New Theory of Children's Thinking Development should pay attention in handling the following four relations:

4.3.1.1 Relation Between Teachers' Leading Role and Students' Principal Position

Teachers are the organizers and instructors of teaching. They must play a leading role in teaching; students are the subjects of cognitive processes and emotional experiences processes. As the aim of "teaching" is to enhance "learning", students must be given the principal position in teaching process. Originally, it is very natural for teachers to fully utilize their leading role and students to have the principal position in teaching process. However, the Western extreme constructivist artificially put the two in confrontation. They thought that exerting the leading role of teachers means restriction and limitation in students' proactivity, enthusiasm and even creativity, which is harmful to the attainment of students' principal position. Actually, teachers' exertion of their leading roles and students' attainment of their principal positions are not mutually exclusive. They can be completely unified in a constructivist learning environment. Under the guidance of this ideology, students' principal position is the evidence of how well the teachers exert their leading roles—it is for certain that the teachers do not only assume their leading role in analysing teaching goals and learner's characteristics, explaining texts to students and enlightening students with those texts, but also in creating learning environment, providing information resources, organizing collaborative learning, implementing exploratory or investigative learning mode and guiding students' independent learning strategies. Thus, under such circumstances, the more the teachers utilize his leading role, the more prominent the students' principal position become; the two of them are be in confrontation but are complementary to each other. This is the ideal we seek for.

4.3.1.2 Relation Between "Teaching-Oriented" and "Learning-Oriented" Instructional Design

"Teaching-oriented" and "learning-oriented" (which are also the instructional designs under constructivist learning environment) are the two types of currently popular instructional designs. As the two designs have their own strengths and

weaknesses, it would be the best to combine them, so that they can complement each other and form a "**learning and teaching-equaled**" instructional design theory which shares complementary advantages. This theory suits the requirement of the new teaching structure which stresses both exertion of the teachers' leading role and attainment of the students' principal position. While applying this theory to create instructional design, it should be noted that computer-centred information technology (no matter the multimedia or computer network) should not be merely seen as the visualization teaching tool for teachers, but more emphasis should be placed on its roles as the cognitive tool and collaborative communication tool that enhances the student's independent learning. The instructional designs under constructivist learning environment play an important role in ensuring this.

4.3.1.3   Relation Between Independent Learning and Collaborative Learning

Constructivism views knowledge as the personal experience-depended-independent construction of a learner in his interaction with the environment. Thus, it put strong emphasis on the important effect of independent learning, independent investigation and independent discovery in cognitive processes. Yet, at the same time, it also stresses very much the mutual support and enhancement between learning partners. It believes that through the collision of ideas, mutual inspiration and complementary advantages, collaborative learning has a vital enhancement effect on deepening the understanding of knowledge (which refers to the mastery of the properties and natures of objects, and the interrelations between objects). Thus, both independent learning and collaborative learning should be put into consideration in instructional design. However, as independent learning is the basis of learning, collaborative learning must be implemented with independent learning as its precondition, or else it will not be able to reach its aims—collaborative learning without a firm foundation of independent learning will be unable to carry out in-depth idea and academic exchange, and thus, it will not be able to achieve the ideal learning effect.

4.3.1.4   Relation Between Extended Reading and Computer Typewriting

The analyses in Chap. 3 shows that **extensive extended reading** and **typewriting with computers** in every lesson are the two prerequisites of accelerated development in language education.

It is obvious that extensive extended reading in lesson requires the support of rich extended **reading materials** and sufficient **reading time**. Reading materials concern the collection and treatment of teaching resources, and reading time is determined by the teacher's organization and control of the lesson's teaching

schedule. Thus, to ensure a successful implementation of extended reading in every lesson, attention should be placed on "instructional design".

Computer typewriting is the "**use-centred**" teaching strategy that enables a dynamic integration of character recognition, reading and writing. It is also the cognition tool that enhances serious thinking, independent investigation and high-level cognitive processing in every student. Whether computer typewriting can really become a "use-centred" teaching strategy and a cognitive tool that enhances high-level cognitive processing in every student or not depend on the teachers' organization and arrangement of classroom activities. That means it must be accomplished through the instructional design of teachers. This revels that the key to attain the targets of accelerated development in language education is in the careful planning of a instructional design with **extended reading** and **computer typewriting**—this design does not only involve careful selection of the contents of **extended reading**, guarantee of **extended reading** time, setting of the topics of **computer typewriting** and arrangement of **computer typewriting** time, but also serious consideration of the relation between **extended reading** and **computer typewriting** (to ensure that extended reading and computer typewriting are effective in consolidating, deepening and widening the requirements of the current teaching aims, the contents of **extended reading** and the topics of **computer typewriting** must be interrelated, and the two of them must also be closely linked with the current teaching aims).

4.3.2   Conducting the Five Teaching Activities Seriously

Not only should the innovation language education theory based on the New Theory of Children's Thinking Development pay attention in handling the above four relations in its instructional design, but it should also conduct the following five teaching activities seriously in its teaching process:

Extension—In every lesson, about 10 min should be devoted to extended reading. To ensure that the extended reading materials are effective in consolidating, deepening and widening the requirements of the curriculum, they should, as mentioned before, possess the following four conditions:

① The contents and themes of the extended reading materials must be closely related to that of the texts
② The genres of the extended reading materials must be similar to that of the texts
③ The difficulty level of the extended reading materials must correspond to the cognitive development level of its student users
④ The extended reading materials must be scientifically and politically correct and are rather interesting, stimulating and informative

Typing—Computer typewriting is the major way of written expression. Training in typing should be conducted earlier, so as to enable the use of typing as the **teaching strategy** of "use-centred" teaching and as a **cognitive tool** that enhances

high-level cognitive processing in every student (it is for certain that the primary school students' computer typing ability shall not only be trained by language teachers in the language lessons, but also by information technology teachers in the collaborating information technology lessons).

Writing—To implement the "use-centred" teaching ideology, handwriting (or typewriting) activity is required in every lesson ever since the students started learning pinyin. In lessons that focus mainly on pinyin and character recognition, most contents of handwriting (or typewriting) are sentence making, writing words, creating riddles, nursery rhymes or doggerels; in lessons that focus mainly on reading, most contents of handwriting (or typewriting) are writing reflections and paragraphs, composing stories based on given examples, rewriting the texts or finishing a paragraph. About 8–10 min are devoted for handwriting (or typewriting) activity in every lesson.

Passage—When teaching characters, phrases, sentences or paragraph, excessive time should not be located for explaining characters and phrases. Emphasis should be put on increasing students' comprehension of the paragraphs and passages (therefore, in the teaching resources, the contents of paragraphs and passages, rather than the meaning of the characters and phrases, should be stressed, so as to meet the requirement of extended reading).

Thinking—While cultivating the abilities to listen, speak, read and write, students' thinking ability, especially creative thinking ability, should be cultivated as well. As stated in the previous chapter, language and thinking are naturally inseparable. The development of language ability (including the abilities to listen, speak, read and write) is closely linked with that of thinking ability. Integrating the cultivation of language ability and thinking ability (especially creative thinking ability) will not increase students' homework burden, but achieve an ideal effect in which the two abilities supplement and enhance each others and yield greater effect with lesser time. On the contrary, if the two abilities are put in confrontation, it will be harmful to both the cultivation of language ability and the development of thinking ability. Apart from that, it should be noted that: while integrating the cultivation of language ability into the training of students' thinking ability, consideration should not be put solely on language concept-based logical thinking or representation-based imagery thinking and intuitive thinking; these three basic thinking forms of human (that is, logical thinking, imagery thinking and intuitive thinking) should be closely integrated. In fact, according to the "theory of creative thinking" (He 2000), for children who have mastered their native spoken language, these three forms of thinking are naturally interdependent, inseparable and supportive to each others. To ensure a successful concurrent cultivation of language ability and thinking ability (especially creative thinking ability) in language education, language teachers must have a profound mastery of the teaching methods and strategies to innovative thinking, that is, creative thinking.

4.4 The Teaching Approaches of the Innovative Language Education Theory

The educational theory circle generally believes that "Teaching approaches are usually referred to as the big methods. They are not only teaching strategies, but theoretical operation styles that cover the principles, contents, goals and objectives, processes of education, as well as the formation of the organization of teaching and its systems" (Ye 1993). This shows that though teaching approaches are methods and strategies, they are different from general teaching methods and strategies; general teaching methods and strategies refer to a single teaching method or strategy, but teaching approaches mean a stable combination and application of two or more teaching methods and strategies. Teaching approaches are the bridges between education theories, learning theories and teaching practices—they are the concrete application of teaching and learning theories, which provide direct guidance to teaching practices. At the same time, they also extract simplified theoretical summation from teaching practices, which give beneficial enhancement to the enrichment and development of teaching and learning theories.

The teaching approach of the innovative language education theory, which builds on the New Theory of Children's Thinking Development", is a "teacher-directed–student-centred combined language teaching approach" (abbrev. "dual principal language teaching approach"). It allows both the exertion of the teachers' leading roles as well as the principal positions of the students. This teaching approach is firmly supported by the New Theory of Children's Thinking Development and proved by the years teaching practices in more than 130 different types of experimental schools (including a group of underprivileged schools in the urban fringes and rural schools in the poverty-stricken areas) that, it can bring substantial improvement in the teaching quality of primary school language education; the vocabularies, reading ability and writing skills of most students, who completed primary two, reached the level required for primary five and six students in the new curriculum. This is a solid achievement of accelerated development in the quality of language education. Thus, the "dual principal language teaching approach" mentioned above is also called "progress accelerating language teaching approach". In the following, the progress accelerating teaching approach of junior primary school grades (primary 1–2) will be discussed first and followed by that of the middle and senior primary school grades (primary 3–6).

4.4.1 Language Teaching Approach of Junior Primary School Grades (Dual Principal Teaching Approach)

The teaching approach of accelerated development in primary 1–2 is titled "teacher-directed–student-centred combined language teaching approach" (abbrev. "dual principal language teaching approach"). In a 40 min lesson, this approach is carried out in two sections. The sections are as follows:

4.4.1.1 Teacher-Directed Section—Achieving the Basic Requirements of the Teaching Goals of the Text by the Exertion of the Teachers' Leading Roles

(1) Lessons that focus mainly on pinyin

In lessons that focus mainly on pinyin, the three major teaching activities in the teacher-directed section are "**motivating students in the introduction of the new lesson**, **pinyin teaching** (including how to read and write the consonants, vowels and compound syllables), **pinyin application** (applying the learned consonants, vowels or compound syllables in making up phrases, sentences, riddles, nursery rhymes, doggerels or tongue twisters)". About 20 min are devoted to this section.

(2) Lessons that focus mainly on character recognition

In lessons that focus mainly on character recognition, the three major teaching activities in the teacher-directed section are **motivating students in the introduction of the new lesson**, **character recognition teaching** and **handwriting teaching**. About 20 min are located to this section. Character recognition teaching teaches the sounds, forms and meanings of Chinese characters. According to the New Theory of Children's Thinking Development, pre-school children aged 5–6 have possessed a very strong mother tongue foundation—they have mastered 3500-odd verbal vocabularies and a variety of sentence patterns. Thus, focus can be put on the "forms" when teaching them the sounds, forms and meanings of Chinese characters. Except providing appropriate explanation to the difficult and rarely used characters, little time is needed in explaining the sounds and meanings of the usual characters; most of the time can be located to teaching the strokes, stroke orders and structures of the forms of Chinese characters. In this way, teachers will not feel a lack of time in the teacher-directed section; On the contrary, if equal effort is devoted to a well-rounded teaching of the sounds, forms and meanings of Chinese characters, the teachers will definitely experience a lack of time, and as a result, the time for independent study in the next student-centred section will be occupied. In the handwriting teaching section, teachers should demonstrate how to write the Chinese characters, which are required in the teaching goals of the lesson, in a step by step manner. They should also ensure that students learn to the write these characters through activities, such as writing in the air and writing the word lattice fields.

(3) Lessons that focus mainly on reading

In lessons that focus mainly on reading, the major teaching activities in the teacher-directed section are "**reading instruction**" and "**reading comprehension**". Reading comprehension should involve various teaching activities, including "**reading demonstration, intellectual simulation, questioning and coaching, answering questions and problems, role plays, class (or group) discussion**". For primary 1–3 reading lessons, "reading instruction" and "reading comprehension" take up about 20 min of the lessons' time. When conducting

reading instruction, attention should be put on correcting the tendency to conduct "plentiful reading" and the wrong concept that reading aloud must be beneficial. Such wrong tendency and concept resulted in frequent reading with various reading methods during lessons, such as "individual reading", "whole class reading", "boys-only reading", "girls-only reading", "one by one reading", "group by group reading", "role play reading", which occupied much of the lessons' time. As excessive time was used in reading, not only did it occupied the time for independent study in the next student-centred section, but also the time for the other important part (**reading comprehension**) of the teacher-directed section was also affected. Although **reading instruction** is important, that does not mean that more reading will give a better result. The key to achieve ideal effect in reading instruction is to hold on to the following three reading activities: **reading demonstration by teachers** (if the school possess better CAI courseware, and there is standardized reading of the texts in it, then, the teachers' demonstration can be substituted with the courseware), **independent reading by students**, **selecting and commenting on the reading of 1–2 students**.

Reading demonstration by teachers is very important—it shows students how they should read in order to meet the requirements; Independent reading by students is a must—the students have to experience and feel by themselves in order to really gain reading ability; selecting and commenting on the reading of 1–2 students is not to be ignored—this is because such teaching activity is a kind of formative assessment. Through checking and commenting on some students, teachers will be able to find out the students' understanding and mastery of the reading requirement of the lesson and provide timely correction and improvement.

4.4.1.2 Student-Centred Section–Consolidating, Deepening and Widening Students' Understanding and Mastery of the Texts Through Enhancing Independent Study

(1) Lessons that focus mainly on pinyin

In lessons that focus mainly on pinyin, students are required to complete the independent study, independent investigation and collaborative learning activities of **extended reading**, **discussion with neighbours** and **written expression (typewritten or handwritten)**.

In these lessons, the extended reading materials are mostly riddles, nursery rhymes, doggerels or tongue twisters that are simple and related to the consonants, vowels or compound syllables that the students are learning.

Typewriting (or handwriting) exercises in these lessons are mostly application of the learned consonants, vowels or compound syllables in making up phrases and sentences, and creating riddles, nursery rhymes, doggerels or tongue twisters with given examples.

Extended reading, discussion with neighbours and typewriting (or handwriting) exercises take up about 20 min of the lessons' time, in which extended reading occupies about 10 min, typewriting (or handwriting) exercises occupies about

8–9 min, and discussion with neighbours occupies about 1–2 min. It should be emphasized that extended reading and typewriting (or handwriting) exercises are a must to student-centred section, while the part on discussion with neighbours can be carried out according to the actual situation (that is to say, this part is not a must. If discussion is not conducted, the remaining 1–2 min can be allocated to extended reading or typewriting (or handwriting) exercises).

(2) Lessons that focus mainly on character recognition

In lessons that focus mainly on character recognition, students are also required to complete the independent study, independent investigation and collaborative learning activities of **extended reading**, **discussion with neighbours** and **written expression (typewritten or handwritten)**.

In these lessons, the genres of the extended reading materials must be similar to that of the texts and the difficulty level of these extended reading materials must correspond to the current cognitive development level of the students. These materials include riddles, nursery rhymes, poems, idiom stories and well-written prose. If the contents of the lesson are related to natural phenomenon (such as the rainforests, underwater world, rocks and dinosaurs), then the extended reading materials must include the related natural knowledge as well. Extended reading materials must also be scientifically and politically correct, and are rather interesting, simulating and informative.

The topics of the typewriting (or handwriting) exercises in these lessons are mostly riddles, nursery rhymes or simple narrative writings with the words or phrases students learned in that lesson. They may also be students' learning experiences, feelings or reflections on the other cognitive teaching goals of the lesson (Cognitive teaching goals in primary school language education include, language knowledge of characters, phrases, sentences and passages, as well as natural knowledge and knowledge related to thinking development). Students' writings can be produced in the forms of prose, reflections or writings which modelled on the texts.

In lessons that focus mainly on character recognition, the three independent study and collaborative learning teaching activities, extended reading, discussion with neighbours and typewriting (or handwriting) exercises will take up a total of about 20 min. The allocation of time in these three activities is the same as that in pinyin lessons, extended reading and typewriting (or handwriting) exercises are a must (each occupies about 10 min), and discussion with neighbours can be conducted according to the actual situation.

(3) Lessons that focus mainly on reading

In lessons that focus mainly on reading, students are as well required to complete the independent study, independent investigation and collaborative learning activities of **extended reading**, **discussion with neighbours** and **written expression (typewritten or handwritten)**.

In these reading-focused lessons, the extended reading materials must be closely related to the topics of the texts and are of a similar genre to the texts.

Their difficulty level must also correspond to the current cognitive development level of the students. These extended reading materials include prose, poems, stories, fables, fairy tales, commentaries, biographies and anecdotes of eminent people. If the contents of the lesson are related to natural phenomenon (such as the rainforests, underwater world, rocks and dinosaurs), then the extended reading materials must include the related natural knowledge as well. Extended reading materials must also be scientifically and politically correct, and are rather interesting, simulating and informative.

The contents of the typewriting (or handwriting) exercises in these lessons are mostly personal understandings, reflections and lessons on the affective teaching goals (for example, teaching goals that touch on morality, values and philosophy of life) of that lesson. They can also be the gain, experience and reflection of learning on the cognitive teaching goals (including knowledge of language and of nature, and thinking development) of that lesson. Students' writings can be produced in the forms of journals, diaries, comments, prose, reflections or even writings which modelled on the texts.

In lessons that focus mainly on reading, the three independent study and collaborative learning teaching activities, extended reading, discussion with neighbours and typewriting (or handwriting) exercises will also take up a total of about 20 min. The allocation of time in these three activities is the same as that in pinyin lessons, extended reading and typewriting (or handwriting) exercises are a must (each occupies about 10 min), and discussion with neighbours can be conducted according to the actual situation.

4.4.1.3 Key Teaching Devices of the Teaching Approach of Progress Accelerating Language Education

"**Extended reading**" and "**written expression**" are crucial to progress accelerating language education.

(1) Importance of "**extended reading**"

① Extensive extended reading enables students to **learn a large numbers of words easily** (as the reading materials contain plot lines and have nature of story, they trigger students' interest in learning easily; given a linkage with other paragraphs, context, logical relations and semantic relations, the reading materials easily trigger students' association and imagination. This facilitates the formation of associative memory and in turn eliminates the heavy burden of mechanical memory. It is beneficial to the learning of new words and the consolidation of learned Chinese characters)

② Extensive extended reading allows both knowledge on the forms and sounds (all reading materials for primary students are marked with pinyin) of the characters, and understanding on the contexts when the words are used. This enables a **comprehensive mastery of the form, sound and meaning of every character** (rather than like phonetic character recognition and concentrated character recognition, in

which students only recognize the sounds and forms of the characters while the meanings may be unknown. This resulted in confusion between characters with same sounds or of similar forms, and the students are unable to use the learned Chinese characters to compose sentences and passages)

③ Another vital effect of extensive extended reading is that it can **effectively raise the humanity of students**. The large amounts of carefully chosen extended reading materials include fine literatures of all times and all countries, as well as the essences of Chinese traditional cultures. They embrace the greatest and noblest thoughts and feelings, and are the incredible fruits of the wisdom of humans. Although extended reading with such rich contents in every lesson, students will build up the good habit of extracurricular reading. This puts students under the nurture of excellent human culture and gives them the nourishment of high-quality soul foods since childhood. This has, in no doubt, an essential role in raising the humanity of students.

According to our survey on a group of experimental schools, although only about 10 min were allocated for extended reading every lesson, but after 2 years, the average reading amount of students amounted to 8–9 million characters (students who read quicker had read more than 10 million characters, and those who read slower has read 6–7 million characters). What does this amount of reading imply? According to the requirement of the new curriculum, the amount of extracurricular reading of the junior primary section (completed primary two) should be 50 thousand characters, the middle primary section (completed primary four) 4 million characters, and the senior primary section (completed primary six) 10 million characters. It should be noted the new curriculum emphasizes the amount of extracurricular reading, but our reading amount mentioned above were all conducted during lessons. This shows that the amount of extended reading during lessons of the progress accelerating language education has already reached or drew close to the new curriculum's requirement on the amount of extracurricular reading. This is the secret of progress accelerating language education's success in enabling students to learn a large numbers of words easily, has comprehensive mastery of the form, sound and meaning of every character, and has a raise their humanity effectively. This is also the key factor that allows leapfrogging development experiment to bring a substantial improvement in the quality of language education without increasing lesson hours and students' homework burden.

Importance of "**written expression**"

① It is an **important teaching strategy** that **implements "use-centred"**, which means an integration of character recognition, reading and writing. It brings a fundamental reform in primary school language education

② It is an **important cognition tool** that fosters "**entire involvement**" from the class, fully triggers students' proactivity and enthusiasm, and effectively guides students in conducting **high-level cognitive processing** (actually, among the numerous teaching methods and strategies of language education, there is none that can foster **involvement of the whole class** and guide **high-level cognitive processing** of all students so effectively as "written expression").

4.4.2 Language Teaching Approach of Middle and Senior Primary School Grades

The initial goal of accelerated development in primary school language education is: after students completed primary two, their amount of vocabularies, reading and writing abilities should attain primary five and six level. After some years of experiment, most experimental schools have attained or even surpassed this goal (only few individual schools are still some distance from it). Then, when the students are in primary three and four, how should the leapfrogging development experiment be continued? With longer passages in the middle and senior primary school grades' language lessons, would the effective teaching approach of progress accelerating language education mentioned above continue to be effective then? To answer this question, we will discuss the following situations.

4.4.2.1 Using the Same Teaching Approach of the Junior Grades

As mentioned, the teaching approach of the junior grades is: the first 20 min of the lesson is mainly teacher directed, and its aims at attaining basically the teaching goals of the lesson (noted that progress accelerating teaching requires an in-depth attainment or even an over attainment of the teaching goals of the lesson within a 40 min session. Thus, in this first 20 min teacher-directed section, "**basic attainment**" of the goals is required. The goal should not be set too high in this section as the achievement of any teaching goal, including cognitive teaching goals and affective teaching goals, requires an "**internalizing**" process, which is the learners' processes of independent study, independent construction, personal experience and personal reflection. Without this "internalizing" process, a teacher will be unable to gain an in-depth attainment of the teaching goals no matter how brilliant he is). The last 20 min are allocated for students to carry out independent study, independent investigation and personal reflection. Completing this "internalizing" process will bring an in-depth attainment or even over attainment of the teaching goals of the lesson (this 20 min "student-centred" section mainly consists of extended reading for about 10 min and typewriting or handwriting of about 10 min).

   According to our years of exploration with teachers who participated in the experiment, it is believed that the usual primary three language lessons and some primary four language lessons can be conducted with the same teaching approach of the junior grades. The following are two examples:

(1) *The Fertile Paracel Islands*

This is one of the texts for the first semester of primary three published by the People's Education Press. Apparently, this text is relatively longer and seems to require more time in lecturing. However, if the teacher is able to grasp the key points and difficult points of it, in-depth attainment of the lesson's teaching goals

can be gained without too much time. To grasp the key points and difficult points, we should first analyse the teaching goals.

Teaching goals of the lesson—Include both affective goals and cognitive goals.

Affective teaching goals—Cultivating students' affection of the majestic scenery of the country through the lively descriptions of the fertile and beautiful Paracel Islands in the text. This goal is to be achieved through the teacher's reading and lecturing, as well as the students' independent extended reading and typewriting (or handwriting) of their experiences and feelings of the text; although the teacher's passionate reading and lively lecturing are infective, to gain an in-depth attainment of the goal, the students also need to feel and experience by themselves; this is only possible by letting students read a large amount of related extra materials and typewrite (or handwrite) their experiences and feelings of the lesson.

Cognitive teaching goals—Recognizing and mastering the words and phrases of the lesson, and understanding the structural characteristics of the text and the method of composing narrative writings. This teaching goal can be basically attained through the lecturing of teachers, and thoroughly attained also by the students' independent extended reading and typewriting (or handwriting) exercise. The structural characteristic of this text is: "general–specific–general"; The method of composing this narrative writing is: Rather than describing according to time, place, people, cause, process and result, its description is divided into four layers, "surface of the sea, sea floor, breach, island"; although there are quite a lot new words in this text (for example, multicoluored, resplendent, dazzling, sluggishly, wiggle…[1]), only the following few are relatively difficult to understand[2]: **Resplendent**—with sharp and bright colours; **Dazzling**—there are lots of multicoloured objects before one's eyes; **Wiggle**—to move without using the hands or feet, but by stretching the body.

The above analyses revel that the key points of this lesson are the affective teaching goals mentioned above. As stated, to gain an in-depth or even over attainment of the teaching goals, the teachers' passionate reading and lecturing are not enough. Students' independent extended reading (There are 10 extended reading materials for this lesson. They touch on various attractions of the country, such as Spratly Islands, Guilin, the Three Gorgers and Lhasa) and typewriting or handwriting of their thoughts and feelings (for example, writing a piece with the topic "My Beautiful Hometown" or about one of the country's tourist attractions that they had been to) are more important and crucial. Explaining the difficult words (resplendent, dazzling and wiggle) is the difficult point of this lesson. Obviously, by holding onto the above key points and difficult point, and grasping the core and key to solve them, there should be no problem for teachers to attain basically the teaching goals of this lesson in the about-20 min "teacher-directed" section.

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[1]The original Chinese vocabularies of these are, "五光十色", "瑰麗無比", "琳琅滿目", "懶洋洋", "蠕動".

[2]Noted that the following explanations of the words are made in accordance with the meanings of the original Chinese vocabularies.

(2) She is My Friend

This is one of the texts for the second semester of primary three published by the People's Education Press. To grasp the key points and difficult points, we should first analyse the teaching goals. The teaching goals of this lesson also include affective teaching goals and cognitive teaching goals.

Affective teaching goal—Cultivating the noble thoughts of risking one's life for others in students through the touching story of Ruan Heng risking his life for his friend in the text.

To gain an in-depth or even over attainment of this teaching goal, not only are teacher's reading and lecturing required, but also more importantly, students' independent extended reading and typewriting (or handwriting) of their thinking and understandings or insights on life after reading and reflecting. Blood transfusion for patients is originally an ordinary matter. However, as Ruan Heng is small and lack knowledge about it, he thinks that transfusing his blood to his friend would risk his life. For him, deciding to transfuse his blood to his friend means deciding to die in exchange of his friend's life—this is the **key point that teachers need to explain**, and the relevant paragraphs in the text are the **focus of the teachers' reading**. Apart from that, to attain affective teaching goals thoroughly, as mentioned, rely ultimately on the understandings and feelings of the students themselves. Thus, it is necessary for students to carry out independent reading on a large numbers of related extra materials and typewrite (or handwrite) their thinking and understandings or insights on life. There are about 10 extended reading materials for this lesson, including *Knowledge of Blood Donation*, *A Story of Donating Bone Marrow*, *Giving is Glorious*, *Inspiration of Life*, *Sharing Life*, *Little Snowman Saving the Tiny Fish*, *Doctor Grandin*, *Noble Spirit–A Prose Devoted to Nurses*. The topic of typewriting (or handwriting) in this lesson is "What do you want to say to the boy in the text?" or "What would you do when others are in danger or difficulties?"

Cognitive teaching goal—The cognitive teaching goals of this lesson concern two aspects: (1) recognizing and mastering the new words and phrases in the text (there is no special requirement on understanding the structural characteristics of the text and training in thinking); (2) the teachers should give simple introduction of the knowledge of nature and life related to blood transfusion (there are also relevant knowledge in the extended reading materials). The difficult point in the words and phrases teaching of this lesson is in providing a correct analysis of the connotations of <u>weeping</u>, <u>whimpering</u>, <u>mewling</u> and <u>sobbing</u>,[3] which have similar semantic meanings. All four of them carry the meaning of "crying", but are different in some ways[4]: weeping and whimpering are crying with sounds (whimpering is softer while weeping is louder); Mewling and sobbing are crying without sound,

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[3]The original Chinese of these are, "哭泣", "呜咽", "啜泣", "抽泣".

[4]Noted that the following explanations of the words are made in accordance with the meanings of the original Chinese.

but with the nose grasping for air (sobbing involves continuous grasping while mewling involves intermittence grasping). As mentioned before, teaching goal of this type can be achieved basically by teachers' lecturing and attained thoroughly by students' independent extended reading and typewriting (or handwriting) exercises.

The above analyses show that by holding onto the above key points and difficult point, and grasping the core and key to solve them, there should be no problem for teachers to attain basically the teaching goals of this lesson in the about-20 min "teacher-directed" section.

4.4.2.2 Using the Teaching Approach of the Junior Grades with Appropriate Amendment

When students are promoted to primary four, texts become longer and students are also required to have a deeper and wider understanding of the texts. Thus, the teaching approach of the junior grades cannot be used as they are, but appropriate amendments are needed.

In the following, "*White Geese*", which is one of the texts for the first semester of primary four published by the People's Education Press, would be used as an illustration. The language teacher of Guangzhou East Dongfeng Road Primary School used three lessons to complete the teaching of this text.

The first lesson: reading through the text, learning the new words (including reading and writing these words, using them to form phrases, explaining the difficult words and using the new phrases to compose sentences) and understanding **the habits of geese** (water loving, gregarious, herbivore, cold resistant). The last requirement (understanding the habits of geese) is the key point of the first lesson, and the extended reading materials all related to it.

The second lesson: required students to understand how the text creates the pride of geese through descriptions of their "ways of quacking, walking and eating". Students also got a better **understanding of the personification technique** through repeating the relevant paragraphs, holding group discussion on the relevant contents, and having extended reading materials that applied similar expression technique.

The third lesson: **deepening students' understanding of the personification technique** through comparing the text with related writings that also employed personification (for example, letting the students compare the text "*White Geese*" with the related writing "*White Ganders*", and comparing the "geese" in "*White Geese*" with the "cats" in the writings of Lao She, Zhou Er Fu and Xia Mian Zun). The last 10 min of this lesson were reserved for students to typewrite passages about their favourite animals with personification, so that they could **thoroughly master (or at least basically master) the personification technique**.

This teaching approach has an accurate analysis and grasp of the teaching goals of the lesson, as well as clear and progressive layers. These enable it to get a very good result at the end. This teaching approach is characterized by having extended

reading in all three lessons, but typewriting only in the third lesson. Comparing it with the original teaching approach used in the junior grades, the part on written expression was removed from the first and second lessons (In fact, a 8–10 min written expression part can still be added in the first lesson as required in the goals of the original layer—such as letting students write about a certain habit of their favourite animals. In this way, only one written expression part was cut when compared with the original teaching approach).

4.4.2.3 Using Teaching Approach that Designs According to Units

In primary three and four, language teaching materials (published by the People's Education Press) are usually organized according to units, for example, there are eight units for the first semester of primary four: natural landscapes, observation and discovery, fairy tales, animals, cultural heritage, love of the human world, traces of growth and technology development (each unit usually comprises of four texts); there are also several units for the first semester of primary three. The title of the sixth unit is "Sceneries of the country" and it includes four texts: *Two Ancient Poems* (one praises the scenery of the Three Gorges, and the other praises Xi Hu), *The Fertile Paracel Islands*, *The Beautiful Lesser Khingan* and *Pearl of the Orient*. The collective teaching goal of these texts is: "Cultivating students' passion on the sceneries of the country through a group of poems and prose which praise the elegant natural sceneries, flourishing cities and rich natural resources of the country". The title of the seventh unit is "Fables" and it consists of four texts: *A Combination of Spear and Shield*, *The Wooden Box of Kolya*, *The Pottery Pot and the Iron Tin*, *The Lion and the Deer*. The collective teaching goal of these texts is: "Cultivating students' basic dialectical reasoning through a group of philosophical fables".

As all texts in a unit share one collective teaching goal, an unified teaching design for the four texts in a unit can be made by considering this collective goal—Organizing the teacher-directed teaching activities (including reading demonstration, reading instruction, intellectual simulation, questioning and coaching, answering questions and problems and organizing activities) and student-centred-independent learning activities (including extended reading, discussion with neighbours, class discussion and typewriting exercises) with the total lesson hours of one teaching unit (usually 13–14 lessons), rather than with the lesson hours of one lesson or one text. In other words, during the lessons of a unit, longer extended reading can be carried out intensively for 1–2 times (for 1 lesson every time) and longer typewriting exercises can be conducted also for 1–2 times (for half a lesson–1 lesson every time). Discussion with neighbours and class discussion can be arranged according to the actual situation and need.

All in all, teaching approach that designs according to units are more suitable for progress accelerating language education in primary 4–6. It should be emphasized that even in this teaching approach, frequent **extended reading** and **written**

expression are still the basic necessities (missing any of these would make it difficult to attain the goals of accelerated development). There is only a difference in how they are actually carried out.

4.4.2.4 Using Monographic Study-Based Learning Approach

In primary four, apart from employing "teaching approach of the junior grades with appropriate amendment" (that means "the revised version of junior grades' teaching approach") or "teaching approach that designs according to units" as the regular teaching approach (regular teaching approach refers to the teaching approach that is employed in nearly every lesson), under appropriate condition, monographic study-based teaching approach can be used occasionally. The following is an introduction of the meaning and characteristics, advantages and limitations, as well as the implementation method of this teaching approach.

(1) Meaning and characteristics of monographic study-based learning

Monographic study-based learning has various expressions outside the country: **PBL** (**P**roject-**B**ased **L**earning based on project study, **P**roblem-**B**ased **L**earning based on problem study) or **WebQ**uest (web-based investigation). **Monographic study-based learning** normally refers a learning method in which students learn and understand the related subject knowledge through studying and solving a particular real problem in the society or nature. During this learning process, students are also trained to integrate their knowledge to solve real problem. This learning method bears two prominent characteristics: (1) the topics of study come from a particular **real problem** in the society or nature (rather than hypothetical or simplified problems); (2) the learning, understanding and actual application of subject knowledge are closely integrated. This makes it possible to accomplish the three stages and two leaping that Mao Ze Dong's "*Theory of Practice*" emphasized in the learning process. According to "*Theory of Practice*", these three stages and two leaping form the complete cognitive process that humans must go through in understanding objectives things; leaping from the stage of **perceptual knowledge** to the stage of **rational knowledge**, and leaping from the stage of rational knowledge to the stage of **revolutionary practice**. Traditional school education often made students' learning process stay in the phrase when the stage of **perceptual knowledge** leaps over to the stage of **rational knowledge**—the teaching goals of the subjects are attained when students have a rather comprehensive and correct knowledge and understanding on the concepts of the subjects and theoretical systems, and get a good result in the examinations. Normally, traditional school education will not concern whether the students have really gained a thorough understanding of their knowledge and whether they are able to apply their knowledge in solving a particular real problem in the nature or society (although traditional school education does emphasize giving vast amount of practical question and application questions to students, these questions are simplified, concerned only one subject or hypothetical. The questions are not original and composite real

problems). Traditional school education can only guarantee students' understanding of the knowledge they learned, but not their true mastery of these knowledge. This is because the learning process of traditional school education only stayed at the stage between **perceptual knowledge** and **rational knowledge**, and has not completed the stage from **rational knowledge** to **revolutionary practice**. In other words, the students can only use their knowledge on paper, but are unable to apply the knowledge in solving real problem, which means that they do not have a true mastery of the knowledge.

(2) Advantages and limitations of monographic study-based learning

As **monographic study-based learning** include the complete three stages and two leaping cognitive process from perceptual to rational, and from rational to practice, it overcomes the above defects of traditional school education to a large extent. It is not only beneficial to students' true mastery and application of the acquired knowledge, but is also vital in cultivating students' innovation, creative thinking and creativity. However, it should be noted that although monographic study-based learning truly possesses the above **advantages** which cannot be replaced by any other teaching approach, it cannot be used as the regular learning approach or teaching approach of a subject. The reason is simple: as the topics of monographic study-based learning come from real problems in the society and nature (rather than hypothetical or simplified problems), it is difficult to learn and understanding the related subject knowledge, and apply the acquired knowledge in solving the problem. A huge amount of research in required (not only literature reviews, but may also include on-site survey, measurements or interviews), and students also need to learn and master the related measuring instruments or research methods. During the research process, continuous efforts (both individual and group) are needed in forming the tentative solution to the problem gradually. After that, independent study and collective brainstorming are required to improve the solution before it is executed. While executing the solution, timely formative assessments are needed to avoid detour and loss. The feedbacks of the formative assessments will be used to amend the original solution and measures, so as to gain a better achievement of the goals…; the process goes on until the problem is really solved. It is obvious that such a "learning, research and solving" process is a rather long process which involves a huge amount of time. It cannot be done in 1–2 lessons and it is difficult to observe its effect within 1–2 weeks. It effect can be seen usually after a few months or even more than half a year. Thus, though monographic study-based learning is very effective, it must be used carefully. The topics of the monographic study-based learning must be chosen with extra care (so that the chosen topic is a real problem in the society and nature and can also tightly combine with the contents of the subject that students are currently studying); The frequency of conducting monographic study-based learning should also be carefully determined—Usually, it is organized for 1–2 times at most for a subject during one academic year, or else the arranged progress of the subject itself and the other subjects will be affected.

(3) Implementation of monographic study-based learning approach

This learning approach usually comprises of five sections:

Section 1: **Selecting a problem**
That means selecting the topic of study. As mentioned, the topics must be a real problem in the society or nature and must be able to tightly combine with the contents of the subject that students are currently studying.

Section 2: **Analysing the problem**
Carefully analyse how many subproblem does this real problem consist. Which amongst these sub-problems is crucial? How should this crucial problem be approached? What conditions are needed? By which ways or methods can these conditions be acquired? And so on.

Section 3: Solving the problem
Forming the solution to the problem through thorough research (not only literature reviews, but may also include on-site survey, measurements or interviews), and collecting information through the Internet and other means; Improving and optimizing the solution through group discussion.

Section 4: Executing the solution
Execute the optimized solution individually or as a team.

Section 5: Assessment and conclusion
① Formative assessment—while executing the solution, timely formative assessments are needed to avoid detour and loss. The feedbacks of the formative assessments will be used to amend the original solution and measures, so as to gain a better achievement of the goals…; the process goes on until the problem is really solved.
② Conclusion—including individual conclusion, group conclusion and teacher's conclusion.

(4) Monographic study-based learning approach and teaching approach

As stated before, the meaning of monographic study-based learning is similar to the Western concepts of "project-based learning" and "problem-based learning", and they all focused on "learning". As it is the Western education circle's custom to "value learning over teaching" (our Chinese education circle is just an opposite of that. Our custom is to "value teaching over learning"), when this approach is employed in school education in the Western countries, it is habitually referred to as learning approach. Influenced by this, when monographic study-based learning is used in school education in China, teachers usually refer to it as "learning approach" rather than "teaching approach". However, as monographic study-based learning is employed in teaching at schools, it is not learning in a general sense, but **learning with the involvement and guidance of teachers, and with a certain form of organization** (it is common sense that according to traditional concept, learning conducted in such situation should be called "teaching"). The corresponding process of this approach is as well not a general learning process, but teaching process. Thus, though monographic study-based learning implemented at school is commonly referred to as "monographic study-based learning

approach" by the education circle, it is obviously more accurate to name it "monographic study-based teaching approach".

4.4.2.5 Other Language Teaching Approaches for Middle and Senior Primary School Grades

Apart from the "**revised version of junior grades' teaching approach**", "**teaching approach that designs according to units**" and "**monographic study-based teaching approach**" (the former two belong to regular approach, which can be used in nearly every lesson. The last one is a approach which can be employed occasionally) mentioned above, there are also two less frequently used language teaching approaches for middle and senior primary school grades (that is, primary 4–6): "**composition teaching approach for primary students**" (consists of picture descriptions and special topic writings) and "**teaching approach that designs to cultivate creative thinking**". Although the latter two approaches are less frequently used, they are the essential language teaching approaches for middle and senior primary school grades (primary 4–6). The "**composition teaching approach for primary students**" is possible only by having an in-depth analysis of the psychological model of primary students during composition—A large numbers of researches on children's cognitive psychology are involved; the "**teaching approach that designs to cultivate creative thinking**" bases directly on the "theory of creative thinking"—this touches on lots of knowledge about the structures, elements of composition and psychological model of creative thinking. Thus, to enable a thorough and clear elaboration of these two language teaching approaches for middle and senior primary school grades, specialized chapters are devoted to the discussion of these approaches (please see Chaps. 5 and 6).

4.5 The Teaching Methods and Strategies of the Innovative Language Education Theory

4.5.1 Teaching Methods and Strategies of the Teacher-Directed Section

As pointed out in Sect. 4 of this chapter, though teaching approaches are methods and strategies, they are different from general teaching methods and strategies; general teaching methods and strategies refer to a single teaching method or strategy, but teaching approaches mean a stable combination and application of two or more teaching methods and strategies. Thus, there is always a close relation between the selection and application teaching methods and strategies and the teaching approach in-use. That is to say, the selection and application of teaching methods and strategies are always determined by the teaching approach. For example, in the above "progress accelerating language teaching approach" which

enable substantial improvement in the quality of language education (that is, the "teacher-directed–student-centred teaching approach"), if the pinyin, character recognition and reading types of lessons are put into consideration in the **teacher-directed section**, seven teaching activities, "motivating students in the introduction of the new lesson", "pinyin teaching", "pinyin application", "character recognition teaching", "handwriting teaching", "reading instruction" and "reading comprehension", are involved. After confirming these activities, the teaching methods and strategies that correspond to these activities are also confirmed. The specific correspondences of them are shown below:

1. **Motivating students in the introduction of the new lesson**—teaching strategies, such as "**atmosphere creation**", "**courseware demonstration**" or "**advanced organizer**", can be employed. "Atmosphere creation" can be achieved through various methods, for example, "playing a wonderful video recording", "reading a touching poem", "playing a beautiful music piece", "telling a lively short story", "rising a typical case" and "designing a funny role play" (usually, methods are more concrete than strategies. However, the two all often regard as the same thing without any difference in many occasions). It is obvious that these video recordings, poems, music, stories or cases involved must satisfy one prerequisite—they must be closely related to the current topic of study, or else the aim to create a suitable atmosphere cannot be attained.

2. **Piniyin teaching**—usually, the consonants, vowels and compound syllables that are taught currently would be the focus in applying pinyin teaching methods and strategies, such as "**pronunciation demonstration**", "**writing demonstration**", "**Students' individual practice**", "**analysis and correction of typical pronunciation errors**", "**analysis and correction of typical writing errors**".

3. **Pinyin application**—Usually, the consonants, vowels and compound syllables that are taught currently would be the focus in applying pinyin application teaching methods and strategies, including "**forming phrases**", "**making sentences**", "**creating riddles**", "**creating nursery rhymes**", "**creating doggerels or tongue twisters**".

4. **Character recognition**—Character recognition teaching methods and strategies, like "**form and meaning**", "**meaning association**", "**iconic indication**", "**courseware demonstration**" and "**special explanation of difficult characters**", can be employed.

5. **Handwriting teaching**—Handwriting teaching methods and strategies, such as "**writing in the air**", "**writing copybooks**", "**writing word lattice fields**", "**courseware demonstration**", "**analysis of typical stroke errors**" and "**analysis of typical writing errors**", can be employed.

6. **Reading demonstration**—Methods and strategies, like "**reading demonstration**", "**courseware demonstration**", "**students' individual reading**" and "**comment on individual reading**", can be used.

7. **Reading comprehension**—various teaching strategies, such as "**reading demonstration**", "**intellectual stimulation**", "**questioning and coaching**", "**answering questions and problems**" and "**collaborative learning**". The strategy "answering questions and problems" involves various methods, like "answering inquiries on

difficult words", "coaching in key sentences" and "analysis of structural characteristics of the text". The strategy "collaborative learning" also includes various methods, such as "discussion", "debates", "competition" and "role plays". It is this integrated application of various teaching methods and strategies that allows students to gain a more accurate mastery of the meanings of the texts, a deeper experience of the feeling of the authors, and a more in-depth appreciation of the expressive sentences.

4.5.2 Teaching Methods and Strategies of the Student-centred Section

In the student-centred section, both the pinyin, character recognition and reading lessons of the "progress accelerating language teaching approach" (that is, the "teacher-directed–student-centred teaching approach") involve three teaching activities: "extended reading", "discussion with neighbours" and "typewriting (or handwriting) exercises". Their correspondent teaching methods and strategies are as follows:

1. **Extended reading**—"independent learning" and "independent investigation" are the strategies that should be employed.

2. **Discussion with neighbours**—Strategies, such as "mutual inspiration", "collective wisdom" and "brainstorming", should be used.

3. **Written expression (typewriting or handwriting)**—"Individual practice", "independent investigation" and "serious reflection" are the strategies that should be employed. Although the topics of typewriting (or handwriting) exercises are different for different types of lessons, the methods and strategies employed in the lessons are the same (as mentioned before, for lessons that focus mainly on pinyin, typewriting or handwriting exercises are mostly application of the learned consonants, vowels or compound syllables in making up phrases and sentences, and creating riddles, nursery rhymes, doggerels or tongue twisters with given examples; for lessons that focus mainly on character recognition, the topics of the typewriting or handwriting exercises are mostly riddles, nursery rhymes or simple narrative writings with the words or phrases students learned in that lesson. They may also be students' learning experiences, feelings or reflections on the other cognitive teaching goals of the lesson; for lessons that focus mainly on reading, the contents of the typewriting or handwriting exercises are mostly personal understandings, reflections and lessons on the affective teaching goals of that lesson. They can also be the gain, experience and reflection of learning on the cognitive teaching goals (including knowledge of language and of nature, and thinking development) of that lesson).

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Chapter 5
The Study of Psychological Model and Teaching Approaches in Primary School Composition

5.1 Major Existing Problems in Composition Teaching

The process of composition is psychologically complex. It involves psychological elements like attention, cognition, memory, association, imagination, analysis, integration, judgments, inferences, emotion. The development of the ability to compose does not only rely on observation, imagination, logical analysis and judgments, but a rather strong reading ability is also required. (Because reading is the major method for students to acquire the abilities in topic examination, material selection, layout sketching, as well as the abilities in the use of words, sentence structure and rhetoric skills.) Composition is a synthetic training to students upon words, phrases, sentences and passages, and upon various psychological activities. Therefore the ability to compose is an integrated ability. It displays students' cognitive and language expression abilities, and is a major tool in assessing students' language ability. Thus composition teaching has long been treated with emphasis and as a difficulty in language teaching.

Primary school teachers have devoted themselves to a large pile of studies on composition teaching. The result is fruitful, thanks to dedicators like Yi Si Xia, Huo Mao Zheng, Yu Yi and Wei Shu Sheng, who are the outstanding language teaching professionals involved in the primary and secondary school composition teaching reform, and who have provided outstanding contributions to the reform. However, our conventional pedagogical concepts and traditional teacher-oriented teaching approach have greatly influenced our primary and secondary education. Thus, composition teaching (especially that in primary schools) remains unsatisfactory overall despite all the effort, and there are many problems in it. The more serious problems are summarized as follows (Gao and Ma 1987; Cai 1994; Wang 1993; Shi and Li 1983).

5.1.1 Value "Knowledge" Over "Ability"

Conventional primary school composition teaching generally emphasizes the knowledge of writing. According to the "Nine-year Free Full-time Primary Education Language Teaching Conspectus" promulgated by the State Education Committee, the primary school students are mainly expected to "learn narrative writing, as well as common, practical writing" and "practise to write sentences in junior form…passages in mid-level…essays in senior form". After 2001, as stated in the "Language Education Standard for Compulsory Full-time Education" promulgated by the Ministry of Education, students in primary 5–6 are expected to "learn simple factual writing and imaginary writing" while "students in primary 1–2 should practise to write sentence…in primary 3–4 should practise to write their experience and feeling, and short letter". It can be seen that the former (*Language Teaching Conspectus*) and the latter (*Language Education Standard*) put nearly identical requirements on composition teaching in primary schools. Thus, at present, practices in primary school composition teaching are still arranged based on the quaternary facets: picture description, passage writing exercise, simple narrative writings and common practical writings. Picture description is divided into description of a single picture and of multiple pictures; passage writing exercise includes various practices and examples of writings that depict scenery, recount an event, describe an object and so on; teaching of simple narrative writing involves appreciation of model essays and teaching of writing methods, such as depiction of character, narration of an event and description of the scenes in an activity; teaching of common practical writings involves lecturing on the model writings and teaching the formats of different practical writings, like, "notice", "diary", "reading journal" and "minute".

   Obviously, these practices in composition teaching are definitely systematic and logical, which further strengthen teachers' leading role in classroom teaching. Nevertheless, a fundamental problem is generated—writing is only regarded as an ability to manipulate language with knowledge on composition, which has nothing to do with synthetic ability in close relation to diverse psychological activities. This kind of composition teaching places emphasis on how to deliver the knowledge of writing with model essays and examples (the focus is on the knowledge of writing), rather than on how to foster the synthetic ability of students. (Synthetic ability consists of the language expression abilities of words, phrase, sentences, passages and knowledge of composition, as well as the cognitive abilities involved in the writing process, such as observation, association, imagination, analysis, integration, abstraction, generalization, judgments and inferences.) Actually, apart from the requirements of learning to write narrative writings and practical writings, the original "Primary Education Language Teaching Conspectus" promulgated by the State Education Committee also stated that, "Composition teaching should cultivate students' abilities of using words to form phrases, linking sentences into paragraphs and joining paragraphs into passages. It should also cultivate students' observational and analytical abilities. These two facets of ability training should start from primary one". Apart from the requirements of

learning to write simple factual writings and imaginary writings, the "Language Education Standard" promulgated by the Ministry of Education also pointed out that, "Cognitive ability, imagination and creativity should be cultivated at the same time with language ability". It is obvious that the above teaching arrangement which value "knowledge" (only knowledge of writing) over "ability" has violated the psychological processes that primary students undergo when they composed, as well as the requirements of the "Primary Education Language Teaching Conspectus" and "Language Education Standard". It even contradicts with the emphasis of the "New Theory of Children's Thinking Development" that "the cultivation of language ability and thinking ability should be integrated dynamically".

5.1.2 Value "External" Over "Internal" Stimulation

To deliver the knowledge of writing in composition teaching, traditional composition teaching relies mostly on the lecturing of teachers. Teachers explain with supplementary examples of different literature styles, object description skills and expressions to students. Students are required to imitate and memorize model essays. Through massive drills (frequent, repetitive "external stimulation"), students' memory and comprehension in the use of phrases, sentences and the associations between them would be consolidated. They would also be able to memorize more vocabularies, sentence patterns and the application contexts of these vocabularies and patterns. This enables students to finally develop into competent language users. The above teaching approach is indeed an application of the method "stimulus–response–reinforcement" in behaviourism to composition teaching. The ultimate goal of this approach is to facilitate students' establishment of "reflex" in language operation. In no doubt, this behaviouristic training approach does facilitate students in grasping a large amount of language knowledge in a short time; obvious effect can be seen in the vocabulary and sentence patterns replacement drills which are frequently used in this approach. However, writing is a complex psychological process. It involves different kinds of individual psychological activities, such as knowledge, sentiment and meaning. A person's writing ability and level do not only depend on the quantity of sentence patterns and vocabularies acquired, but also some internal factors like one's observation ability, emotion and attitude, thinking style and value judgment. Thus, a training that focuses on external stimulation and reinforcing observable behaviour without taking internal factors into account can only be effective in shaping behaviours into a particular automatic operating mode. Once the scenarios change, students who are used to that particular operation mode (that is, used to imitating model essays, using set phrases and adaptive to constant language environment) will find themselves helpless. It is obvious that this kind of teaching approach which value "external" over "internal" stimulation is powerless in cultivating students' ability to perform composition activities that required higher level thinking quality. (Think quality can be measured by aspects such as profundity, flexibility, originality, agility and criticality of thinking (Zhu and Lin 1991).)

5.1.3 Value "Writing" Over "Speaking"

As Mr. Ye Sheng-tao mentioned, "'Yu' in the phrase 'yu wen' [literally means "language"] embraces the meaning of how to listen to others and how to speak properly. These are what language teachers should teach their students". Language teaching specialist, Professor Gao Hui-ying, also stated that, "Composition should comprise both oral and written training. Cultivating students' composition ability actually means teaching them to express their idea fluently in both oral and written forms". "Yu wen" is originally a combination of written and spoken languages. "Yu" refers to spoken expression, and "wen" refers to written one. A combination of both produces "yu wen". Although this is the case, our primary school language teaching policy usually places "wen" at the centre of study and ignores "yu"; "writing" is emphasized while "speaking" is neglected. The teachers pay much attention to ensure that students get enough practice in writings (writing diaries, paragraphs and special topic writings), but rarely let students speak during lessons. Students then become shy and unable to speak properly. Some even flushed once they try to speak and stammer their words. Spoken language is different from written language in many ways. (The former is more figurative, arbitrary and less formal, while the latter is more rigorous, formal and logical.) Despite their differences, spoken and written languages are closely related to each other. In terms of information processing, both "speaking" and "writing" are information output (whereas "listening" and "reading" are information input) and both express individual thoughts, opinions or feelings, yet in different ways. In order to express a clear and precise idea, we should be sure of the idea in mind, select appropriate phrases and consider the sequences of utterances or sentences before speaking or writing. Since speaking requires one's immediate discretion and prompt decision, high oral ability acquired through frequent practice can establish an excellent foundation for writing. Valuing "writing" over "speaking" will affect students' development of verbal communication and their improvement in written expression. People with high oral ability think quicker and clearer; On the contrary, though people who write well may not speak well, they have sharp viewpoint and clear expression without confusion in logic. Thus, "speaking" and "writing" can be combined in composition teaching to complement the merits of each other and make up for the deficiencies. Separating "speaking" from "writing" or even putting them in confrontation is unreasonable and contradictory to the rules of composition teaching.

5.1.4 Value "Rationality" Over "Sentiments"

Here, "rationality" refers to "theory" and "being rational", and "sentiments" refers to "affect". Valuing "rationality" over "sentiments" means that in composition teaching, teachers mainly deliver writing theories and neglect emotional interactions with students. For example, in teaching narration, six major criteria, "time, venue, people, cause, process and consequence" will be introduced with illustrations

on several pieces of model essays; Practical writing teaching puts emphasis on six parts of standard format, namely "topic, title, text, wish expression, signature and date", and again uses model essays as examples. Though these theories are necessary and should be introduced, unlike texts of natural science, they do not educate students directly. Instead, they unconsciously edified and enlightened students through descriptions of people, episodes of story and affective expressions of author. In addition to the content of a text, teachers' language, facial expressions and actions are important in delivering the central idea of the text. This affective communication is especially important to junior and middle grades primary school students. Teachers' facial expressions and actions (a type of soundless language, also referred to as body language) are sometimes more expressive and influential than words. Thus, affective element should not be neglected in composition teaching. Apart from learning theories, students should be moved by affection. The integration of these two criteria can arouse students' interest and willingness in reading and writing. Focusing on "rationality" alone and explaining the elements, genres and format of the passages is dull and uninteresting. It will only discourage students from learning rather than attaining the goal to learn and master writing skills and knowledge. "Composing a passage" is a special psychological process dominated by the affect of authors. Such domination does not occur only in literatures, but also in narrative writings which focus mainly on describing scenery, objects, person and recounting events. Writing would become merely a language application skill if students' affect are not stimulated, and they are not guided to pay attention to and observe the great diversity of things around them, and to love and experience their colourful dairy life. Students would only be able to produce monotonous and identical writings without personal characteristics and emotion. These writings may be fluent and structurally complete, but they are unable to touch anybody. That means they fail to improve the language expression ability and communication skills of students.

5.1.5 Value "Content" Over "Situation"

Conventional composition teaching commits another mistake in emphasizing too much the explanation of the content of the model essays, but ignoring the creation of the "situation" described in the essays. Many teachers teaches the model essays by giving a biography of the author, background, key ideas, summaries of the paragraphs, analysis of the texts and features of the text. This kind of formularized and standardized teaching filled up every lesson. It fails to trigger students' excitement and imagination to write through creating a suitable atmosphere with the environment or by setting up the appropriate situation. The originally interesting, exciting and lively composition lessons are turned into abstract and boring vocabularies and sentence patterns arrangement and combination practices which involve mechanical imitation and copying. In special topic compositions, the topics are set without adhering to students' daily life and without consideration of their sentimental world. No effort is made to create a real situation in correspondence to the topics. The

students thus fail to approach the topics. As times go on, students gradually lost confidence in writing and become afraid of writing. Some may even develop psychological reactance and become unwilling to attend composition lessons. In contrast, if attention is placed in setting up the appropriate atmosphere before each composition lessons, it can rejuvenate the atmosphere of lessons and attract student's interest. It can also trigger their imagination and foster their figurative thinking ability. Students will naturally develop a desire to express themselves and write, and their fondness for composition lessons will also build up gradually. This shows that creating the appropriate atmosphere is essential in composition teaching. There are various methods to create atmosphere, such as playing a multimedia courseware, showing a picture or photograph or even telling a story, singing a song, telling a fable or reading a poem. It is for certain that these courseware, picture, photograph, story, song, fable or poem must be relevant to the topics of the composition in that lesson. (The topic of composition may be chosen by the teachers or by the students themselves.)

5.2 The Psychological Model of Primary School Students at Composition

The cause of the preceding problems in composition all originated from the influence of traditional teacher-oriented teaching approach. This approach overemphasizes teachers' leading role. It only considers how teachers should teach without considering how students can learn. Students' psychological activity in learning is ignored, and this can be seen in composition teaching. As mentioned, the process of composition is psychologically complex and involves various psychological activities. However, as traditional composition teaching focus on knowledge of writing, little researches were conducted on students' psychological characteristics and cognitive pattern at composition. Actually, all the five preceding problems arose because of this ignorance in students' psychological characteristics and cognitive pattern. In order to implement fundamental changes to the traditional composition teaching approach, we should build up a psychological model of students in writing, study the psychological pattern of students and key psychological factors involved in writing compositions. In this way, we can find out the conditions and variances in teaching that affect and enhance these psychological factors, and apply them as a guide to our further research in primary school composition teaching reform. This is the scientific attitude that should be hold in teaching reform.

5.2.1 The Psychological Models of Special Topic Composition

There are two types of primary school compositions, namely "picture description" (for junior students) and "special topic writing" (for middle and senior students).

Writing according to the specific scope and requirements of the teachers is another common type of compositions (some called it "special idea writing"). As this type of composition is still restricted by the scope and requirements raised by the teachers, it is also regarded as "special topic writing". Although differences exist between picture description and special topic writing in terms of the cognitive characteristics of the targets and subjects of cognitive processing, as well as the psychological process, both of them need to go through four identical procedures—material selection, thought construction, language expression and language refinement. Then, what are the corresponding psychological processes of these procedures of special topic writing? Based on the fact that the process of composition rely heavily on the information stored in memory, Bereiter & Scardamalia suggested that composition is a "knowledge telling process", and proposed in 1987, the following model of psychological process in special topic writing as shown in Fig. 5.1 (Peng and Tan 1991):
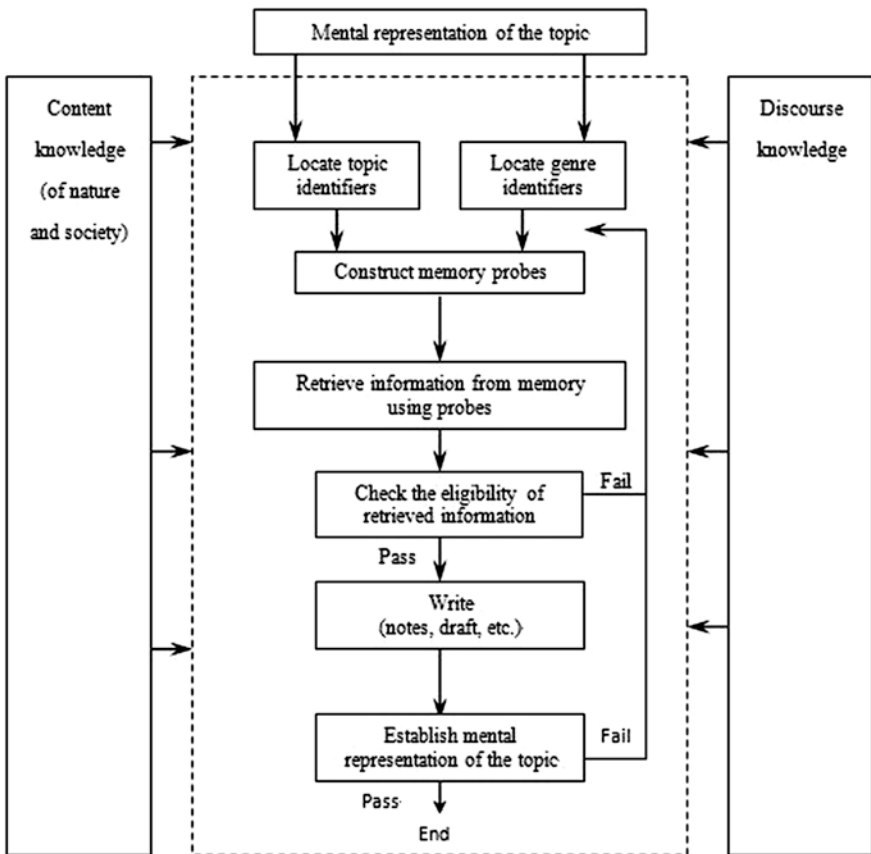
Fig. 5.1 Bereiter & Scardamalia's psychological model in composition (knowledge telling psychological model in composition)

Bereiter & Scardamalia's model regarded knowledge as playing a key role in the writing process. He put forward the idea that the knowledge of writing (including topic examination, material selection, layout, strategy, syntactic rules, vocabularies and punctuation marks) is a prerequisite to compositions (knowing "how to write"), while knowledge of nature and society is a basic element of compositions (knowing "what to write"). His model viewed "the conception of composition" as a process in which an author retrieves relevant knowledge or information from long-term memory according to the topic and genre of the composition, organizes them logically, and then presents the central idea precisely and grammatically in written form. Thus, this model can also be called the "knowledge telling psychological model in composition". The defect of this model is that it only concerns with the effect of composition ability, and the knowledge of composition, nature and society in the writing process. The decisive influence of the authors' observational and psychological processing capacities is neglected. None of the processes in the above model is related to observation of objects. For psychological processing, the model merely regards two procedures, i.e. the "retrieve information from memory using probes" and "check the eligibility of retrieved information", as the whole psychological process in writing compositions. This illustration is too general and insufficient to explain the whole picture. Psychological processing is the most influential factor in the conception of writing. It is also the most vital and crucial factor that influence the whole writing process. As this model merely emphasizes knowledge and neglects ability (especially psychological processing ability), it is a one-dimensional (dimension of knowledge) psychological model in writing compositions.

Mainland studies on psychological model in writing compositions lag behind those of foreign countries. Though many language education specialists have realized the importance of this issue in their years of practice in education, and have discussed the psychological model of primary students in writing compositions in some essays and works (Cai 1994; Zhang 1989; Zhu 1984), work that gives an in-depth investigation of the issue from a psychological angle is rare. The most in-depth and fruitful study on this issue is conducted by Zhu Jing Xi at the Contemporary Pedagogical Research Centre of Beijing Normal University. Based on the "image-operational processing model" proposed by Dr. Zhao Wei Hua from Beijing Normal University's Developmental Psychology Research Centre, he constructed a "psychological model of primary school students in writing compositions" in early 1997. The model is as shown in Fig. 5.2 (Zhu 1997). As it builds on image operation, it is also called the "'image-operational psychological model in writing compositions".

"Image processing ability" (including the primary and secondary adaptations of images) is the core of the model. It is built upon Dr. Zhao Wei Hua's "image-operation processing model" (see Fig. 5.3 (Zhao 1995)), which is adapted from Shepard and Cooper's "mutual adaptation theory" introduced in 1995.

According to reference (Zhao 1995; please see Fig. 5.3), "The primary image operation of writing is to transform the newly retrieved information into virtual images, which is built in accordance to the basic structure of writing. After confirming
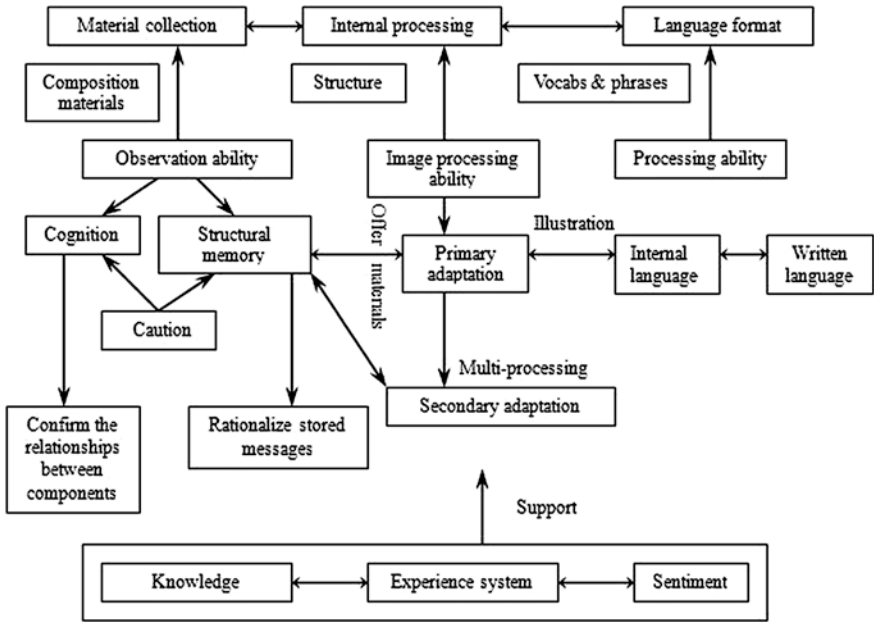
Fig. 5.2 Image-operational psychological model in writing compositions
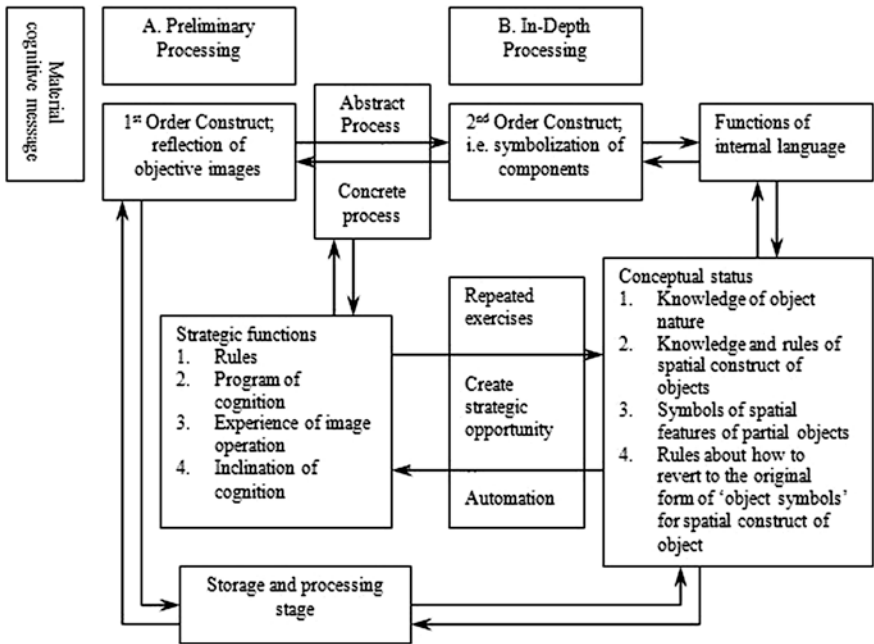
Fig. 5.3 Image-operational processing model

the structure of the primary adaptation, individuals would proceed to the secondary adaptation with personal affections and value concepts. Secondary adaptation consists of two operations, refining and appending. Refining means using the stored information in memory to fine tune the image, making it more accurate. Appending refers to patching the gaps of the image with the stored information in mind".

The feature of image-operational psychological model in writing compositions is its focus on the significance of internal psychological processing. It largely mends the loophole of Bereiter & Scardamalia's model, and this is its major credits. Furthermore, the 2-staged adaptations can work correspondingly with "decomposing operation" (extracting information from different areas and forming real-life situational image, i.e. a reproduction of objective things) and "assembling operation" (refining and appending). This design is more applicable and can be imitated by computers easily, which is compatible with the composition software CAI. This is another credit of this model.

A defect of this model is its simplification of the psychological process in writing compositions. It deems the primary and secondary adaptations (decomposing operation and assembling operation) as the entire psychological process. Image operation normally only deals with concrete image thinking, but not with abstract logical thinking. The "conceptual status" section in the "image-operational processing model" employed by this model can adjust and control the secondary adaptation by using knowledge such as the related objects' nature and spatial construct. By refining and appending the information, this section produces a more accurate and complete image. Nevertheless, it is still operation and processing on images (that means using images as the mental materials), and thus still belongs to imagery thinking. It is essentially different from abstract logical thinking, which uses language concept as mental materials. Even imagery thinking itself comprises of "concrete image thinking" and "general imagery thinking" (aka "linguistic imagery thinking" (Zhu and Lin 1991). As mentioned above, the only parts that touch on image operation in Figs. 5.2 and 5.3 are "primary adaptation" and "secondary adaptation", which are the "decomposing operation" and "assembling operation" on images. (These two operations belong to concrete imagery thinking. They are lower level image operations.) The third kind of operation—imagination (reproduction and creation of images) is not tackled. According to the view of developmental psychology about thinking (Zhu and Lin 1991), "imagination" is general imagery thinking and it belongs to higher level image operation (images become "imagination" through combination and reconstruction, not just simply decomposition and assembly). The model in Fig. 5.2 does not only obliterate the difference between concrete imagery thinking and general imagery thinking, but also neglects the association of and distinction between the three kinds of image operations. The model's depiction of "image operation", which is its focus, is also incomplete—it lacks the most important image operation ("imagination"). Thus, to be more exact, this model in Fig. 5.2 should be named "low-level image-operational psychological model in writing compositions". Casting general imagery thinking and abstract logical thinking aside from the psychological process of composition is the most disappointing point of this model.

Apart from that, this model mainly concerns about the roles of "knowledge" (especially knowledge related to characters, phrases, sentences and paragraphs) and "ability" (including ability of observation, image processing and language processing) in composition. Though reference (Zhu 1997) does mention about the effect of "sentiment" in the conception of writing, it just glosses over it without going into discussion. Even in its latter discussion on teaching principles, processes and methods, nothing about "sentiment" is mentioned. Thus, the model in Fig. 5.2 is, strictly speaking, a "quasi-two-dimensional model". ("Two-dimensional" means that it includes mainly the dimensions of knowledge and ability, but not that of sentiment; "quasi" means that its ability dimension is incomplete, for it fails to include imagination ability and the crucial abstract logical thinking ability.) Failing to consider the role of sentiment is another defect of the model. Although it is a big leap compared with Bereiter & Scardamalia's model (a one-dimensional model), it does not fully and faithfully reflect the psychological activity of primary school students in writing compositions.

Though Zhu Jing Xi's quasi-two-dimensional model has the two defects mentioned above, it is, anyway, our country's first psychological model in writing compositions. It provides a new train of thought and field of vision to our country's language education reform. Thus, it does not only bear theoretical significance, but is also very valuable. It deserves full recognition for this.

On the basis of Bereiter & Scardamalia's one-dimensional model and Zhu Jing Xi's quasi-two-dimensional model, as well as our recent years' experiments of composition teaching reform in numerous experimental schools, a new psychological model of writing special topic compositions is proposed. This model takes into consideration the influence of knowledge, ability and sentiment in writing. As shown in Fig. 5.4, this model emphasizes the important effect of "thinking" in internal psychological processing. ("Thinking" here refers not only to concrete imagery thinking and general imagery thinking, but also abstract logical thinking.) Thus, it can be called "thinking-processing psychological model in writing compositions". As it takes into consideration the influence of knowledge, ability and sentiment, it is a three-dimensional model. In the following, the model is used to illustrate the corresponding psychological factors and operations in the different phases of composition (material selection, thought construction, language expression and refinement):

5.2.2 Phase of Material Selection

Primary Education Language Conspectus requires students to learn narration, so the topics of special topic compositions should be about personal reflection and views on past experience of particular events, people and objects. Thus, the contents of material selection (that is, the materials for formation of writing) should be formed by images and concepts.
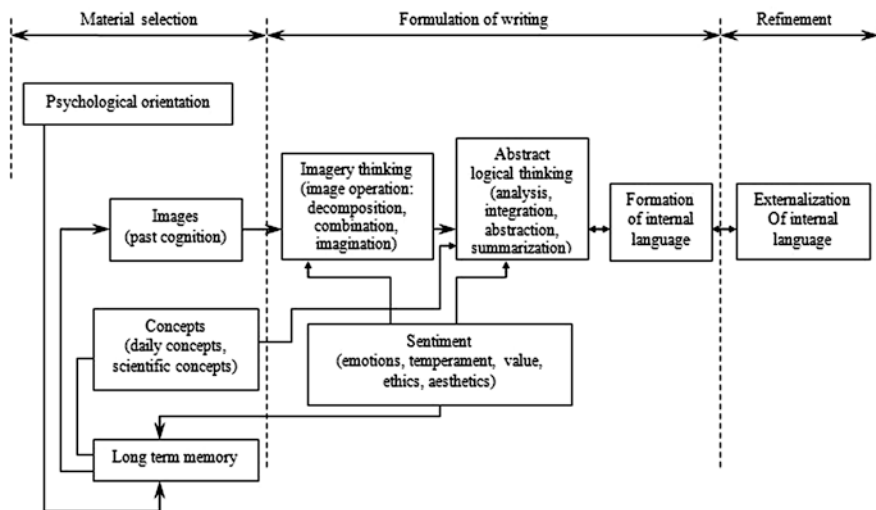
Fig. 5.4   Thinking-processing psychological model in writing compositions

"Image" is the reflection of previously perceived objects (which is not perceived now) and the reoccurrence of residual trace from past experience. "Feeling" is the subjective experience of people towards objective events generated from our sensory register. "Sense" is the organization and explanation of information derived from feeling. It is produced by feeling, and inseparable from feeling while also different from it. This is because the formation of sense depends on the current information of feeling, as well as the cognitive subject's past knowledge and experience. Feeling only reflects only a single attribute of an object, while sense reflects many, that is, the whole entity of an object. Feeling, sense and image share the same characteristics of being intuitive in nature. They are the reflection of the brain's intuition towards an object and belong to the sensory information scope. They represent three different developmental stages ranging from low to high levels.

In spite of the same characteristics stated above, image and sense are different in the following ways:

① **Image is the residual trace left by past experience**, which is the concrete image of an object stored in mind. Though it belongs to the scope of sensory information, it is a leap from sensory perception, which means that it can exist separately from the concrete object. (There is no sensory perception without concrete object.) This detachment from concrete objects enables direct processing of the images in mind, which in turn produces more accurate and stable images.

② **Except being intuitive, image also possesses certain degree of generalizability**. (Generalizability refers to a process in which the external characteristics of different objects are compared, and follows by the removal of different characteristics, and integration and expansion of common characteristics to other objects in the same category.) As image possesses the ability to make intuitive and

generalized reflections on objective objects, it enables perception-centred sensory information to develop into concept-centred logical information with the adjustment and control of language.

With the viewpoints above, psychologists (Zhu and Lin 1991) believe that image is a bridge linking concrete sensation and abstract thinking.

"Concept" is another material used in thought construction of writing. In order to express reflections and opinions upon previously perceived objects (images), the sensory information of an object need to be sublimated to a logical one. Concept is needed to perform this further processing; logical information of an object is attained by using concepts in making judgments and inferences. It is in this way that authors can generate qualified articles with stances. Image is a type of sensory information. It is the sensory materials of thinking, while concept is the rational type. They are closely related, but also essentially different: As mentioned above, objective objects stimulate the sensory organs and thus produce sensation, which in turn generate images with its residual trace in mind. These images are stored in long-term memory. With repetitive processing, images become more complete and accurate, and are converted into the stable image and concept of the objects, i.e. "experience". Experience is elevated to concept after further refining and generalizing. Thus, concept originates from image, but is also of a higher level than image.

The most important psychological operations in selecting materials are "psychological orientation" and "information retrieval". As individuals are always in the process of subjective and objective interaction, psychological orientation should be set in advance so as to facilitate individuals to perform materials selection and form ideas about a particular writing topic. Psychological orientation enables individuals' to select relevant materials and discards the irrelevant ones according to the topic of the composition. Information retrieval refers to the retrieval of images and concepts from lone-term memory. Thus, under the premise of psychological orientation, information retrieval refers to a retrieval of images and concepts that are relevant to the topic from long-term memory.

The above analysis shows that there are two concerns about the selection of materials:

① **Large quantity of visualized, lively and tangible materials can be generated from rich images**, and images are determined by perceptions of objects in the past. (Retrieval from short-term memory is needed to change the past experience of students into writing materials in the lesson.) In order to get a more complete and accurate image in the perception of objective objects, training and cultivation of the students' observational ability should be strengthen.

② **To gain a more in-depth understanding on a matter rather than remaining in the superficial sensory information, "concepts", which is the rational materials of thinking, should be added in the following stage of formation of writing. That means that there should be more sufficient accumulation of knowledge.** In order to achieve this, more instructions should be given to students on in-class and extra-curriculum reading. This enhances students' knowledge in different areas (not only knowledge about writing, but also natural science, social science and general daily life knowledge).

5.2.3 Phase of Conception in Writing

Conception is the key in writing. In conventional composition teaching, it usually covers the following areas:

① **Examining the topic**

Attention should be placed on the specific scope, content, people, time and situation of the topic.

② **Determining the central idea**

Central idea is the thoughts, viewpoints and principles that the author would like to express through his writing. It is the most important content of a composition. Material selection should be made by taking the central idea into consideration. Materials that relate to the central idea would be put in the writing, while the unrelated one would be discarded; Materials that can highlight the central idea would be written in detail with longer length, while the others would be written roughly with shorter length.

③ **Producing an outline**

Producing an outline helps to organize thinking in writing. That means confirming: which materials would be use to express the central idea, what would be written first and what later, what would be written in detail and what roughly, as well as how to link up the different parts in the piece of writing.

④ **Selecting and designing concrete details**

After the outline is produced, the concrete details of the piece of writing should be selected and designed based of the different requirements on description of events, people, sceneries and objects.

Description of events: A clear account should be given on the time, place, people, cause, process and result of the event.

Description of people: The characters should be vividly depicted. Mastery of the following two aspects is needed to produce a vivid depiction: (1) The appearances, actions, languages and psychology (gradually deepening from external to internal) that can represent the characteristics and features of the characters should be written; (2) Concrete events should be used to depict the characters. This means to put down the facts and episodes that can best reveal that personalities, qualities and spirit of the characters.

Description of sceneries: Lively description should be given to natural sceneries.

Description of objects: Profound depiction of real-life objects (such as a particular type of animal, plant, building and utensil) that bear special meaning.

The above four are requirements derived according to the process of writing composition. Regarding the psychological operation of composition, the conception of special topic composition is comprised by the following constructs (see Fig. 5.4):

5.2.3.1 Image Operations (Imagery Thinking)

Cognitive psychologists agree that images can be sorted into definite images and general images. Definite images reflect the characteristics of a particular object, where general images reflect the common characteristics of similar objects. In our process of understanding objective objects, usually definite images are formed at the initial learning stage, followed by formation of general image while getting more information from society at a later stage. During the continuous reflection on objective objects, we often perceive different objects of the same category, and formed numerous different definite images. Through further analysis, integration and abstraction, these definite images are converted into general images, which summarize the common characteristics of objects of the same category. In writing special topic compositions, usually general images are extracted from long-term memories. Due to individual variations in cognitive development, the general images of objects of the same category are different in different people: some may have more in-depth and accurate images, which means they have higher generalizability, while others many have lower generalizability. It is apparent that the generalizability of general images is crucial to the depth, comprehensiveness and accuracy of a piece of writing. Thus, in the conception process, extracting directly formed general image from long-term memory is a basic step. More should be done through further image operations and processing so as to increase the level of generalization. This is a critical step in the conception of writing.

There are three kinds of image operations: decomposing, assembling and imaginary (Zhu and Lin 1991; Zhao 1995; Zhu 1997; Cooper 1990). "Decomposing" is to break up an entire image into several fractions. (Each fraction is a unique image.) For instance, the image of a rabbit can be broke up into eyes, ears, mouth, fur, paw, tail. "Assembling" is to combine images of objects of the same category to make it richer, more complete and accurate, such as by performing association and then combining the images of a rabbit during movement, stillness and the like, a more figurative, vivid and complete image of a rabbit would be produced. It can be noted that "association" is a vital prerequisite of image combination operation, and plays an important role in the process of the operation. "Imagination" is a process of combining various original images and carrying out creative reformation on them. In the imaginary process, all combined images undergone changes from their original traits (which are kept constant in decomposing and assembling operations). As a result, a new image, the "imaginary image", is formed. The goddess of the moon and all typical characters in fiction are new images, i.e. imagery images.

The formation process of imaginary images can also be distinguished into "anticipated" and "unanticipated". Unanticipated imagination is a low-level imagination without a conscious and intended goal, while anticipated imagination is high level imagination with a conscious and clear goal. The conception process of composition involves only anticipated imagination. As imaginary images are formed by restructuring and combining various original images, anticipated imagination carries certain degree of innovation and even creativity.

According to the level of innovativeness, anticipated imagination can be further classified into "reformed imagination" and "creative imagination". Reformed imagination produces images upon others' description of an unperceived object (like dinosaurs), while creative imagination constructs images upon individual imagination towards a new object without others' ready-made description. Apparently, creative imagination has special significance in the conception process of composition. To conclude, developing students' ability of imagination, especially "creative imagination", is an indispensable part in upgrading their writing ability.

5.2.3.2 Abstract Logical Thinking

Although image processing has a certain degree of generalization, the resultant conclusion is merely drawn from the external characteristics of an object, not from the intrinsic nature of the object itself. Image operation, especially the operation of combining images (to from imaginary images), though creative, still belongs to imagery thinking (rather than logical thinking). This means that it generally remains in the sensory information level. In the conception of composition, sensory information alone cannot thoroughly reveal that nature of objects. The authors will not be able to form a clear and in-depth central idea or produce typical concrete details that can reflect the intrinsic nature of the events or people. Such conception of composition must fail. Thus, further processing in thinking should be appended to the foundation of image operation.

The thinking specified here refers not only to imagery thinking, but also abstract logical thinking. A finding from a long-term research project on thinking development of primary school students conducted by developmental psychologists in our country indicates that (Zhu and Lin 1991) "the basic characteristic of primary students' thinking is: the major thinking format shifts from concrete imagery thinking to abstract logical thinking. Abstract logical thinking at this stage is still directly linked with perception experience and is still very concrete and figurative". "The transition from concrete imagery thinking to abstract logical thinking is the 'leap' or 'change' in thinking development. There is a turn in this transitional period, and this turn is the 'critical age' of primary students' thinking development…It is generally believed that this critical age starts from primary four (about 10–11 years old);…With appropriate education, the critical age can commence earlier in primary three". This shows that though the thinking of middle and senior grades primary students is still very concrete and figurative, there is formation of preliminary abstract logical thinking. This abstract logical thinking will have larger development (leap or change) in primary three and four. Logical thinking uses phrases and language as the medium of expression, and concept as the materials of mental processing. Thus, by the adjusting and controlling phrases and language, and using concepts to perform judgments and inferences, thorough reformations can be made on a large quantity of sensory information (images and the result of image operation), which capture the essence and truth of them. This allows the authors to form a better concept of the composition by producing a

meaningful central idea, and selecting the lively episodes which best reflect the natures and patterns of objects, and best reveal the personalities of the characters.

Processing on general logical thinking contains various kinds of psychological operations, such as analysis, integration, abstraction, generalization, comparison, categorization, systematization and materialization (Zhu and Lin 1991; Cai 1994). More complicated and advanced logical mental processing includes using various concepts (and even compound concepts) to perform judgments and inferences (which includes categorical reasoning, hypothetical reasoning and complex reasoning).

Among these operations, analytic and integrated operations are the basic types of processing because other operations are derived from them. Within analytic and integrated operations, distinctions and associations among objects are found, which form the condition for abstraction, generalization and categorization. Systematization is a further development of generalization while materialization is an inverse process of abstraction. Judgments are made on the even more complex abstraction and generalization, and every part of inference (no matter the major premises, minor premise or conclusion) involves judgments. Hence, analysis and integration is the most fundamental psychological operation ability of logical mental processing. Abstract and generalization enable formation of new concepts and help to reveal the intrinsic nature of objects (while judgments and inferences based on abstraction and generalization reveal the intrinsic nature of more complex objects and inter-object internal relation pattern), which helps to convert sensory information to rational information. That is to say people can get a more comprehensive and correct understanding of objective objects only through abstraction and generalization. This proves that abstraction and generalization are the most meaningful psychological operations in mental processing. As analysis and integration, abstraction and generalization are interdependent and inseparable unities, for the purpose of convenience, these two most important psychological abilities are referred to as analytic ability and generalization ability (that is, analysis and integration ability, and abstraction and generalization ability). It should be noted clearly that analysis always include integration, and summarization is always performed with abstraction without exception.

The above analysis indicates that image operation and logical mental processing are vital for "examining the topic", "determining the central idea", and "selecting and designing concrete details", while "producing an outline" is the simple external expression of image operation and logical mental processing.

5.2.3.3   Constraint of Sentiments upon Imagination and Logical Thinking Processing

According to Modern Chinese Dictionary, "qing cao" [literally means "sentiment"] in Chinese refers to "a consistent psychological state stemmed from an integration of feelings and thoughts". In other words, it consists of emotion, feeling, concept (moral, aesthetic, values) and so on.

Psychologists believe that (Wang 1992), "Emotion and feeling are like a censorial machine that supervises thinking activities. It is responsible for enhancing or organizing working memory, inference operation and problem solving. It is because emotion is both an objective expression and a subjective experience. The stable psychological background or psychological state formed by emotional experience helps to organize and coordinate current thinking activities. Emotion helps us to select information and accommodate the environment. It also directs our behaviour to change the environment. We usually think broadly and flexibly in order to figure out quick solutions to problems when we are in a good mood. But we will do the opposite when we are in a bad mood, as our mind is blocked up and thus our creativity is gone". Therefore, to enable efficient and smooth thinking activities (both imagery thinking and abstract logical thinking), not only should we guide students in maintaining a good psychological state, which foster their thinking in composition, but we should also incorporate daily life materials into teaching texts in our language education, so as to cultivate students' positive emotion and healthy emotional development.

The effect of thinking concepts on the process of conception in composition is self-evident. It affects the scope and the area of association and imagination (especially "creative imagination"), the comprehensiveness and depth of the understanding and expression of the topic, and also the deepness of processing of the materials. All in all, every part in the conception of composition is influenced by authors' thinking level, morality, aesthetic and values. In fact, this kind of influence does not only exist in the whole process of composition conception, but started at the phase of "material selection" (see Fig. 5.4).

The above facts reveal that "knowledge" and "ability" should not be the only two concerns in composition teaching. The influence of "sentiment" should also be put into consideration. That means we should strive to establish a "three-dimensional composition teaching model" that comprises of knowledge, ability and sentiment.

5.2.3.4 Formation of Internal Language

In the above, the first three internal psychological operations, i.e. image operation, mental processing and sentiment effect, involve in the conception process of composition are discussed. Image operation includes decomposition and assembly of images, associations and imaginations (reconstructed imagination and creative imagination). The process of image operation is indeed that of imagery thinking. Mental processing refers to the process of abstract logical thinking. The methods of mental processing in imagery thinking and abstract logical thinking have both commonalities (both includes processing methods such as analysis, integration, abstraction and summarization) and differences (for example, there is huge difference between association and imagination in imagery thinking, and judgments and inferences in abstract logical thinking). Apart from that, another major different between the two is: The materials used in mental processing are different. The

former uses intuitive sensory information or images as materials, while the latter employs language-represented concepts (including concepts of science and daily life).

In the following, we will investigate how people use language as a medium to complete and form the conception of compositions. From the angle of psychological processing, the process of completing the conception of composition is that of the formation of internal language, and internal language is the result of the conception.

It is common sense that language consists of phonetic, semantic and syntactic components. It is a kind of social communication tool and embraces sociability. Language refers to the process in which an individual applies a particular language. It is both an individual's physical and psychological phenomenon, and thus embraces individuality. Individuals are able to speak a large quantity of things with one language. Based on the format of expression, language can be divided into "spoken language", "written language" and "internal language" (Zhu and Lin 1991), and the first two of them are known as "external language".

During the conception process of composition, interpersonal verbal exchange is not required. The authors only think quietly by themselves. Thus, the medium of logical thinking processing is not spoken language or written language, but a special internal language. The intermediate result and final result of using this special language to perform conception is internal language. Internal language has the following characteristics:

- Although internal language is a soundless language (muted language), it still triggers our articulation device that transfers signals to the brain. This signal is weak but sufficient enough to regulate and control thinking activities.
- It is a simplified language (usually fragments of external language). A word or a phrase can embody a complete meaning. This is because internal language is used to communicate with oneself rather than with others. The relation between a word (or a phrase) and its complete meaning exists in one's mind. Thus, a word (or a phrase) is sufficient to represent a complete complex meaning. This simplicity of internal language facilitates the efficient of thinking.
- It is connected with conscious behaviours. People often hope that they can speak and act with order, aim and plan, and that they can raise consciousness and lower aimlessness. Thus, they often "think before speaking" and "think before acting". "Think" here refers to using internal language to think thoroughly one's word and action before they are said or done. The conception process of composition is a process that employs internal language to process materials, so that the resultant composition can approach the requirements of the topic in a more orderly, goal-oriented and planned manner.

When one starts writing, he has to go through the material selection process, in which one would concentrate on the specific image or image group related to the topic through psychological orientation (that means extracting relevant information from long-term memory), and organizes the materials systematically in mind. At the beginning, the selected image or image group is vague and tentative. Further

processing with decomposing, assembling and association (concrete imagery think-ing) would advance the selected images into clear, complete, rich, and lively one. New images based on original image group can be formed through reconstructed imagination and creative imagination (general imagery thinking). However, not all retrieved and newly established images fit the requirements of the topic and the genre of the composition. At this juncture, under the influence of individual con-cept (including morality, aesthetic and values) and personal emotion and feeling, internal language would be used as the medium to analyse and integrate the above images, and performed judgments and inferences with the related concepts. This will help to confirm the basic properties of objects reflected by the various images and concept, their internal relations and their effects in expressing the main idea. Basing on this, and with repetitive association and imagination, and consecutive logical thinking processing, concepts and images that are closely related to the topic would be highlighted and the less related one would be deleted or cut. By tak-ing also the requirement of the genre into consideration, the basic structure, major contents and presentation format will gradually be formed in mind. This is the con-ception process of composition. The structure, major content and presentation for-mat stored in mind with internal language are the result of the conception, which is commonly referred to as "fu gao" [literally means "internal draft"] in Chinese (so, the conception process of composition is "da fu gao" in Chinese).

5.2.4 Phase of Language Expression and Refinement

The phases of language expression and refinement in writing process correspond with the "externalization of internal language" in the psychological process model. "Externalization of internal language" means transforming the "internal draft", which is the structure, major content and presentation format of the composition stored in mind with internal language, into grammatical texts. It is reasonable to thinking that this phase does not involve any psychological processing. However, this is not the case. When the conception process has basically finished and the author starts expressing his ideas in written form, his mental processing persists. He continues to think and analysis the content he put down. Once he finds that the written expression does not correspond or fully correspond to the topic, he will return to the conception phases and repeat the above procedures again. (Such re-conception is usually done partially on a particular part or detail, but it is possible to start from the very beginning in few unusual cases.) The author will resume writing after re-conception. This shows that written expression of language (that means writing) is not totally separated from the conception process, but is inter-locked with it. That is to say, though this phase focuses on written expression of language and training in vocabulary processing ability (Knowledge of writing is usually useful in this phase, though it does a part in other phases), it is also closely related to the processing of imagery thinking and abstract logical thinking, and is important to the training of mental processing ability.

5.2.5 *The Psychological Models of Picture Description Composition (Including Oral and Written Descriptions)*

As mentioned before, picture description is mainly practised by junior primary students. Thus, by basing on the researches of the psychological processes of junior grades primary school students in writing, and comparing them with the psychological processes of middle and senior grades primary school students in writing, the model of psychological process in picture description composition (including oral and written descriptions) produced should look like that in Fig. 5.5. This model emphasizes the important effect of imagery thinking in the internal psychological processing (Imagery thinking here includes both concrete imagery thinking and general imagery thinking. That means it includes psychological operations such as decomposition, assembly, association, reconstructed imagination, creative imagination.), thus it is named "imagery thinking psychological model of picture description composition".

Picture description and special topic composition are different mainly in two ways: (1) Regarding the psychological operation of "material selection", the materials for picture description searched and retrieved from long-term memory are not images or image group associated with specific topics. Instead, materials are formed by directly observing the external characteristics of the objects from the picture that is currently displaying, and supplementing it with related images in long-term memory. Though retrieving images from long-term memory is still needed at this stage (see Fig. 5.5), its aim is to supplement and refine the new images formed by observing the current objects. That is to say, the aim of retrieving original images is to enable processing of the new images, so as to produce
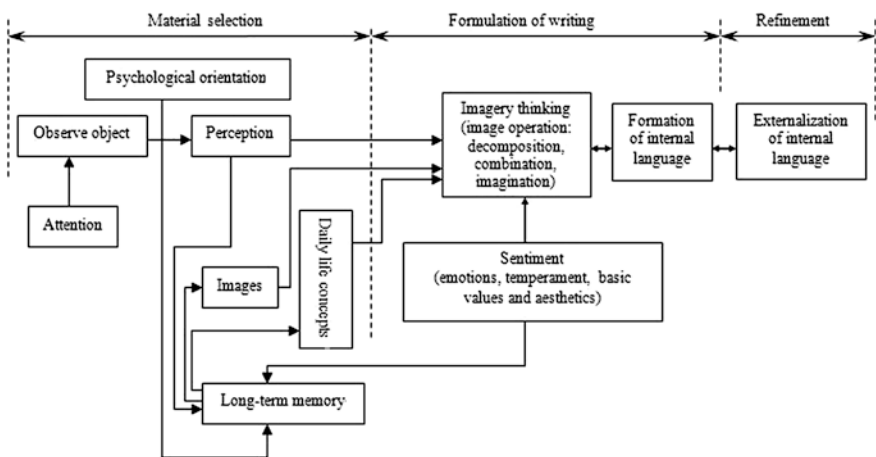
Fig. 5.5 Imagery thinking psychological model of picture description composition

more complete and real general images, which in turn enriches the writing materials; (2) Picture description composition is usually practised by junior primary students—their thinking development is still at the stage when images are used as the major materials for mental processing. Images are also the major target of internal psychological processing, and these students lack real logical thinking-processing ability. Though concepts and language are involved in the imagination of these junior grades students, all the concepts are simple daily life concepts or concepts related to concrete objects (rather than scientific abstract concepts), and images remain the major mental processing materials in imagination. The involvement of concepts and language serves only to foster more in-depth processing of images. Thus, it is essentially different from abstract logical thinking, which purely used concepts as the mental processing materials. In teaching picture description, the focus is normally placed on promoting students' abilities in observation, image operation (including association and imagination) and primary language expression, rather than on training their logical thinking processing ability. Nonetheless, it is essential to build a favourable environment for students to acquire picture description skills, so as to accelerate the transition from picture description phase to special topic composition phase.

5.3 Exploration of Composition Teaching Approach for Primary Students

5.3.1 Three-Dimensional Models of Composition Teaching Goals

The previous analysis of the psychological models of special topic composition of primary students shows that the process of writing compositions involves knowledge (daily life knowledge, natural and social science knowledge, knowledge of writing), ability (abilities to observe, to perform image operations and logical thinking, as well as oral and verbal expression abilities) and sentiment (emotions, sentiments, ethics, aesthetics and values). Knowledge determines "what to write", ability determines "how to write" (and knowledge of writing is also related to "how to write") and sentiment determines "why bother to write". These basic qualities require in composition are indicated in the three-dimensional model in Fig. 5.6.

The elements shown in the model above are not learnt solely through lessons. For example, daily life knowledge, and natural and social science knowledge are essential in writing composition. (Daily life experiences and natural and social science knowledge are the sources of composition.) Yet, the former is attained through social interaction and daily life experience, while the latter is gained through lessons of academic subjects in primary and secondary schools, and extra-curriculum reading of various types of books, newspapers and magazines. Only
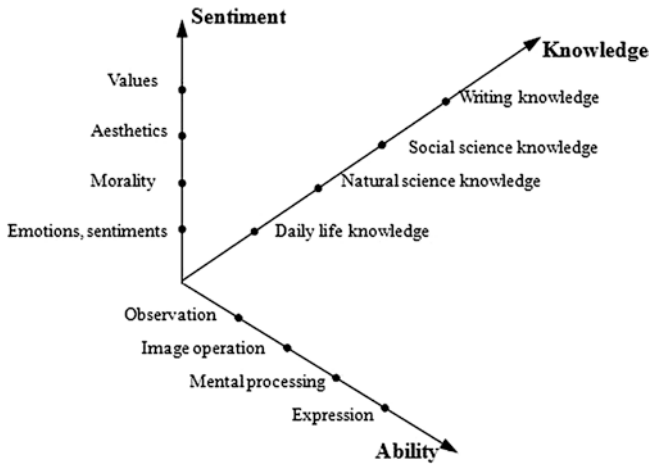
Fig. 5.6   Three-dimensional model of the three elements of composition

knowledge of writing is mastered mainly through composition teaching. Thus, in the following discussion of the three-dimensional models of picture description and special topic compositions, the "knowledge dimension" is indeed a "writing knowledge dimension".

As the target of picture description composition is mainly junior grades primary students, teaching of the "sentiment dimension" does not involve values, but only preliminary morality and aesthetics; and teaching of the "ability dimension" only includes the abilities of observing objects, performing image operations (including decomposing and assembling images, as well as association and imagination) and expressing with words (both oral and written). The ability to perform strict logical thinking processing is usually not included in the scope of teaching. Therefore, using the model in Fig. 5.6 as the foundation, and incorporating in it the *Primary Education Language Teaching Conspectus*' requirements on writing knowledge of junior primary students, a three-dimensional model of picture description composition teaching goals can be constructed as shown in Fig. 5.6a.

The targets of special topic composition are middle and senior grades primary students. These students have basically mastered the lower level image operation ability (that is, the ability to decompose and assemble images) in the picture description composition phase. Thus, in this phase of special topic composition, focus can be put on cultivating their abilities of performing higher level image operation (that means imagination, and especially creative imagination) and logical thinking processing. Apart from that, the materials of special topic composition are not sensory information from direct observation of the current objects, but are retrieved from long-term memory. It seems that the materials are unrelated to the observation process. However, as stated before, images are the reproduction of the trace left by pervious perception. That means images originate from observation of objects (not at present, but in the past). Accumulation of rich and complete

images is impossible without concrete, careful and comprehensive observation of objects. That is why cultivation of students' observational ability should not be neglected even in the phase of special topic composition. Therefore, using the model in Fig. 5.6 as the foundation, and incorporating in it the *Primary Education Language Teaching Conspectus*' requirements on writing knowledge of middle and senior primary students, a three-dimensional model of special topic composition teaching goals can be constructed as shown in Fig. 5.6b.

5.3.2 Three-Dimensional Composition Teaching Approaches

1. Three-dimensional teaching approach for picture description composition
Taking into consideration the three-dimensional model of picture description composition teaching goals in Fig. 5.7a and the aforementioned three-dimensional model of the three elements of composition in Fig. 5.5, it is believed that the **three-dimensional picture description teaching approach** that suits the age and psychological characteristics of junior primary students would be as that shown in Fig. 5.8. The actual teaching activities, contents and requirements that correspond with this approach can be found in Table 5.1.
2. Three-dimensional teaching approach for special topic composition
Taking into consideration the three-dimensional model of special topic composition teaching goals in Fig. 5.7b and the aforementioned thinking-processing psychological model in writing compositions in Fig. 5.4, it is believed that the **three-dimensional special topic composition teaching approach** that suits the age and psychological characteristics of middle and senior primary students would be as that shown in Fig. 5.9. The actual teaching activities, contents and requirements that correspond with this approach can be found in Table 5.2.

5.3.3 The Six Key Elements in Achieving the Goals of Three-Dimensional Composition Teaching

It can be noted from the above three-dimensional teaching approaches of picture description and special topic composition that both of their teaching processes involve six major teaching activities or sections. The six teaching sections in picture description composition are: Creating atmosphere, coaching observation, image operation, model essays demonstration, language training and collaborative learning; While that of special topic composition are: Analysing the topic and determining the central idea, selecting materials, inspiring imagination, developing intellects, language training and collaborative learning. These six sections roughly follow a certain temporal sequence. They cannot be detached from each other and sometime would even intersect with each other.
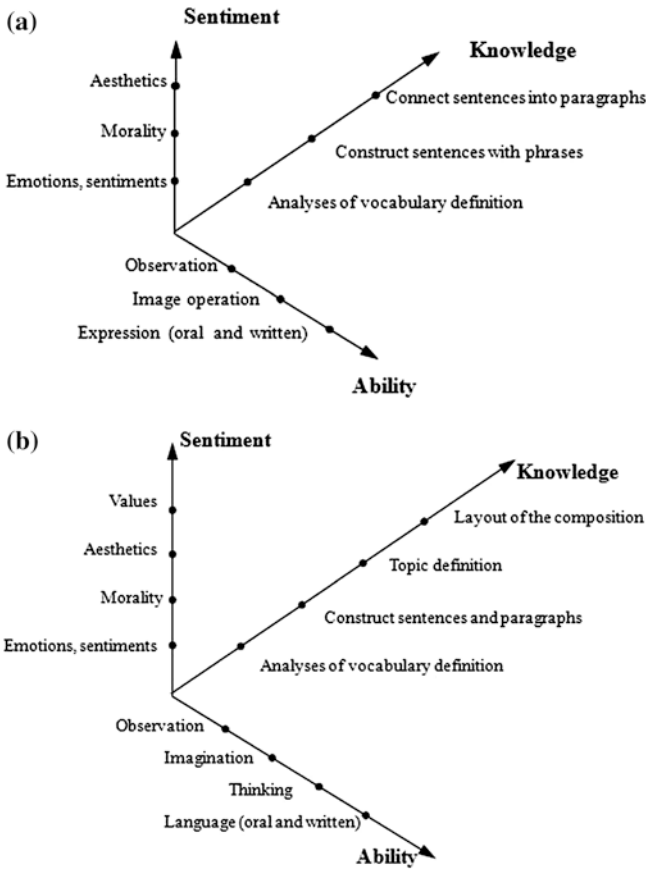
Fig. 5.7   a Three-dimensional model of picture description composition teaching goals. **b** Three-dimensional model of special topic composition teaching goals

Using special topic composition as an example, it usually starts with analysing the topic and determining the central idea, and selecting materials. Then, the teacher will inspire students' imagination and trigger them to perform logical thinking processing. However, while selecting materials, intervention from logical thinking is necessary for refining the materials. Abstract logical thinking is a necessity also in the language training section (expression and application of language). The two of them are closely knitted together and inseparable: Logical thinking uses abstract concepts to conduct analysis, integration, comparison and categorization, which formed the foundation for judgments and inferences. The particular viewpoint and opinion gained after that will be recorded down with "internal language" in simple and relatively incoherent phrases (soundless phrases), but which captured the complete meaning. A piece of composition is formed by writing down the internal language in standardize and grammatical sentences (externalization
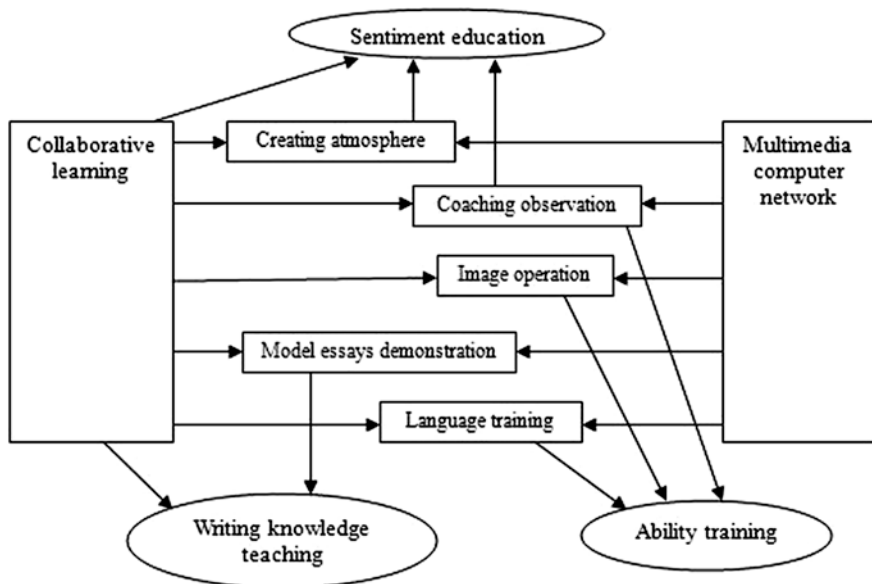
Fig. 5.8 Diagram of the three-dimensional picture description teaching approach
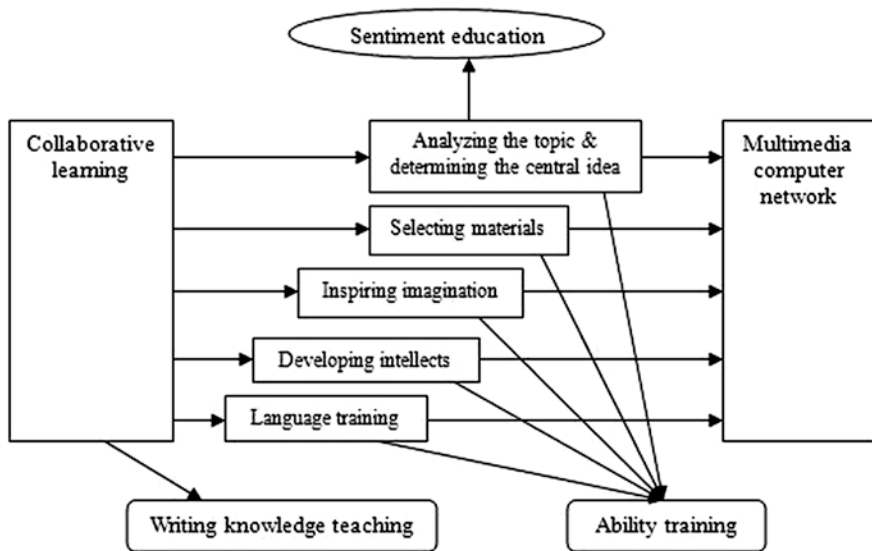
Fig. 5.9 Diagram of the three-dimensional special topic composition teaching approach

of internal language). As mentioned before, the formation and externalization of internal language require repetitions: the initial viewpoints and opinions are often incomplete, incomprehensive and rather superficial. It is after repeated thinking

(continuous mental processing), amendments and supplements that they gradually reach perfection, and ultimately formed a fine piece of writing with systematic thinking, clear viewpoints, exuberant feelings and fluency.

The situation is similar in picture description composition. Picture description composition usually starts with creating atmosphere and coaching observation, and then follows by image operation, model essays demonstration. Normally, the psychological operations involve in the observation coaching section are perception and attention. However, to have a more comprehensive and in-depth observation, intervention from image operation and even logical thinking are needed, which means that there is intersection between sections. This is because images of the past can enrich and deepen the understanding of the currently perceived objects. The natures of objects can be revealed from their external characteristics (images) only by conducting analysis, integration, judgment and inference on the images and related concepts with logical thinking—objects that are perceived may not be understood. Only objects that are understood can be perceived thoroughly. The major target of picture description composition is junior grades primary students, who are still in a relatively low-level of thinking development. Normally, in the observation coaching section, the teaching requirement is attained if there is appropriate integration with image operation. (While observing the objects, students can carry out decomposition, assembly, association and imagination on the images of related objects.) The *Language Teaching Conspectus* does not require junior grades primary students to receive training on abstract logical thinking. However, if possible, appropriate instruction on preliminary logical thinking processing can be provided to students during the observation process. This is beneficial to accelerating the junior grades primary students' transition from concrete imagery thinking to abstract logical thinking.

The above analysis shows that no matter it is the three-dimensional teaching approach of picture description or special topic composition, the six teaching sections during the teaching process should not be regarded mechanically as six "stages" with strict temporal sequence. They should be viewed as the six vital elements that foster the attainment of the teaching goals of three-dimensional composition teaching. These six elements are interrelated. They interact and intersect with each others, and as a result, form a complete composition teaching process as an organic whole. To avoid a false concept that the aforementioned sections in the teaching process are separable, the above teaching approach is not named "six-staged composition teaching approach" or "composition teaching approach with six sections". As mentioned, this teaching approach originated from the three-dimensional model of composition teaching goal. Thus, it is believed that it would be more appropriate to name it "three-dimensional composition teaching approach" as it was in the previous sections.

As seen from Tables 5.1 and 5.2, the corresponding relations between the teaching requirement and teaching sections (that mean elements) of each dimension in the three-dimension teaching approach are as follows:

Knowledge dimension: The teaching of writing knowledge spreads over all the six teaching sections, but is mostly done in the "collaborative learning" section

Table 5.1 Teaching activities, contents and requirements of the three-dimensional picture description teaching approach

↗	Creating atmosphere	Coaching observation	Image operation	Model essays demonstration	Language training	Collaborative learning
Teacher's activities	Create scenarios that match students' age and psychological characteristics	Offer concrete guidance of observing objects, such as: • By following the sequence • By comparison • By inference (In junior grades, usually simple inference base on daily life concepts is taught. Logical inference based on general concepts can be introduced gradually in middle and senior grades.)	Offer and instruct image operation methods: • Decomposition • Assembly • Association • Imagination	Provide model essays that describe the created scenario as reference to students	• Let students describe the scenario verbally • Let students type their oral descriptions out with commuters • Comment on the oral descriptions of students	Organize collaborative learning with neighbours or the whole class under a computer network environment: • Let students observe the created scenario together with their learning partners, supplement each others' imaginations, and correct the mistakes made during language training. All in all, collaborative learning should be conducted throughout the whole teaching process • Appreciate and analyse with students the good writings composed by students • Correct the errors in phrases and sentences with students • Summarize the writing method with students • Deepening students' understanding on the ideology, feelings or morality displayed by the created scenario through discussion

Table 5.1 (continued)

╲	Creating atmosphere	Coaching observation	Image operation	Model essays demonstration	Language training	Collaborative learning
Students' activities	Perform preliminary observation on the scenario created by the teacher, so as to get a general impression (a preliminary image of the object)	• Perform further and careful observation on the created scenario according to the methods instructed by the teacher (so as to form a more complete image of the object) • Typewrite the result of the observation with computers (**integration of observation and typewriting**)	• Actively conduct various image operations according to the methods instructed by the teacher • Typewrite the results after decomposition, assembly, association and imagination with computers (**integration of thinking and typewriting**)	Read the model essays carefully by referring to the scenario. Analyse and summarize the characteristics of the essays to foster imitation, transference or innovation	• Based on image processing, give oral descriptions of the created scenario in imitation of the model essays • Typewrite the oral descriptions with computers (**integration of speaking and typewriting**)	Actively participate in the learning activities organized by teachers on the web
Functions of media	Create the required scenario with slide show, projector, wall charts, video recorders or computers	Enable students to have a more in-depth and comprehensive observation by making use of various medias (especially computers), which can visualized the external characteristics of objects figuratively and in details	Aid students in performing different image operations with various medias (computers would be the best)	Realize the corresponding scenario by referring to the descriptions offered in the paragraphs of the model essays	Realize the corresponding scenario as described in the oral and typewritten descriptions	Provide learning resources for collaborative learning through computer network

(continued)

Table 5.1 (continued)

╲	Creating atmosphere	Coaching observation	Image operation	Model essays demonstration	Language training	Collaborative learning
Content of teaching	Realize a particular advanced ideology, sentiment or morality through creating the scenario	• The ideologies, sentiments or moralities displayed by the created scenario • Methods of observation	Conduct different image operation methods	Concretely explain the methods of selecting phrases, constructing sentences and linking sentences with the model essays	• Oral training • Preliminary training of writing skills (conduct exercises on selecting phrases, constructing sentences and linking sentences into paragraphs)	• Knowledge and methods of writing • The ideologies, sentiments or moralities displayed by the created scenario
Teaching requirements	• Enable students to have a preliminary understanding on the ideologies, sentiments or moralities displayed by the scenario (the sentiment dimension)	• Develop students' observational ability (the ability dimension) • Enable students to understand the ideologies, sentiments or moralities displayed by the scenario (the sentiment dimension)	Develop students' image operation ability, especially imagination ability (the ability dimension)	Enable students to learn the related knowledge and methods of writing through analysing and summarizing the model essays (the knowledge dimension)	Develop students' elementary expression ability, including both oral and written abilities (the ability dimension)	• Deepen the understanding and mastery of the knowledge and methods of writing through collaborative learning (the knowledge dimension) • Enhance students' understanding of the ideologies, sentiments or moralities displayed by collaborative learning (the sentiment dimension)

Table 5.2 Teaching activities, contents and requirements of the three-dimensional special topic composition teaching approach

/	Analysing the topic and determining the central idea	Selecting materials	Inspiring imagination	Developing intellects	Language training	Collaborative learning
Teacher's activities	• Guide students to analyse the topic correctly (When analysing the topic, attention should be placed on the scope, time, person and phrases limited by the topic.) • Require students to determine the central idea of the writing based on their analysis of the topic	• Guide students to select materials reasonably • Materials should be selected in strict accordance with the central idea • Create the related scenario to enhance students' imagination and enrich their original images	Inspire students to make fascinating but reasonable imaginations; Not only require students to make reconstructed imagination, but also strive hard to conduct creative imagination	Conduct "model essays demonstration", "inspiration and inducement", "real example explanation" and "segment exercise", so as to cultivate and develop students' abilities in performing analysis, summarization, abstraction and generalization, as well as using concepts to perform judgments and inferences, and their creative thinking ability	Let students typewrite their drafted compositions with computers. Let students read their compositions	Organize collaborative learning with neighbours or the whole class under a computer network environment: • Let students observe the created scenario together with their learning partners, supplement each others' imaginations, and correct the mistakes made during language training. All in all, collaborative learning should be conducted throughout the whole teaching process • Appreciate and analyse with students the good writings composed by students • Correct the errors in phrases and sentences with students • Summarize the writing method with students • Deepening students' understanding on the ideology, feelings or morality displayed by the created scenario through discussion

(continued)

Table 5.2 (continued)

╲	Analysing the topic and determining the central idea	Selecting materials	Inspiring imagination	Developing intellects	Language training	Collaborative learning
Students' activities	Analyse the topic seriously according to the teacher's requirement, and based on the analysis, determine the central idea that the composition would like to express	• Start recollecting seriously to search and extract from memories images that are relevant to the central idea (theme), and use them as the writing materials • Observe the scenario created by the teacher to supplement and refine the original images	Perform operations such as decomposition, assembly and association on the images extracted from memory in accordance to the requirements of the topic. Then, perform reconstructed imagination or creative imagination with language and concepts	Employ concepts to conduct further judgments and inferences on the already-formed images which suit the requirements of the topic and are relatively complete and rich. This will elevate the sensory information reflected by the images into rational one. Store it in the form of internal language, and the conception process of composition completed here	Typewrite the drafted compositions with computers • Read the composition silently or aloud	Actively participate in the above collaborative learning activities organized by teachers on the web

Table 5.2 (continued)

	Analysing the topic and determining the central idea	Selecting materials	Inspiring imagination	Developing intellects	Language training	Collaborative learning
Functions of media		Create the topic-related scenario with slide show, wall projector, wall charts, video recorders or computers, so as to foster students' imagination and enrich their original images	Stimulate students' imagination with various medias (computers would be the best)	Provide relevant scenario or cases to thinking development teaching activities such as "model essays demonstration", "real example explanation" and "segment exercise"	Create relevant scenario to students' written expressions (or when they read aloud)	Provide rich and high quality relevant learning resources to collaborative learning through computer network
Content of teaching	• How to analyse the topic • How to determine the central idea	How to select materials	How to form recon-structed imagina-tion and creative imagination	How to conduct further process-ing on materials	• Oral training • Written expression training (con-duct exercises on select-ing phrases, constructing sentences, link-ing sentences into paragraphs, arranging the whole composition)	• Knowledge and methods of writing • The ideologies, moralities and values that the theme of the composition would like to express

Table 5.2 (continued)

╲	Analysing the topic and determining the central idea	Selecting materials	Inspiring imagination	Developing intellects	Language training	Collaborative learning
Teaching require-ments	• Learn to first two steps of special topic composition: analysing the topic and determining the central idea (the ability dimension) • Gain an elementary understanding of the contents that the central idea expressed, especially those related to sentiments, attitudes and values (the senti-ment dimension)	• Learn to select appropri-ate materials in accordance to the central idea (the ability dimension) • Further develop the ability to observe, especially the abilities to use comparison and inference (logical inference based on concepts) in observa-tion (the ability dimension)	Develop students' reconstructed imag-ination and creative imagination (the ability dimension)	Cultivate and develop students' abstract logical thinking and creative think-ing (the ability dimension)	Develop students' expression ability, including both oral and written abilities (the ability dimension)	• Deepen the understanding and mastery of the knowledge and methods of writing through collaborative learning (the knowledge dimension) • Enable students to gain a more in-depth and comprehensive understanding of the contents that the central idea expressed, especially those related to sentiments, attitudes and values (the sentiment dimension)

in which teachers and students comment and correct compositions together. Daily life knowledge can be taught by incorporating it into the sections "creating atmosphere" and "coaching observation".

Ability dimension: The cultivation of observational ability, imagination, thinking ability and language expression ability are conducted in their corresponding sections "coaching observation, image operation, inspiring imagination and language training".

Sentiment dimension: It is mostly realized in the "creating atmosphere", "coaching observation", "analysing the topic and determining the central idea" and "collaborative learning" sections. Yet, it is hoped that it can be spread over to every teaching section in the composition teaching process. While conducting this three-dimensional composition teaching approach, teachers should hold on to the teaching ideology that the requirements of sentiment education should be embraced from the beginning to the end.

The following is a gist of the major teaching sections in Tables 5.1 and 5.2:

Creating atmosphere—Should fully reflect the theme, which means that it should enhance the expression of a particular advanced ideology, emotion or morality.

Coaching observation—Should teach students observation skills, and place special attention in teaching them to observe from the correct perspective and viewpoint. (Viewing an object or event from different angles may yield completely different results.) Students should be guided to perceive and experience objects or events with healthy mentality and emotion.

Image operation—Should guide students to imagine with correct ideology and healthy emotion, rather than having idle fancy.

Developing intellects—Abstract logical thinking is a process of judgment and inference which uses language as its medium, and employs concepts in performing analysis, integration, abstraction and summarization. It is inevitably bounded by mindsets, moralities, aesthetics and values. Thus, this section is not only an important one for training students' abstract logical thinking, but is also a favourable section to cultivate students' sentiment.

Language training—As mentioned, language training always integrate with the process of mental processing, and they are inseparable. Thus, this section is also influenced by mindsets, moralities, aesthetics and values, and it should incorporate sentiment education in it as well.

Collaborative learning—It is the conclusion and strengthening stage of the whole composition teaching process. Not only should the teaching of writing knowledge and methods be finished in this section, but the goals of sentiment cultivation should also be consolidated and deepen through conclusion and discussion in this section.

5.4 The Evaluation Systems of Composition Teaching

Basing on the requirements of the *Primary Education Language Teaching Conspectus* and the three-dimensional models of picture description and special topic composition teaching goals in Fig. 5.7, it is not difficult to derive relatively scientific and practical evaluation systems to picture description and special topic composition teaching. The evaluation systems are shown in Tables 5.3 and 5.5. (The "weight" of each criterion in the tables are determined by the experiences of language education specialist.), and their explanation can be found in Tables 5.4 and 5.6.

5.4.1 Evaluation System of Picture Description Composition Teaching

The three structural criteria in this evaluation system correspond to the teaching goals of three-dimensional picture description composition teaching in Fig. 5.7a; and the ten individual criteria correspond to the sub-goals of each dimension.

5.4.2 Explanation of the Evaluation System of Picture Description Composition Teaching

The "evaluation standard" in Table 5.4 should never be achieved through the blunt sermons, and abstract and contentless reasoning of teachers. Teachers should follow the principles of "incorporating the teaching of reasons in that of senti-ment", "using sentiment to teach reasons" and "using sentiment to arouse inter-est", so that students can receive education and be changed and influenced by the teachers unobtrusively and imperceptibly.

5.4.3 Evaluation System of Special Topic Composition Teaching

The three structural criteria in this evaluation system correspond to the teaching goals of three-dimensional special topic composition teaching in Fig. 5.7b; and the 13 individual criteria correspond to the sub-goals of each dimension.

Table 5.3 Evaluation system of picture description composition teaching

Criteria			Evaluation grade				Individual score	Subtotal
Structural criteria	Individual criteria	Weight	Excellent	Good	Average	Poor		
			100–90	89–75	74–60	59–0		
Sentiment education (40 marks)	1. Emotion and affect education	0.20	20–18	17.9–15	14.9–12	11.9–0		
	2. Moral education	0.10	10–9	8.9–7.5	7.4–6	5.9–0		
	3. Aesthetic education	0.10	10–9	8.9–7.5	7.4–6	5.9–0		
Composition knowledge teaching (30 marks)	1. Lexical meaning identification teaching	0.10	10–9	8.9–7.5	7.4–6	5.9–0		
	2. Sentence construction teaching	0.10	10–9	8.9–7.5	7.4–6	5.9–0		
	3. Paragraph formation teaching	0.10	10–9	8.9–7.5	7.4–6	5.9–0		
Ability training (30 marks)	1. Observation skills training	0.10	10–9	8.9–7.5	7.4–6	5.9–0		
	2. Image operation training	0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	3. Verbal expression training	0.07	7–6.3	6.2–5.3	5.2–4.2	4.1–0		
	4. Written expression training	0.08	8–7.2	7.1–6	5.9–4.8	4.7–0		
Total								

Table 5.4 Explanation of the evaluation system of picture description composition teaching

Criteria		
Structural criteria	Individual criteria	Evaluation standard
Sentiment education (40 marks)	1. Emotion and affect education	• Attention should be placed on conducting patriotic education (so that students will have knowledge about the country's magnificent sceneries, long history, splendid cultures, hard working people and elegant written characters, which cultivate their patriotism) • Attention should be placed on cultivating students' passions for the Communist Party, socialism and revolution leaders, and making them understand that revolution is a hard-won achievement • Guide students in understanding nature and develop passion for nature • Attention should be placed on developing students' active, initiative and optimistic emotions
	2. Moral education	• Attention should be placed on cultivating students' good moral qualities (obeying one's parents, respecting the teachers, be united and friendly, and ready to help others) • Developing students' good habit to obey the society's moral standards consciously
	3. Aesthetic education	• Attention should be placed on cultivating students' noble and healthy aesthetics
Composition knowledge teaching (30 marks)	1. Lexical meaning identification teaching	• Train students to read, write and apply the learned vocabularies correctly • Train students to correctly define the acquired synonyms and antonyms
	2. Sentence construction teaching	• Teach students to express their meaning by constructing grammatical and fluent sentences with acquired vocabularies
	3. Paragraph formation teaching	• Teach students to connect related sentences into paragraphs so as to express more complex and complete meanings • Train students to rearrange sentences that are in wrong order correctly
Ability training (30 marks)	1. Observation skills training	• Train students to observe objects by following the sequence and by comparison • Train students to capture the external characteristics of objects during observation
	2. Image operation training	• Train students to perform decomposition, assembly and association on images with proficiency • Attention should be placed on cultivating students' imagination
	3. Verbal expression training	• Train students to verbally express simple thoughts and feelings systemically and accurately
	4. Written expression training	• Train students to express simple thoughts and feelings in words systemically and accurately

Table 5.5 Evaluation system of special topic composition teaching

Criteria				Evaluation grade				Individual score	Subtotal
Structural criteria	Individual criteria		Weight	Excellent	Good	Average	Poor		
				100–90	89–75	74–60	59–0		
Sentiment education (40 marks)	1. Emotion and affect education		0.15	15–13.5	13.4–11.3	11.2–9	8.9–0		
	2. Moral education		0.10	10–9	8.9–7.5	7.4–6	5.9–0		
	3. Aesthetic education		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	4. Life philosophy and values education		0.10	10–9	8.9–7.5	7.4–6	5.9–0		
Composition knowledge teaching (30 marks)	1. Lexical meaning identification teaching		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	2. Sentence construction and paragraph formation teaching		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	3. Topic analysis and central idea determination teaching		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	4. Composition layout teaching		0.15	15–13.5	13.4–11.3	11.2–9	8.9–0		
Ability training (30 marks)	1. Observation skills training		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	2. Image operation training		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	3. Thinking ability training		0.10	10–9	8.9–7.5	7.4–6	5.9–0		
	4. Verbal expression training		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
	5. Written expression training		0.05	5–4.5	4.4–3.8	3.7–3	2.9–0		
Total									

Table 5.6 Explanation of the evaluation system of special topic composition teaching

Criteria		
Structural criteria	Individual criteria	Evaluation standard
Sentiment education (40 marks)	1. Emotion and affect education	• Attention should be placed on conducting patriotic education (so that students will have knowledge about the country's magnificent sceneries, long history, splendid cultures, hard working people and elegant written characters, which cultivate their patriotism) • Attention should be placed on cultivating students' passions for the Communist Party, socialism and revolution leaders, and making them understand that revolution is a hard-won achievement • Guide students in understanding nature and develop passion for nature • Attention should be placed on developing students' active, initiative and optimistic emotions, and guiding them to avoid developing negative, decadent and pessimistic emotions
	2. Moral education	• Attention should be placed on cultivating students' good moral qualities (obeying one's parents, respecting the teachers, be united and friendly, and ready to help others) • Developing students' good habit to obey the country's law and society's moral standards consciously
	3. Aesthetic education	• Attention should be placed on cultivating students' noble and healthy aesthetics • Attention should be placed on guiding students to resist poor taste and unhealthy literatures and art works consciously
	4. Life philosophy and values education	• Aid students in developing gradually the lofty aspiration to study for the achievement of the country's "four modernizations" and for contributing to the peace and prosperity of human • Aid students in gaining a correct understanding on the value of life and in gradually establishing values that suit the needs of social development
Composition knowledge teaching (30 marks)	1. Lexical meaning identification teaching	• Train students to read, write and apply the learned vocabularies correctly • Train students to correctly define the acquired synonyms and antonyms
	2. Sentence construction and paragraph formation teaching	Teach students to express their meaning by constructing grammatical and fluent sentences with acquired vocabularies, as well as to connect, according to particular semantic relations, related sentences into paragraphs so as to express more complex and complete meanings

(continued)

Table 5.6 (continued)

Criteria		
Structural criteria	Individual criteria	Evaluation standard
	3. Topic analysis and central idea determination teaching	Teach students to analysis the topic through various aspects, such as the scope, contents, times, people and situation restricted by the topic, and then determine the central idea (that is, theme) of the composition based on the analysis
	4. Composition layout teaching	Train students to form ideas of their compositions in strict accordance with the theme, and to search for, organize and process the relevant materials. That means conducting analysis, integration, association and rational imagination on the images; And to employ related concepts in conducting analysis, integration, abstraction, generalization, judgments and inferences. Then, based on the result of the organization and processing, confirm the basic layout, major contents and presentation format of the composition
Ability training (30 marks)	1. Observation skills training	Not only train students to observe objects by following the sequence and by comparison, but also by inference (concept-based judgments and inferences) so as to gain a more in-depth observation and understanding
	2. Image operation training	Train students to have fascinating but reasonable imagination. Students should be able to conduct both reconstructed imagination and creative imagination
	3. Thinking ability training	Cultivate and develop, through various methods, students' concept-based analysis, integration, abstraction and generalization, judgment and inference abilities, and creative imagination
	4. Verbal expression training	• Train students to verbally express relatively complex thoughts and feelings systemically and accurately
	5. Written expression Training	• Train students to express relatively complex thoughts and feelings in words systemically and accurately

5.4.4 Explanation of the Evaluation System of Special Topic Composition Teaching

The "evaluation standard" in Table 5.6 should also be achieved through following the principles of "incorporating the teaching of reasons in that of sentiment", "using sentiment to teach reasons" and "using sentiment to arouse interest", so that students would be changed and influenced by the teachers unobtrusively and imperceptibly. Blunt sermons should be avoided, or negative effect would be resulted.

5.5 About the Psychological Models and Teaching Approaches of Composition of Secondary Students

Although this chapter's research on psychological process model of composition takes only primary students into consideration, its psychological process model of special topic composition is basically applicable to junior form secondary students. (This is because the thinking development level and psychological characteristics of junior form secondary students are similar to that of the senior grades primary students.) Apart from that, the three-dimensional teaching approach of special topic composition (Fig. 5.9) and its related teaching activities, contents and requirements (Table 5.2) derived from the psychological model is as well basically applicable to composition teaching for junior form secondary students.

Senior form secondary students have reached the advanced stage of abstract logical thinking in their thinking development. Their psychological model of composition can be constructed by having further analyses on the parts of "imagery thinking" and "abstract logical thinking", as well as making necessary supplements and amendments in Fig. 5.4. Their corresponding three-dimensional composition teaching approach can only be formed by basing on the revised psychological process model of composition. Though the conclusions of Fig. 5.4 and Table 5.2 have referential value for teaching senior form secondary students, the most ideal effect may not be reached.

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Chapter 6
Cultivation of Creative Thinking in Language Education

6.1 The Crux of Current Language Education: Smothering Creative Thinking

Language education as it exists in our country has been seriously criticized by parents, teachers and society since the 1990s. It has indeed aroused the attention of our whole society and has triggered universal discussions, in newspapers and journals, of the need to carry out reform in that area. One of the largest scale universal discussions was triggered by a group of three articles, which expressed worries about China's language education, published in the column "Century Observation" of the "Beijing Literature" journal in November 1997. (They are: "My Daughter's Assignments" from a parent, Zou Jing Zhi; Secondary school teacher Wang Li's "Notes on Secondary School Language Education"; and university lecturer Xue Yi's "The Grief of Literature Education".) These articles examined, respectively: problems with our country's standardized examination for secondary school language education, teaching resources, methods and approaches, and the aims of literature education; they contained in-depth analyses and slashing criticisms. They triggered strong resonance and reaction from society. Subsequently, "China Youth Daily", "Guang Ming Daily" and many newspapers and magazines of different provinces republished those articles or published passages which discussed the issues they raised. "China Education Daily" even published a series of five special reports titled "A Survey and Reflection on the Current Language Education in Primary and Secondary Schools" by journalist Li Jian Ping, for 20 days from 26 February to 16 March in 1998. These reports discussed the functions and aims of language education, the problems in the teaching of reading, character recognition and composition, and also the reform of examination methods. They gave a comprehensive examination of the current situation of our country' language education, and inspired people towards deeper analyses and thoughts about the issue, thus pushing the universal discussion gradually towards its climax.

To have a deeper understanding and reflection on our country's language education, Wang Li, one of the authors of the three articles mentioned above, commenced her interview in April 1998 with about 20 language education specialists and scholars in Beijing and Shanghai at her own expense. She published her interview records (11 in total) in the July and October issues of "Beijing Literature" that year, bringing the universal discussion to a higher level.

Overall, the scale of this universal discussion is unprecedented, and the discussion itself has far-reaching significance. Its scope and depth are unprecedented in the language education circle and rare even in the basic education field. As journalist Li Jian Ping pointed out in his series of special reports, this universal discussion touches on the functions and aims of language education (the focus of discussion was whether the nature and functions of language subjects are instrumental or humanistic, or both); the flaws in reading, character recognition and composition teaching (people criticized especially the impacts of standardized examination on reading teaching); and the reforms needed in examination methods. To summarize, there are three major targets of criticism in this discussion:

6.1.1 Overemphasizes the Instrumental Aspect of Language Subjects While Neglecting Their Humanistic Aspect

Many specialists have pointed out that instrumentality and humanity are the two fundamental aspects of language subjects, as implied by the very nature of those subjects. They are the two sides of the same coin, interdependent and inseparable. Without humanity, there will only be alteration in phrases and sentence patterns. Language education will lose its soul and become a meaningless play of words in the arrangement of language symbols. Contrarily, lecturing on humanity abstractly without teaching concrete expressions and applications of language will turn the lively, rich and profound traditional culture of the nation into ossified doctrines. Teachers will not be able to move students with love and enlighten them with reasons, and the effect of humanistic education to teach students to be upright persons through imperceptible influences will be lost. Yet, over the years, and for various reasons, these two aspects have often been put in confrontation in the actual practice of language education in our country. (Some specialists believe that this has been caused mainly by the introduction of the **Soviet Union's language education experiences** in the early days of the liberation and, for many years, the **excessive influence of linguists** in the composition of language teaching resources.) Only the instrumental nature of language subjects is emphasized, and the humanistic nature is neglected. This is a noteworthy tendency in language education.

What is the humanity of language subjects? Why should it be emphasized? Famous language education specialist Yu Yi has given a brilliant explanation to these questions. She pointed out that, "Learning language is just like learning to be an upright person. Together with the reading, writing, listening and speaking training in language are the infiltrations of cognitive education, sentiment

education and personality education. Language is not merely a symbol system, but the meaning system and value system by which a nation understands and interprets the world. It is linked with the profound culture of the nation (Wang 1998)." This is the humanity of language subjects. Failing to recognize this humanity "and emphasising only the instrumentality of language is like dissecting a passage with a scalpel. The only things left in students' minds are fragmentary symbols" (Wang 1998). This will "restrict the thinking of students, turning them into 'robots' and erasing their personalities and auras" (Wang 1998).

6.1.2 Overemphasizes Standardized Examinations, Smothers Students' Creative Thinking

Since the 1990s, reading has been examined as an independent language ability in the University Entrance Examination. This is an advance that greatly fosters the cultivation of students' reading ability. However, formulating questions is both the key and the problem in assessing reading ability. The current format of questions is standardized single choice or multiple choice tests. Four choices would be given to a passage quoted from the texts, and students have to choose the one that best reflects the author's intention or the text's form of expression. As only one amongst these choices is correct and the other three are specious (there are only slight differences in the expression of their meanings), careful comparisons and considerations are needed before making judgments. Obviously, it is difficult to produce multiple choice questions that are scientific, accurate and challenging. Apart from that, life experiences are different for different people. People think from different perspectives and have diverse understandings and views. It is difficult to fix one standardized answer.

There is considerable controversy over multiple choice questions in the education circle. One side supports the use of standardized multiple choice questions to assess reading ability (for example, the National Education Examination Authority). They believe that this type of question emerges from the use of computer scoring. It aims at accuracy and fairness, and avoids the randomness of manual marking. Before using computer scoring, there were relatively big random errors in marking. According to a survey by the psychologists of Beijing Normal University, there can be as much as a 35 mark difference when the same examination script is marked by different teachers. This is indeed unfair. Contrarily, machine scoring is not affected by personal subjective factors, and is thus relatively fairer. The other side which rejects the use of standardized multiple choice questions believes that language is not the same as mathematics and science subjects. The contents of language lessons are works that contain their authors' thoughts, feelings and efforts. They are not abstract concepts, definitions or formulas. Language lessons naturally embrace ambiguity and diversity; the main ideas of the texts and the understandings of the paragraphs, or even the meaning a particular sentence, would be different for different people. It is difficult to give a simple black or white judgment.

In fact, if standardized examination is overstressed, rote memorization will result, which will restrict or even smother students' creative thinking. For example, in a particular year, the questions in the University Entrance Examination asked students to turn "think in the same way and work together" into a Chinese four-word idiom. Its standardized answer is "同心協力" (literally meaning "consistent thinking, joint effort"). If students answered "齊心協力" (literally meaning "united thinking, joint effort"),[1] they would be marked as wrong. Another question asked students to turn "giving a very vivid description" into a Chinese four-word idiom. The standardized answer is "維妙維肖" (literally meaning "remarkably true to life"), and "栩栩如生" [literally meaning "as vivid as life")[2] would be marked as wrong. These are typical examples that reveal the serious drawbacks of standardized examination. There are still numerous examples like this, and they can be found easily in reference books and revision exercises of the University Entrance Examination. Just as Liu Bin, former deputy director of the State Education Commission, stated, "Rote memorization…is much related to standardized examination methods. Standardized questions are also called objective questions. They have the advantages of being objective, accurate and easy to mark, but are great in quantity, inflexible and mechanical. They will easily lead students toward rote memorization and studying blindly. Standardized examinations have extended their influence from the University Entrance Examination to the High School Entrance Examination and Middle School Entrance Examination, and now even primary schools are having standardized examinations. Investigation is needed to determine the pros and cons and their influences."

6.1.3 Overemphasizes Training in Writing Skills While Neglecting Cultivation of Observation Skills and Imagination

Many teachers think that, because it has been influenced by "exam-oriented education", our language education has developed an ossified and mechanical training mode. Basically, composition teaching should stress observation and the accumulation of knowledge and thoughts in daily life. It should encourage students to express their real thoughts accurately in their own words. Students should be encouraged to tell the truth and convey their real emotions and feelings. The writings should be able to mirror the writers.

However, controlled by the requirements of the University Entrance examination, teachers place emphasis only on training in writing skills. They only require

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[1]The idioms "同心協力" and "齊心協力" indeed have the same meaning, and are appropriate answers to the question.

[2]The idioms "維妙維肖" and "栩栩如生" indeed have similar meaning, and are appropriate answers to the question.

writings to have clear viewpoints, sufficient arguments and rigorous logic, so that students can justify themselves, get higher scores and rank their writings amongst the second-class writings. Whether the students are telling the truth and expressing their real feelings are not their concern. When exams are approaching, teachers will be busy guessing the composition topics of the examination, and students busy memorizing model essays. To strengthen training in writing skills, some schools even require students to compose one substantial piece of writing every day. Gradually, the writings of students become almost an encyclopaedia of lies, false feelings and fake stories; nearly all students have produced stories of helping a physically challenged person to cross a road or sending an umbrella to a teacher. All students speak as if they are a radio; they have all recounted the same story, with variations only in time, place and people, and they all get high marks from the teachers. A teacher who marked the examination scripts of the University Entrance Examination sighed, "The students' writings have no personal style. They recount the same story and write in the same way. Marking their paper is really boring." Some specialists and scholars called for attention to this, "Where have the observational ability and imagination of China's youth gone?" The answer is obvious: teenagers do not even need to observe with their eyes and think with their brains, why then shall we talk about observational ability and imagination?!

As stated before, the three major targets of criticism in this discussion are:

- Overemphasize on the instrumental nature of language subjects while neglecting their humanistic nature erases students' personalities and auras, turning them into "robots"
- Overemphasize on using multiple choice questions to assess students' reading ability turns them towards rote memorization, and restricts or even smothers their **creative thinking**
- Overemphasize on training in writing skills makes teenagers lose their most basic and essential abilities: **observational ability and imagination**

Amongst the three targets of criticism, the second one is clearly directed to **creative thinking** and the other two to **aura**, and **observational ability and imagination**. "**Aura**" means being quick minded and farsighted, and possessing rich imagination and creativity; and strong "**observational ability**" and rich "**imagination**" are the vital prerequisites for the formation of creative thinking. This reveals that though there are three targets of criticism in this universal discussion on the current situation and reform of our country's language education, there is indeed only one focus of criticism. It is believed that current language education is smothering students' creative thinking and strangling the growth of innovative talents. This is precisely the fundamental problem and the crux existing in our country's language education. After the third National Education Conference in 1999, there is a call to implement quality education focusing on cultivating students' innovative spirits and practical abilities. The issue of cultivating students' creative thinking in language teaching also gradually attracts more attention from school principals and teachers (cultivating creative thinking is the key to cultivating innovative spirit and innovation),

which brings changes to the above situation. However, overall, our language education circle is merely having a preliminary understanding of the aforementioned fundamental problems, and has only started to carry out reform. There is still a great distance from attaining real quality education.

Then, how could this distance be shortened, so that we can achieve more quickly an effective cultivation of students' creative thinking in language education? We should first verify our understandings of the following two aspects: (1) the relationship between language and thinking (including language ability and thinking ability); (2) the elements that comprise creative thinking (that means the structure of creative thinking). It is only by verifying our understanding of the above two aspects that we can cultivate students' creative thinking in language education effectively. Sections 6.2 and 6.4 are devoted to the discussion of this issue.

6.2 Rectifying the Understanding of the Relationship Between Language and Thinking

The relationship between language and thinking is a controversial issue in academic circles. It has generated heated debate among linguists, psychologists and philosophers for a long time, and consensus still has not reached. The following are some of the more representative viewpoints:

6.2.1 Language Determinism (Chang 1990)

"Language Determinism" is a viewpoint proposed by American linguist B.L. Whorf. It hypothesized that language tends to determine thinking. Whorf generated this view from his comparative researches on English and the various indigenous languages of the Americas. He believed that (Wang 1988) language is a kind of background knowledge to the speakers, and everyone uses this background knowledge when thinking with their mother tongue. The background knowledge of a language is its grammar. "When people use distinctive grammars, these grammars reveal that there are different ways to observe and evaluate externally similar behaviours. Thus, observers derived different opinions and formed specific views about the world." Whorf also clearly pointed out that (Houston 1972), all in all, language is the most important factor that affects the world view and thinking processes of the speaker. Obviously, Whorf believed that language determines thinking and is the ruler of thinking. Different languages result in different cognitive styles, and from different world views.

This type of understanding of language and thinking can be traced back to the German linguist W. Humboldt. Humboldt stated that (Kodukhov 1987), "The language of a nation is its spirit, and the spirit of a nation is its language. Language and national spirit are linked together by countless ties…" However, the person who directly influenced Whorf was E. Sapir. When Sapir taught anthropology

courses at Yale University in 1931, Whorf was his student and he conducted various researches on the indigenous languages of the Americas under the supervision of Sapir. During the research processes, Sapir stressed (Wang 1988), "Men do not live in isolation in the objective world…, they are likely to be controlled by language…, the reality of the world is largely built on the language habits of men." This reveals that Whorf's view that language determines thinking was directly learned from Sapir. As this language determinism viewpoint has not been proved with rigorous scientific evidence, it is commonly referred to as the "Sapir-Whorf hypothesis".

It is a consensus that language is linked with social and cultural background and that different nations have their own different expressions of language. However, this cannot generate the conclusion that language can control people's thinking and world views. As Professor Gui Shi Chun, who is also a linguist, pointed out (Gui 2001), "The social existence of people is what initially determined people's consciousness. In today's world, people form various social groups and hierarchies according to their economic status, and form different world views. If it is really language that determines world view, then there would be no hierarchy in the world. If both capitalists and workers speak the same language and have the same world view, there would be nothing called 'labour—management controversy' in the world." This shows that theoretically, language determinism lacks evidence and does not stand.

6.2.2 Unity of Language and Thinking (Wang 1988)

This view believes that though language and thinking belong to different categories, they are interdependent and inseparable. **There is no language without thinking, and no thinking without language, and thus the two are united**. The representative of this view is J. Watson, who thought that (Wang 1988), "Thinking is just like language for it is also a language habit, or thinking in language format." "The actions of thinking are internal language movements. Thinking is soundless speech and language is thinking with sound." According to this view, when people are thinking, they are also engaged in a soundless speech. These soundless language activities, which are only used in self reflection rather than in communication, are commonly referred to as "internal language". Internal language can be converted into external language (that is, explicit language with phonetic morphology, which can be perceived by auditory organ). The manifestation of this "conversion" is seen when people sometimes speak to themselves or shout involuntarily. This phenomenon proves that thinking is really inseparable from language under most circumstances. Psychologist E. Jakobson once surveyed some of his testees' lower lips and tips of the tongue with electrodes (Chang 1990). The testees were asked to read poems and do calculation. They were required to speak the first time (external language) and then to read to themselves (internal language) the second time. The electric current pulses recorded were basically the same. This seems to prove that internal language always accompanies thinking.

Further researches reveal that there are two types of internal languages: an extended one and a simplified one. Extended internal language is indeed soundless speaking to oneself. It is characterized by complete sentence structure, and its only difference with external language is that it is soundless. Simplified internal language has incomplete sentence structure. Sentences are often formed by predicates while the subjects and other elements of the sentences are omitted. They only reveal the thinking process by bits and pieces. Thus, the basic features of this type of internal language are "concise and concentrated". These features give such internal language prominent advantage—it can finish the thinking process with shorter time, which means that it has higher thinking efficiency.

This type of "unity view" is not only quite influential internationally (many psychologists from American and the former Soviet Union hold this view), but it has also received support from many linguists in our country. Some even take a step further to change this "unity view" into an "equality view", which regards language and thinking as the same thing. For example, Professor Zhu Shao Yu of Northeast Normal University believed that, "Language subjects are both linguistic subject and thinking subject" (Zhu 1988). Professors Wei Can Jin and Tao Ben Yi of Shanxi Normal University agreed with Zhu's view, and further pointed out that, "It is unscientific to regard listening, speaking, reading and writing abilities as pure language abilities", (Wei 1997) and continued: "What is language ability? It is summarized into four words: listening, speaking, reading and writing in the past. But, let us think and discuss about it. Can these four words include all the connotations of language ability? And even include its major connotations? I do not think so. Listening, speaking, reading and writing are only the external formats of language ability. Its core is indeed in inspiring students to use language as a tool to conduct thinking…"

Under the guidance of the "unity view" or "equality view", language subjects become thinking subject; and listening, speaking, reading and writing abilities are no longer the major connotations of language ability. Such a view is far from convincing. Actually, not only is the "equality view" not accepted by academic circles (further discussion can be found in Sect. 6.2.4, of this chapter), but the "unity view" itself also commits a big mistake. The "unity view" can be confuted simply with a basic fact that is known by all people. People who are inherently deaf mute or deaf have lost their language abilities ever since birth. However, they are still able to conduct normal thinking with sign language and body language. Although this type of thinking is not as rich and complex as that conducted with language concepts, you cannot deny that these people possess basically the same advanced thinking ability as normal persons.

6.2.3 Thinking Determinism (Gui 2001)

On the issue of the relationship between language and thinking, there is still another opposite viewpoint to Whorf's language relativism—thinking determinism. This view holds that although language and thinking have a close relationship,

they are not "homologous" (homologous means sharing the same evolutionary origin) and definitely not "united" or "equal". They have their own development patterns. In the human growth and development process, cognitive ability develops before language ability. As thinking is the major content of the cognitive process, it is thinking that determines language rather than the other way round. Although this view agrees that both types of thinking are needed (the type that uses and the type that does not use language as the material shell for thinking), it is always the thinking that determines the language. As this thinking determinism stresses that the development of thinking ability commences before that of language ability, it is also called the "cognitive hypothesis". This view is currently gaining wider acceptance from international academic circles, and its representative is L. Vygotsky (Gui 2001), a scholar of the former Soviet Union.

After surveying the numerous researches on animal thinking in chimpanzees conducted over 4 years by German psychologist W. Kochler, Vygotsky pointed out that chimpanzees possess some kind of intelligence (Vygotsky 1962). For example, they use long and thin twigs as a tool, pull it into a deep ant hole to attract the ants, so as to catch and eat them when they come out; they insert a narrow stick into a thicker hollow one to form a stick that is long enough to reach fruits in high places; they could even dig a brush into the paints in order to draw a picture. Certainly, these kind of "paintings" lack form, and cannot be regarded as real paintings. They are only like the scribbles created by 1 or 2-year-old human infants. The above facts reveal that chimpanzees possess the elementary ability to use simple tools to solve problems, but this intellect is unrelated to audio language. Common sense tells us that this is because chimpanzees are unable to speak. This also shows that language is not necessary when chimpanzees think (although they are only having relatively low level thinking). Thus, Vygotsky believed that there is a "pre-language stage" in the thinking development process of chimpanzees.

Apart from that, chimpanzees also have their own "language". For example, they are able to understating each others' facial expressions, gestures and sounds, and can use these to communicate with each other. The only problem is that the facial expressions and gestures are always linked with concrete actions; and sounds are their way of expressing desires and feelings rather than the symbolic representation of objective objects. Though chimpanzees can make noise, these noises are not audio language and are unrelated to thinking. Thus, Vygotsky thought that there is a "pre-thinking stage" in chimpanzees' evolution towards audio language.

Vygotsky not only investigated the different origin and development of thinking and audio language from the evolution of man-like apes, but he also explored this issue from the growth and development process of human infants. He found that in infants' thinking and audio language development, there are also pre-language and pre-thinking stages, which are similar to those of the chimpanzees. For example, infants usually begin to speak simple language when they are around 1 year old. Before that, though they are unable to speak (not even able to say simple words like "ma ma" and "pa pa"), they already possess elementary intelligence

similar to or even higher than that of the chimpanzees. This is the "pre-language stage"; infants are able to make different noises in the first few months after they were born. They can cry, yell, shout and imitate the sounds of adults (babbling). These noises mainly express feelings such as happy, angry, hungry and thirsty, and some desires or imitations of others. They are not the symbolic representations of objective objects, which mean that they are unrelated to the process of thinking. This is the "pre-thinking stage" which is similar to that of the chimpanzees.

Through researches on the development of thinking and audio language in man-like apes and human infants, Vygotsky found that they are very similar to each other—there is a "pre-language stage" and a "pre-thinking stage" in both of them, which means that language and thinking do not emerge together and that thinking develops before audio language. Based on this, Vygotsky claimed that it is thinking that determines language rather than the other way round.

It should be noted that it is the existence of the "pre-language stage" that enables the claim that audio language and thinking do not emerge at the same time. This is because at this stage, there is thinking (although at a lower level) without language. Though a similar conclusion can be inferred from the existence of the "pre-thinking stage", its implication is not the same. "Audio-language" does not emerge without thinking at this stage; contrarily, there is already thinking, but it is only that this kind of thinking is still not connected with sounds. Without establishing such a connection, real audio language cannot emerge. Thus, the existence of these two stages indeed explain the same phenomenon: language and thinking do not emerge at the same time. Vygotsky's division of these two stages only arose from thinking this issue from different angles: one considered the development of thinking, while the other considered the evolution of audio language.

For the relationship between language and thinking, Vygotsky, on the one hand, stressed that it is thinking that determines language rather than the other way round while also agreeing that thinking development is somehow restricted by language. On the other hand, he thought that language and thinking should not be equalized, which means one should not think that there is a causal relationship between them. He pointed out that language and thinking are like two circles: parts of them overlap, and these parts are where language and thinking are the same, which can also be called "verbal thought". However, verbal thought cannot include all forms of thinking (Vygotsky 1962).

6.2.4 Scientific Understanding of the Relationship Between Language and Thinking

6.2.4.1 Defects in Vygotsky's Theory

The above analyses show that the first two theories (linguistic relativism and unity of language and thinking) are obviously biased, while the third theory (represented by Vygotsky), though it stresses that cognitive ability develops before language

ability, which means that thinking determines language, also admits that language has an important effect on thinking—the development of thinking is restricted by language. It is obvious that the third theory matches the objective fact better and is more convincing. That is why it receives wider support from international academic circles. Yet, it should be noted that this theory, represented by Vygotsky, still has not identified the nature of the relationship between language and thinking. Though Vygotsky correctly described this relationship, he only touched on the external "phenomenon" and did not explore the internal nature. (Language ability is an explicit behaviour which can be directly observed and measured. Thinking ability can also be judged by its external thinking results. Analysis of the relationship between language and thinking can be done by observing external phenomena). Thus, the fundamental defect of Vygotsky's theory is its failure to clarify the nature of the relationship between language and thinking. Precisely because of this, the theory does not end the academic circles' doubts and debates about that relationship, but leads it to another time-consuming but ineffective debate.

For example, centred on Vygotsky's view that "verbal thought cannot include all forms of thinking" (this view is originally correct, but it has one flaw in that Vygotsky did not go further to answer "**Why can it not include all forms of thinking?**" and "**How many forms of thinking should there be?**", which are questions that people are generally concerned with), linguists J. Foder, Z. Pylyshyn and B. Mclaughlin issued many essays from 1975 to 1989, Forder 1975, 1980, 1987, 1994, Forder and Pylyshyn 1988, Forder and Mclaughlin 1989 devoted to discussion on the question "as thinking without language existed, then what form does thinking take in our minds?" (Gui 2001). For this, Foder and the others proposed a hypothesis about the "language of thought" (abbrev. "LOT"), which stated that thinking exists in the LOT (that is, language of thought) form in our minds. The LOT hypothesis includes the following two aspects (Gui 2001): (1) Beliefs, wishes and other intentional mental states are real psychological and physical representations in the brain. They are the basic causes of explicit behaviours; (2) These states have structural characteristics similar to the intentional objects.

6.2.4.2 New Questions Arising from the LOT Hypothesis

The proposal of the LOT hypothesis originally aimed at solving Vygotsky's unanswered questions. However, it actually works the other way round and creates even more confusions to the related concepts. As Professor Gui Shi Chun stated (Gui 2001), the LOT hypothesis brings many new questions, for example:

① What kind of language does the language of thought belong to? Foder stated that it is a kind of psychological language rather than natural language. Then, how much does it resemble natural language?

② What actually is psychological language (that is, language of thought)? Some believed that it is images. However, all objects with image representations have

external appearance. The objects that can be thought with Foder's psychological language have no external appearances (or their external appearances are unknown to us). Thus, psychological language is not likely to be images.

③ If psychological language is not natural language, then the following questions must be answered: What is the relationship between psychological language and natural language? Can the learning of natural language foster the development of psychological language? Or can natural language elevate or convert into psychological language? Foder consistently stressed that psychological language is independent of any of the languages we use, and that the expressive power of natural language depends on that of the psychological language rather than the other way round.

All in all, the academic circles still have divided opinions towards the language of thought (LOT) hypothesis. This hypothesis fails to solve the problem by clarifying and deepening people's understanding of the relationship between language and thinking. Contrarily, it creates more confusion and complications to the related concepts. Thinking and language belong to two different categories, but Foder blended them together and created the concept "language of thought". Such mixture of language and thinking triggers debates in the academic circles, which focus on what this mixture actually is. These unnecessary debates have gone on for more than 10 years, which is more of a loss than a gain.

6.2.4.3 The Common Cause of the Defects in the Two Theories

Actually, both the defects in the LOT hypothesis and those in Vygotsky's theory stem from the same root, a lack of understanding of the internal relationship between language and thinking.

Vygotsky understood the relationship between language and thinking only through a comparison between the external manifestations of language ability and thinking ability. He did not make a serious analysis of the internal structure of thinking. He failed to grasp the internal essential relationship between language and thinking, but only had a superficial understanding of it.

Foder's understanding is an even more simplified one. He did not thoroughly discuss the emergence and development of thinking and language, or analyse and compare their external manifestation, not to mention analysing and comparing their basic nature. He merely superposed these two very different concepts together to create the new concept "language of thought", and thought that he had got the solution to the problem. That is why he failed to grasp the essential relationship between language and thinking. Thus, in order to gain a real understanding of the nature of relationship between language and thinking, and to thoroughly correct the various wrong concepts that the academic circles have towards this issue, investigation should start by analysing the basic nature of these entities rather than looking at them merely on the surface. To do so, we should start with an objective scientific analysis of the connotation and structure (that means the

elements) of thinking, and see if we are able to discover any relationship between thinking and language, which would enable us to find the crux of the problem.

6.2.4.4   Using System Theory to Analyse the Connotation and Elements of Thinking

According to system theory, any things in the objective world exist and change in the form of a system, and a system is formed by several elements, including thinking. Researches of cognitive science prove that thinking, which exists as a system, has four elements: mental processing materials, mental processing methods, mental processing buffer zone and mental processing mechanism (He 2000).

Both psychologists and philosophers believe that thinking is a special function that human brains developed through evolution over a long period of time. They define thinking as "The brain's generalised and indirect reflections of the intrinsic properties of objective objects and the regularities of the internal relationships between objects" (Zhu and Lin 1991). They are "**indirect**" reflections because they are reflected indirectly through symbolic representation systems (such as concepts, representations and gestures) rather than reflected directly like using a camera; they are "**generalised**" reflections because they do not reflect all properties of the objective objects or copy the external phenomena exactly as they are. They abstract the various properties and external phenomena of the objects, and produce generalized reflections of the patterns of internal relationships between objects based on this abstraction.

It is only by gaining a real understanding of the above definition and connotation of thinking that we can attain a better understanding of the structure of thinking, that is, its elements. As mentioned, thinking reflects objective objects indirectly through symbolic representation systems. The symbolic representation systems human employ during the thinking process include: language-based concepts, "object representations" which reflect the properties of objects (also called "property representations"), "relation representations" which reflect the relationships between objects, sign language and semaphore (He 2000). The symbolic representation systems employed in the thinking process are the specific subjects of mental processing, which means that they are the aforementioned first element of thinking—"mental processing materials". In other words, mental processing materials include language-based concepts, property representations, relation representations, sign language and semaphore.

In the human thinking process, reflections of objective objects with symbolic representation systems are produced through the following three mental processing methods (He 2000):

① Processing methods that employ language concepts for analysis, integration, abstraction, generalization, judgments and inferences—for logical thinking
② Processing methods that employ property representations for decomposition, assembly, association and imagination (which is divided into reconstructed imagination and creative imagination)—for imagery thinking

③ Processing methods that employ relation representations for intuitive perspec-tive, spatial integration, pattern matching and snap judgment—for intuitive thinking

The three mental processing methods for different types of thinking stated above are the aforementioned second element of thinking—"mental processing meth-ods". The above analysis shows that different types of thinking have completely different methods of mental processing.

Obviously, in order to possess real advanced and complex thinking, which means producing generalized and indirect reflections of objective objects through various mental processing methods, working memory is needed. Working memory helps to temporarily store the initial materials, intermediate results and final results of mental processing. It is the aforementioned third element of thinking—"mental processing buffer zone". In cognitive psychology, it is named "working memory".

Thinking is a special function that the brain developed through evolution over a long period of time. Thus, it naturally has a material base. That is, there must be a corresponding neurophysiological mechanism in the cerebral cortex, which sup-ports the various mental processing methods and buffering. This is the aforemen-tioned fourth element of thinking—"mental processing mechanism".

The above reveals that thinking, which exists as a system, has four elements: **mental processing materials**, **mental processing methods**, **mental processing buffer zone** and **mental processing mechanism**.

6.2.5 Scientific Understating of the Relationship Between "Language and Thinking"—The Relationship Between "Element and System"

The analysis of the structure of thinking, which is its elements, enables a clearer understanding of the relationship between language and thinking: The develop-ment of cognition (thinking) precedes that of language, whether in the evolution of primates or in the growth and development of humans. Thus, it must be the development of thinking that influences the learning and development of lan-guage. That means it must be thinking that determines language, not the other way round. However, the above analysis of the structure of thinking also reveals that language considerably influences and restricts thinking. As mentioned, there are various mental processing materials, such as language-based concepts, prop-erty representations, relation representations, sign language and semaphore. The most important one amongst them is language-based concepts. Language-based concepts mean using words or phrases in language to represent concepts. (Single concepts are represented by words, while compound concepts are represented by phrases.) Words carry specific meanings and have fixed pronunciations. They are the smallest language unit which can be used independently. There are two types of words, "content words" and "function words". Content words have

specific meanings. They can be used as sentence elements and used independently to answer questions. Thus, concepts are all represented by content words. Contrarily, function words do not have specific meanings. They cannot be used independently to answer questions or used as sentence elements. Their only function is to indicate the relationship between sentence elements and assist content words in expressing their meanings. Phrases are language units formed by two or more content words, which are not sentences. In other words, the most basic unit (words) and the most basic combination unit (phrases) of language form the carriers of the major mental processing materials (concepts) of thinking. Concepts and their carriers (words or phrases) are inseparable. A scientific concept system cannot be established without the words or phrases of language, which means that advanced human thinking cannot be formed without them. That is why the academic circles basically regard the relationship between concept and thinking as that of language and thinking. Precisely because of this understanding, the classic authors of Marxism gave the famous claim that "language is the material shell of thinking". As the relationship between language and thinking is equivalent to that of concept and thinking, and the above analysis of the structure of thinking also clearly shows that the relationship between concept and thinking is equivalent to the "relationship between element and system" (concepts are a major mental processing material, and mental processing materials are an element of thinking system), thus, the relationship between language and thinking is the "relationship between element and system". This is derived according to system theory and after serious analyses of the nature and internal structure of thinking. Thus, it completely ensures that this is the relationship between the intrinsic natures of language and thinking that we have been searching for, rather than the relationship between external phenomena.

Clarifying this "relationship between intrinsic natures" allow us to build our understanding of the relationship between language and thinking on a more scientific basis. This will disperse the dense fog that has been covering the academic circles' understanding of this area for a long time, and readily solve the endless arguments of many problems. For example:

As language-based concepts are only one of the many mental processing materials, that means that without language, thinking can still be conducted with other mental processing materials (for example, property representations, relation representations, sign language and semaphore). Thus, it is obvious that Whorf's "linguistic relativism" cannot stand.

As the relationship between language and thinking is that of element and system, and according to system theory, system and element are of two different levels and connotations, then the "unity view" which attempts to unify them and the "equality view" which regards them as the same collapse by themselves. This is because their views are in direct conflict with system theory.

According to system theory, the various elements that comprise a system are not piled together in an isolated and separated manner. They form an organic whole; they depend on and interact with each other (For example, as one of the mental processing materials, "language-based concepts" do not serve the function

of "processing materials" in isolation. Instead, they also exert great influence on the other three elements. When "concepts" are chosen as the processing materials, the corresponding mental processing method, storage mode and processing mechanism in the cerebral cortex are very different from those when "property representations or relation representations" is chosen. This view has indeed been proved by the modern researches of neuroscience.) (Smith and Jonides 1995). This proves that Vygotsky's view that "not only is language determined by thinking, but thinking is also restricted by language (that means language has great influence and restriction on the development of thinking)" is correct and scientific.

The relationship between language and thinking is that of element and system, and as mentioned, element and system belong to two different levels and connotations, and system is of a higher level than element. According to system theory, there is interaction between elements (elements are not independent), and comparing the effects of an individual element to that of a system formed by several elements, it is obvious that under normal circumstances (that means when all elements are synchronized) the effect of a system must be greater than that of an individual element. This is derived from the system theory's principal of "the whole is greater than the sum of its parts". This proves that Vygotsky's view that "it is thinking that determines language rather than the other way round" is well based. This is the reason why Vygotsky's theory generally received international recognition. The defect of his theory is that it failed to clarify the relationship between thinking and language from the nature and internal structure of thinking. Thus, though Vygotsky had a basically correct description of the relationship between language and thinking, he failed to answer higher level questions related to thinking, such as "why would there be such a relationship between language and thinking?" and "apart from language-based thinking, is there any other type of thinking? And what are they?"

6.3 The Significance of a Correct Understanding of the Relationship Between Language and Thinking to Language Education

The above analyses of the connotation and elements of thinking allow us to really grasp the intrinsic nature of the relationship between language and thinking, as well as to clear up the specious viewpoints on this important issue that have been spreading in linguistic and psychology circles for years. This is not only valuable to researches on cognitive science (especially to the investigation of the structure of creative thinking, i.e. its elements), but also provides an important guide to an effective cultivation of students' thinking ability in language education, which can be seen at least in the following four aspects:

6.3.1 Cultivation of Intuitive Thinking Should No Longer Be Neglected

The above analysis of the first element of thinking system reveals that generally there are three types of basic "mental processing materials": language-based concepts, object representations which reflect the properties of objects (also called "property representations") and relation representations which reflect the relationships between objects. These three are also indeed the only three mental processing materials. (This is because though sign language, body language, semaphore and telegraphs can be used as the symbolic representation systems which reflect objective objects, they are not the most basic and generally used systems. They can only be counted as auxiliary mental processing materials.) Corresponding to the three basic mental processing materials, which are "language concepts", "property representations" and "relation representations", are three basic types (or basic forms) of human thinking: logical thinking, imagery thinking and intuitive thinking. (One of the basic characteristics of intuitive thinking is that it uses relation representations as its mental processing materials.) This requires teachers to focus also on the cultivation of intuitive thinking, which has actually been neglected for years in language education, when they are cultivating students' logical thinking and imagery thinking in language lessons. The discussion in Part 4 of this section will show that intuitive thinking is an essential element in the structure of creative thinking. Neglecting the cultivation of intuitive thinking will make it impossible to nurture innovative talents with a high level of creative thinking. However, it is disappointing that this issue still has not attracted attention from the language education circle.

6.3.2 Cultivation of Language Ability Should No Longer Be Confused with that of Thinking Ability

The relationship of language and thinking is that of element and system, and element and system belong to different levels and have different connotations. Thus, in language education, language should not be confused with thinking (obviously, language subjects should not be seen as thinking subjects), and cultivation of language abilities (that is, reading, writing, listening and speaking) should not be seen as equivalent to that of thinking. We should provide a comprehensive cultivation of students' thinking abilities (including logical thinking, imagery thinking and intuitive thinking, which are the three basic types of human thinking or basic forms of internal thinking) in language education. We are also completely capable of effectively cultivating students' thinking abilities through language education. To reach this goal, we should not substitute the cultivation of logical thinking, imagery thinking and intuitive thinking with the teaching methods and strategies which cultivate language abilities such as reading, writing, listening and speaking.

Obviously, we should not do it the other way round either—substituting the cultivation of language abilities such as reading, writing, listening and speaking for the teaching methods and strategies which cultivate the various thinking abilities. It should be pointed out that such confusion with the cultivation of language and thinking still exists quite extensively in our country's primary and secondary education. It is even supported by some of the famous scholars in the linguistic circle and reflected in their academic works or essays (Zhu 1988; Wei 1997), which resulted in greater influence. Thus, more attention and caution should be given to this issue.

6.3.3 Different Types of Teaching Methods and Strategies Should Be Used for Different Types of Thinking Abilities' Cultivation

While not confusing the cultivations of language with that of thinking, different teaching methods and strategies, which correspond with the mental processing methods, should be used for different types of thinking (as mentioned, different types of thinking have different mental processing methods.) rather than applying the same methods to all of them. The above analysis of the second element of thinking shows that there are various "mental processing methods" that are commonly used, such as "analysis, integration, abstraction, generalisation, judgment, inference, association and imagination". In fact, if these mental processing methods are divided according to the types of thinking, then,

Those belonging to logical thinking are: processing methods which use language concepts to perform analysis, integration, abstraction, generalization, judgment and inference

Those belonging to imagery thinking are: processing methods which use property representations to conduct decomposition, assembly, association, imagination (including reconstructed imagination and creative imagination), abstraction and generalization

Those belonging to intuitive thinking are: processing methods which use relation representations to perform intuitive perspective, spatial integration, pattern matching and snap judgment. Intuitive thinking possesses these rather special processing methods, as its major processing materials (relation representations) are "spatial visual representations"

This shows that to foster an effective cultivation of students' thinking ability in language education, **different teaching methods and strategies, which correspond with the mental processing methods, should be used for different types of thinking**. Currently, in the treatises about teaching approaches of language subjects and language education, there are already quite adequate researches (though there are still some defects) on methods to cultivate students' logical thinking and imagery thinking in language education. However, the method to cultivate students' intuitive thinking in language education is still unexplored. We sincerely hope that language teachers of primary and secondary schools can start serious exploration of this issue.

6.3.4   The Three Basic Forms of Human Thinking Should No Longer Be Viewed as Isolated and Separated

The structure of human thinking is formed by four elements, and when primary school students enter school (about 6 years old), they have already mastered the elementary listening and speaking abilities of their mother tongue. According to researches by psychologists, school-age children aged 4–5 are able to listen and say about 2500 words; and those aged 5–6 are able to listen and say about 3500 words (Zhu 1998). This proves that right from primary one, students possess both representation-based thinking (that means imagery thinking and intuitive thinking) and language concept-based logical thinking. Certainly, such logical thinking is still of a lower level kind (for example, logical inferences still need the support of concrete objects, and it is hard for the children to conduct inferences on hypotheses and propositions) when the primary students are in the junior grades. Yet, "lower level" does not mean "does not exist", for example, though representation-based thinking is also of a lower level kind when the primary students are in the junior grades, people still admit its existence in the students' minds. However, it is disappointing that in our country, and even in the world, it is generally believed that in the junior primary school grades, only cultivation of imagery thinking is needed, and the cultivation of logical thinking is left until middle or senior grades. This belief implies that junior grade (especially primary one and two) primary school students only possess representation-based thinking, but without language concept-based logical thinking. This indeed stems completely from the fetters of J. Piaget's "stage theory of children's cognitive development". (This theory of Piaget stated that children aged 2–7 are in the "pre-operational" stage of cognitive development. The major characteristic of this stage is that children only possess representation-based thinking, and do not have language concept-based logical thinking.) The seminal contributions Piaget made to researches on children's cognitive development should be appreciated. However, much of his testing of children's cognition were conducted half a century ago. At that time, there were no micro computers or computer networks, and even television had not been popularized. Theories that are established according to those old tests were already not very scientific at that time (such as the descriptions of the major characteristics of

the "pre-operational" stage), and some were outdated. In any case, they obviously do not fit in with the cognitive development of children in the information era.

To nurture new persons of talent who can adapt to the developmental needs of the twenty-first century, we should bravely challenge the authoritative theory and break through the restriction of traditional thoughts and concepts. We should search for new theory and truth through practice. Through our analyses of the nature and internal structure of human thinking, as well as our recent years' innovative explorations of an accelerated approach in language teaching in junior and middle primary school grades, we found that right from primary one, students possessed all the three basic forms of human thinking at the same time (viz. logical thinking, imagery thinking and intuitive thinking). Equal emphases should be placed on these three forms of thinking. They should be enhanced and cultivated through various environments, methods and approaches (multimedia and Internet environment should be fully utilized) in all subjects, especially language subjects. These three forms of thinking should not be separated, and cultivated in isolation. They should be tightly integrated, so that they can complement and enhance each other. (This is because system theory states that the elements of a system are not isolated or separated initially, but are interrelated and interact with each other.) Practice proves that if language teaching in junior and middle primary school grades is really designed in accordance with this train of thought, and rich Internet resources are fully utilized to produce favourable interactions between humans and computers, and between students and teachers, a substantial improvement in the quality and efficiency of language teaching in character recognition, reading and writing is possible. This will also provide better training and cultivations of students' language concept-based logical thinking, as well as representation-based imagery thinking and intuitive thinking (and even creative thinking). In this way, the goal of effecting simultaneous improvement and development in language ability and thinking ability can be achieved. Contrarily, neglecting the training of students' logical thinking in junior and middle primary school grades will greatly defer children's comprehensive thinking development (and certainly the development of creative thinking will be affected), and create irrecoverable losses throughout the life of the students.

6.4 Rectifying Our Understanding of Creative Thinking

6.4.1 Five Mistakes the Current Education Circle Have Made in Their Understanding of Creative Thinking

6.4.1.1 Equating Divergent Thinking with Creative Thinking

Currently, there is a popular view in our country: when people talk about creative thinking, they talk only about divergent thinking, believing that divergent thinking is creative thinking. Some years ago, a series of quite influential reference books for the University Entrance Examination titled themselves: "Divergent Thinking in

Mathematics", "Divergent Thinking in Physics", "Divergent Thinking in Chemistry", "Divergent Thinking in Language"… They are typical reflections of the above view. Obviously, the editors of that series of books think that possessing divergent thinking alone means possessing creative thinking. Indeed, divergent thinking *is* one of the elements of the structure of creative thinking, and it also has an irreplaceable effective role in creative thinking activities. It charts the path for thinking activities, that is, to think in the opposite direction to traditional thought, ideas and theories. It aims at breaking through the restrictions of traditional thought, ideas and theories. This role of divergent thinking is very important, but it should not be overstated. It should also be noted that this is the *only* effective role (determining the direction of thinking) that divergent thinking has. Divergent thinking is neither the whole, nor even the principal element in the creative thinking process. Equating divergent thinking with creative thinking was the basic view held by American psychologist Joy Guilford in the 1960s and 1970s. It has been outdated for a long time, but many in our country still spread this lopsided view around as if it were something trendy.

6.4.1.2 Confusing Intuitive Thinking with Imagery Thinking—Denying Intuitive Thinking as One of the Basic Forms of Human Thinking

Intuitive thinking is an area which has not been thoroughly explored by the psychology circle. Its nature and mental processing characteristics are still unclear. Precisely because of this, among the general public, and even among some scholars, there is a popular belief that "intuition is the sixth sense". The "sixth sense" is a kind of inexplicable feeling which cannot be clearly expressed. For many people, "intuition" is a kind of unfounded subjective assumption that comes from nothing. This understanding of intuition is completely wrong. In fact intuition is another important basic form of human thinking. Intuitive thinking, imagery thinking and logical thinking are the basic forms of human thinking. The three of them are equally important, and none is dispensable. It is not the sixth sense outside the five senses produced by the five sensory organs. **The mental processing of intuitive thinking has the following three basic characteristics**:

① An overall grasp of the relationship between objects (that means internal relationship)—it puts aside the tiny details of objects, but understands objects from their entirety and within the overall situation. It is a kind of thinking that looks at the larger picture and masters the overall situation.

② Intuitive perspective, spatial integration and pattern matching—these are the basic psychological processing methods of intuitive thinking. Intuitive thinking only focuses on the relationships between objects. It does not take into consideration the specific properties of every object. (It is the duty of logical thinking and imagery thinking to conduct analysis, integration, abstraction, generalization, association and imagination on the specific properties of objects, but not that of intuitive thinking.) To master the overall relationships between objects,

the basic mental processing methods employed by intuitive thinking are "intuitive perspective", "spatial integration" and "pattern matching". As the mental processing materials of intuitive thinking are relation representations (mainly spatial visual relation representations), the first step of intuitive mental processing must be "intuitive perspective", and the second step is to conduct "spatial integration" on the results of intuitive perspective (discarding the secondary factors from the various complex relationships between objects, and grasping only the essential relationships with decisive effects). After that, the major relationship models gained through intuitive perspective and spatial integration will be used to make comparison with similar relationship models stored in the long-term memory ("pattern matching"). If both of them are completely the same or basically the same, then the present relationships will be processed directly according to experience, and there is no need to carry out logical analysis, judgment and inference step by step.

③ Swift judgments within a moment—intuitive thinking requires judgment about the relationships between objects to be made through pattern matching within a moment. It is a kind of nonlinear, leaping and fast-paced thinking performed in three-dimensional space (while logical thinking is a kind of linear, sequential and slow-paced thinking performed in a one-dimensional timeline).

Many writings in Chinese also call intuitive thinking "direct imagery thinking", and equate it with imagery thinking (Qian 1986). Some writings think that intuition is one of the observational abilities of imagery thinking (Wen and Lian 1997), which means regarding intuition as one of the properties of imagery thinking. To conclude, all of them obliterate the basic characteristics of intuitive thinking and deny intuitive thinking as an independent form of thinking or as a basic form of human thinking. This will certainly weaken or even cancel the cultivation and training of the intuitive thinking of teenagers.

6.4.1.3 Unilaterally Exaggerating the Effect of Logical Thinking—Putting Logical Thinking, Imagery Thinking and Intuitive Thinking into Confrontation

This error consists of focusing only on the different and opposing aspects of logical thinking and imagery thinking (or logical thinking and intuitive thinking), whiles the other side, in which they mutually support and depend on each other, is neglected. Thus, these three basic forms of thinking are often regarded as isolated and separated, and inappropriately divided into higher and lower levels.

In reality, imagery thinking, intuitive thinking and logical thinking are all indispensible basic forms of human thinking. Though they use different mental processing materials and methods, there is not a difference of level between them. However, the following view has been spreading for years in many teaching resources and works of the philosophy and psychology circles: only logical thinking can reveal the natures of objects and the internal relation patterns between objects. This means that our understandings of objective objects can be

elevated from a sensory one to a rational one. Thus, logical thinking is a higher level thinking. Imagery thinking and intuitive thinking only allow us to gain visual and imagery sensory knowledge. They hardly reveal any nature or pattern of objects. Comparing them with logical thinking, they remain at the stage of sensory knowledge and hardly reveal the nature or pattern of objects, and thus they are lower level thinking. This ideology results in an emphasis on logical thinking and neglect of imagery thinking and intuitive thinking. As these three types of thinking are indeed mutually supportive and interdependent (He 2000), emphasizing logical thinking alone not only greatly weakens imagery thinking and intuitive thinking, but also disables the normal development of logical thinking. The result of this must be that a correct set of cultivation and training method will not be established for any type of thinking. In other words, teenagers will not receive the most effective cultivation and training in these three types of thinking.

6.4.1.4 Unilaterally Exaggerating the Effect of Imagery Thinking—The View that Developing the Right Brain is Developing Creative Thinking

The processing characteristics of logical thinking are that it is linear and sequential. It can only conduct slow-paced logical analyses and inferences based on original knowledge and concepts along a one-dimensional timeline. There is no leap or sudden change in the thinking process. Thus, it is commonly believed that it is quite impossible for logical thinking to have direct inspiration or insight (that means making creative breakthrough) like imagery thinking and intuitive thinking. In other words, creative breakthrough can only be achieved with imagery thinking and intuitive thinking. As mentioned before, academic circles currently often confuse intuitive thinking with imagery thinking. Together with the view that "the right brain tends to process overall stimulus" (that means the right brain has advantages in processing overall stimulus of representation), proposed by Nobel Prize winner Sperry in the 1970s, the academic circles believe that the right brain has advantages in both imagery thinking and intuitive thinking, and thus conclude that developing the right brain is needed in order to accomplish creative breakthrough. For a long period of time, and even now, "developing the right brain" has been a synonym of "developing creative thinking". Actually, restricted by the technology level in the 1970s, Sperry could only conduct his experiment on a few "split-brain patients" with brain damage. Thus, it is inevitable that his conclusion is lopsided. In the 1990s, the emergence of positron emission tomography scan (PET) and magnetic resonance imaging (MRI) enable scientists to accurately measure the brain waves of a large group of people under different mental states, which verifies that: the processing mechanism and working memory of imagery thinking are mainly in the left brain rather than the right brain (Only the processing mechanism and working memory of intuitive thinking are mainly in the right brain.) (He 2000). This reveals that the belief that developing the right brain means developing creative thinking is a mistake which lacks scientific evidence.

6.4.1.5 Neglecting Research on Dialectical Thinking

Dialectical thinking (that is, dialectical logical thinking) is an important element in the structure of creative thinking. However, there are not many essays and works devoted to it by the international psychology circle, and in-depth research on it is even rarer. It seems that dialectic thinking is a pure philosophical question which should only be explored by philosophers. And in fact, researches on dialectical thinking can only be found in works of philosophy. We believe, however, that such a view is biased. It is harmful to in-depth researches on creative thinking. Thus, we sincerely hope that psychologists can also give serious attention to this issue.

6.4.2 The Six Elements of Creative Thinking

The "Inside and Outside Circulation Model" (DC model) (He 2000) derived from contemporary psychological and neurophysiology researches states clearly that the structure of creative thinking should be formed by six elements, which are divergent thinking, imagery thinking, intuitive thinking, logical thinking, dialectical thinking, and horizontal and vertical thinking. These six elements are not unrelated and isolated, and they are not arranged in a parallel manner without priority. Instead, they are arranged according to specific division of work. They cooperate with each other while exerting their own individual effects. Some of them have strong and even a crucial effect on creative breakthrough, while some have lesser effect, but none is dispensable. Each of them has irreplaceable effect, and together they form an organic whole—the structure of creative thinking.

Amongst these six elements of creative thinking, divergent thinking only solves problems related to the *direction* of thinking that means the directional problem of thinking. Dialectical thinking and horizontal and vertical thinking mainly provide guiding philosophy and psychological processing strategies in solving difficult and complex problems, which helps to shorten the formation processes of inspirations or insights. Imagery thinking, intuitive thinking and logical thinking are the basic forms of human thinking. They are also the major processes of creative thinking, and thus are the main body of creative thinking. All in all, amongst the six elements, one is used to determine the direction of thinking (just like a pointer, which has a guidance effect), two are used to provide guiding ideologies and strategies in solving difficult and complex problems, and the other three form the main body of creative thinking. They may be summarized as follows:

One pointer (divergent thinking)—determines the direction of thinking

Two Strategies (dialectical thinking, and horizontal and vertical thinking)—provide macro philosophical guidance and micro psychological processing strategies, so as to shorten the formation processes of inspirations and insights

Three Forms of Thinking (imagery thinking, intuitive thinking and logical thinking)—form the major processes of creative thinking (that means the main body of creative thinking).

These are the different effects of the six elements of creative thinking activities and their relationships. The structure of creative thinking refers indeed to the organic whole formed by these six elements according to the aforementioned relationships. As mentioned, all elements in this organic whole have irreplaceable effects, and consequently the structure of creative thinking must be viewed as an integrated system. (That means no element or elements should be isolated or specially emphasized.) The structure of creative thinking is the key to understanding and mastery of creative thinking activities. It is also the general principle in cultivating and training teenagers' creative thinking. Thus, it is necessary to have a comprehensive and correct understanding of this structure, and the effects and characteristics of its elements.

6.5 The Five Focuses of the Cultivation of Creative Thinking

In reality, cultivating creative thinking requires us to take into account all the six elements that constitute the structure of such thinking. However, "horizontal and vertical thinking", which is one of the elements, is used to provide psychological processing strategies in solving difficult and complex problems (that means enhancing the emergence of inspirations and insights). It is more directly relevant to significant art creations, scientific discoveries and technological inventions, and it would be more comprehensible only with the support of the theory of "thinking complexity" (see (He 2000)). Thus, this element can be left out for the time being when discussing the cultivation of creative thinking in normal primary and secondary schools students. The following discussion of the cultivation of creative thinking will therefore focus on the other five elements.

6.5.1 Focusing on the Cultivation of Divergent Thinking

Traditional education only focuses on convergent thinking (also called centralized thinking, common thinking and forward thinking in Chinese) and neglects divergent thinking (also called multi-directional thinking, difference thinking and reverse thinking in Chinese). This is the result of the great influence its education ideology exerted on it. Traditional classroom teaching centres around teachers. It stresses one-way lecturing of knowledge from teachers to students. (Interaction between teachers and students is largely ignored.) Students are regarded as the targets of inculcation of knowledge, and the goal of teaching is to develop students into practical talents, who have a good understanding, digestion and application of the knowledge and experience of their predecessors (but not good at creating new knowledge and theories). If judged only from the angle of knowledge

transmission, tradition education is not in an inferior position. (Our students, whether in primary or secondary schools or at universities, generally have a rather firm grasp of foundational knowledge. The results of our students in academic subject examinations are also generally higher than that of their counterparts in the Western developed countries.) The flaw in our traditional education is mainly a failure to nurture a large group of creative talents with creative thinking and innovative ability. This is because this type of education does not aim at cultivating "creative" ability. Its aim is to inculcate knowledge in students: students are not seen as lively cognitive subjects with subjective initiative and creativity, but as receptors of external stimulations and targets of knowledge inculcation.

Guided by this education ideology, understanding and mastering the theoretical systems, basic concepts and basic principles of academic subjects, as well as comprehending and digesting the contents and requirements of teachers' lecturing, become the highest teaching goals. All of the students' thoughts and ideas, as well as understandings and opinions on problems, need to be concentrated on and directed towards the theoretical systems, basic concepts and principles of academic subjects; and all of the students' behaviours must be in line with the teachers' requirements and traditional standards. These are the goals of convergent thinking (also called centralized thinking, common thinking and forward thinking in Chinese).

Convergent thinking requires all contents and results of thinking to concentrate and centre on traditional concepts. Thus, it has the advantages of enhancing the inculcation of academic subjects knowledge, as well as the learning and mastering of the predecessors' knowledge and experiences. Its drawback is that it easily results in blind faith in students towards books, teachers and authorities. Students would be led to believe that everything written in the books are classic and anything the teachers say are the truth. They would not dare to suspect them. Thus, focusing on convergent thinking alone (or centralized thinking, common thinking and forward thinking in Chinese) would forever retain our understanding of the level of our predecessors. There would never be any new theory or new thinking. In order to have innovation, then, divergent thinking must be emphasized. Without divergent thinking (that is, without multi-directional thinking, difference thinking and reverse thinking in Chinese), creativity will not sprout and blossom. It can even be said that all creation originates from divergent thinking. There are numerous examples to this: Through their themes, expression techniques and styles, monumental literary works such as "The Story of the Stone", "The Water Margin" and "Romance of the Three Kingdoms" display divergent thinking, which is distinctive and dares to surpass their predecessors. Even short passages of about a hundred words, such as "Inscription on a Crude Dwelling" and "Song of the Lotus", and Li Bai and Du Fu's poems with only a few lines, are all masterpieces filled with divergent thinking.

Using Liu Yu Xi's "Inscription on a Crude Dwelling" as an example, this piece of writing only has 81 characters. Yet, his literary talent has been eulogized for generations, and this piece is also the representative work of his divergent thinking. Through the ages, many Chinese literati have extolled the beauties of the

famous mountains and great rivers. They often praise the famous mountains as "towering and magnificent" and great rivers as "profound and enormous". However, Liu Yu Xi **started with reverse thinking**, and clarified at the beginning that "A mountain need not be towering, famous will it be if deities dwell. A river need not be profound, charming will it be if dragons reside." Liu stressed that inner beauty and actual quality should be the focus rather than form and appearance. This paved the way for the introduction of the passage's theme and founded a firm ideological base for his praise of his crude dwelling. After that, Liu gave a vivid description of his dwelling from three aspects, the environment of the dwelling, people in the dwelling and people's activities in the dwelling. Undoubtedly, Liu's excellent literary talent won praise for "Inscription on a Crude Dwelling" for generations. Yet, the profound ideological content he put in this writing by conducting divergent thinking also contributed a lot. Writings without ideological content are superficial. It is only by a combination of profound ideological content and good writing skills that a piece of writing will enjoy everlasting charm.

Zhou Dun Yi's "Song of the Lotus" is another literary masterpiece which embodies divergent thinking. Before the Sung Dynasty, there were numerous poems and writings which extolled flowers and plants in China. Most of them devoted their praise to chrysanthemum (for being "charming and graceful"), peony (for being "elegant and poised") or plum blossom (for being "gallantly confronting the harsh winter snow"). Praises for lotus or water lily are rare. Using "lotus" as the theme of his writing, Zhou Dun Yi embodied different thinking; he did not blindly follow the others. More importantly, in writing "Lotus", he used a completely different approach and a completely different conception from others in his time. Poet Yang Wan Li, who lived about the same time as Zhou Dun Yi, wrote two very famous poems which praised "lotus and water lily". One of them is "Seeing Lin Zi Fang Off at Jing Ci Temple at Dawn", which goes "June it is now anyway in the West Lake. The scenery is different from in all other seasons. The towering lotus leaves are boundless emerald. Notably red are the lotus under the sun." The other one is "The Small Pond", which goes "Quietly the spring goes, cherishing the small water flows. The leafy shade mirrors herself in the water, for she loves the gentle sun. The lotus buds have just shown their pointy edges. But long before have the dragonflies stood on the top." The former poem describes the scenery through a macro context, while the latter one depicts it from a micro angle. Macro description requires the authors to have an extensive view and an unrestricted writing style, which requires much effort in describing the scenery. It should create a magnificent and extensive feeling, which touches people's hearts. On the other hand, micro description requires the authors to have a very detailed and accurate depiction of the scenery, which can recognize the whole through the observation of the parts. It should give an exquisite and elegant feeling with lasting appeal. Whether the description is through the macro context or in a micro angle, the depictions of the external appearance of "lotus and water lily" in the two poems of Yang Wan Li have reached the peak of perfection. It is difficult to surpass that. Thus, Zhou Dun Yi **used difference thinking** to seek for his own unique way. He did not depict "lotus and water lily" from their external

appearance. Instead, he described them from the ideological contents, and spirit and quality. From his some tens years of life experiences and careful observation of different people in society, he apprehended the finest, purest, noblest and most precious quality. Then, with personification, he conveyed this quality through the external appearance of "lotus and water lily" with lively, figurative and accurate language. Apparently, he depicted the stem of the lotus, "erect and hollow, with no tendril or branch", and described the lotus, "Wafting her subtle perfume wide and far, gracefully in a spotless state she stands" and "Stainless she raises from the mud, cleansed by the pure water she is never coquettish". Indeed, through these depictions, he extolled a lofty ideological level, which is "frank without selfish intention (erect and hollow), simple rather than trying to please the public with claptrap (with no tendril or branch), has noble quality and can stand the test of time (Wafting her subtle perfume wide and far), as well as upright and preferring to die rather than succumb in a violent storm (gracefully in a spotless state she stands)". This is the enormous artistic charm of the "Song of the Lotus", which allows it to pass down through generations. This is also its spiritual strength which enables it to purify people's souls forever.

Examples like the above are numerous in Chinese traditional culture. If language teachers search for them seriously, they will be able to get an enormous pool of resources for cultivating their students' divergent thinking and creative thinking.

6.5.2 Focusing on the Cultivation of Intuitive Thinking

In Sect. 6.4 of this chapter, it is pointed out that intuitive thinking has three basic characteristics. To master these characteristics, special attention should be given to the following two points: (1) **The main characteristic of the nature of intuitive thinking**—intuitive thinking is a kind of nonlinear, leaping and fast-paced thinking performed in three-dimensional space. It is essentially an overall comprehension of the relationships between objects (that is, internal relationships). It looks at the larger picture and masters the overall situation; (2) Though intuitive thinking makes swift judgments within a moment, these judgments are not baseless subjective assumptions that come from nothing. Instead, they are **intuitive judgments made after conducting psychological processing, such as perspective, spatial integration and pattern matching, based on rich practical experiences and profound knowledge**. Though these intuitive judgments are not absolutely reliable (if it is not very urgent, that means if time allows, it would be better if logical analysis and inference could be carried out to examine and verify the intuitive judgments after they are made), they are normally based on good grounds. The richer the practical experiences are, and the more comprehensive the different kinds of knowledge and relationship modes are, the more reliable these grounds are, and the more accurate the intuitive judgments become.

A famous example of using intuitive thinking to form inspiration or insight, and bringing a breakthrough to the theories of science is the discovery of "Archimedes' Principle". Intuitive thinking enabled Archimedes to have a sudden insight (inspiration) at the moment he sat in the bathtub, i.e. that: The volume of water that is elevated in the bathtub is equal to the volume of the body that is in the water. Apparently, "the volume of water that is elevated" and "the volume of the body that is in the water" are two unrelated matters. However, through overall comprehension and intuitive perspective, Archimedes discovered the internal relationship (or "implicit relationship") between them within a moment—their volumes are the same. Newton's discovery of the "Law of Universal Gravitation" through apples falling on the ground is also closely related to intuitive thinking: To normal people, "apples falling on the ground" and "the revolution of the Moon around the Earth" are two unconnected matters. However, Newton discovered that the reason why apples fall to the ground rather than fly to the sky, and why the Moon always revolves around the Earth rather than break away and fly into space, is the effect of gravity. This means that he was able to find the internal relationship (implicit relationship) of two seemingly unrelated matters. This is an example of advanced intuitive thinking ability, which enables one to discover the internal relationships unseen by normal people.

Intuitive thinking is not only closely related to the discoveries of natural laws, but it also has significant meaning for humanities and social science researches. Actually, there is no lack of examples of this in secondary school language textbooks. For example, "Cao Gui's Debate on War", which is a short passage from the *Chronicle of Zuo*, is a story that happened in the 10th year after Duke Zhuang of Lu came to the throne. At that time, *Qi*, which was a powerful warring state, attacked the other state, *Lu*. Cao Gui thus volunteered to give counsel to Duke Zhuang of Lu. He asked the Duke, "By what to overcome? (What do we rely on to win this war?)"

> The Duke said, "Daily necessities such as clothes and foods, I dare not to have them all, but share them with others". Cao replied, "These little favours extend not to all people. The civilians will not heed your command." The Duke said, "Offerings such as animals, jades and silks to ancestors and gods, I dare not to overstate, but remain honest to the ancestors and gods." Cao replied, "These are but little sincerity and faith. The deities will not shower on you their blessings." The Duke said, "Legal cases of both large and small, though I am unable to handle each and every one, the truth are my base in enforcing sentence." Cao replied, "You dedicate yourself to work for good of the civilians. This is our reliance to win the war."

Duke Zhuang of Lu said that he relied on three things to win the war. Firstly, he gave favours to his officials. Secondly, he prayed sincerely for the blessings of the deities. Lastly, He treated all the cases with justice and reason, and would not falsely accuse an innocent person. Cao Gui used intuitive thinking to look at the larger picture and master the overall situation (**intuitive perspective**). He put aside those secondary factors in the various spatial relationship images related to war, and grasped only the crucial factor that determine the victory of war—the support of the civilians (**spatial integration**), with which he turned down the Duke's

first two reasons, and accepted only the third. Mao Ze Dong fully recognized this point, believing that it could "win the trust of the people". In the Battle of Zhang Shao that followed, Cao Gui proposed the operational policy that "Courage is our reliance in fighting. When the drums beat the first time to command an attack, the morale of the troops surged. When they beat the second time, the morale of the troops sinks lower. When they beat the third time, the morale of the troops is drained. When the morale of the other side is drained and ours surges, we win." The policy is proposed after having a general overview of the situation of both sides on the battlefield (**intuitive perspective**), and contrasting and comparing them with the previous cases of battles (**pattern matching**). The facts proved that Cao Gui's operational policy was correct. Thus, "Cao Gui's Debate on War" is not only a classic which embodies dialectical reasoning, but is also an excellent example of using intuitive thinking to produce correct strategy and tactics of war.

A further example is "Zou Ji Persuades The King of Qi to Accept Advice" in *Chronicles of the Warring States*. Apparently it is a story of Zou Ji comparing his charm with Mr. Xu who lived in the north of the city, while in fact it reflects how Zou Ji discovered an important governance philosophy through intuitive thinking. Zou Ji asked his wife, "Who is handsomer, me or Mr. Xu in the north of the city?" His wife replied, "You are definitely handsomer. Mr. Xu is no match for you!" Zou Ji did not believe it, and so asked his concubine the same question again. His concubine replied, "Mr. Xu is no match for you!" The following day, a guest came and Zou Ji repeated the question. The guest replied, "Mr. Xu is not as handsome as you." For normal people, when they get the same answer from their wife, concubine and friend for the same question, they would believe it. Even if they do not believe, they would just leave the doubt in their mind rather than thinking of it deeply. However, Zou Ju did not act in this way. He did not stay with the surface phenomenon, but used the mental processing methods of intuitive thinking, such as **intuitive perspective** and **pattern matching** (comparing the behaviours of his wife, concubine and friend when they answered this question, and when they interacted with him under normal circumstances). This allowed him to discover the "intrinsic relationship" accidentally hidden under their identical replies—his wife favoured him, his concubine was afraid of him, and his friend wanted to ask for his help. This intrinsic relationship would not be revealed without conducting intuitive thinking (whether consciously or unconsciously). From this, Zou Ju thought of the situation of the King. If the king of a country was always surrounded by a group of consorts and concubines, palace maids, nobles and high officials who fawned upon him with words of praise and lies, then he would be in a very dangerous situation. Thus, Zhu Ju decided to use his personal experience to persuade the King of *Qi* to accept advice.

There are still numerous similar examples. In fact, intuitive thinking is not only a powerful tool in the exploration of natural science and social science. It is also widely used in our daily life. When one is at a critical juncture or under a circumstance which requires swift judgment, time is limited and there is no room for one to conduct logical analysis and rigorous inference unhurriedly. Under such circumstances, one can only use intuitive thinking to make correct judgment swiftly,

or else one may be in great danger. The chiefs of the executive branches and of a firm need intuitive thinking especially, because it enables them to look at the larger picture, as well as to master and grasp the overall situation; More importantly, they need to familiarize themselves with the processing methods of intuitive thinking, namely, intuitive perspective, spatial integration and pattern matching. Cultivation of intuitive thinking needs to start from one's childhood, and our language education and language teachers have an especially important responsibility for this. The two examples mentioned above should be able to give some insight as to how intuitive thinking can be cultivated in language teaching.

6.5.3 Focusing on the Cultivation of Imagery Thinking

Let us now look at some examples that depend on imagery thinking to form inspirations or insights.

Case 1: The proposal of the "Theory of Continental Drift"
In the early twentieth century, some geologists and meteorologists (such as Taylor and Beck of America and Wegener of Germany) all discovered when they observed the world map that the contour of the South American continent is very similar to that of the African continent. An interesting **imagination** then come up in their minds: millions of years ago, these two continents were originally one. It was because of a change in geological structure that they gradually split up. With this imagination, Wegener conducted a lot of geographical surveys and researches on fossils on both sides of the Atlantic. Finally, with the support of various types of evidences, such as paleoclimate, ancient glaciers, and the correspondence of the geological structures and rock compositions between the two sides of the Atlantic, Wegener proposed the "Theory of Continental Drift". This theory was further verified by the geomagnetic survey conducted by the British physicists in the 1950s, and it became an influential theory in contemporary geological studies. This reveals that the proposal of the "Theory of Continental Drift" was impossible without the aforementioned interesting imagination.

Case 2: The invention of "infrared tracking technique"
All biologists know that rattlesnakes have poor vision. They cannot even clearly see things within ten centimetres. Yet, they are able to catch accurately a vole that is ten odd metres away at night. The secret lies in the loreal pit between their eyes and noses. This pit is a biological infrared sensor for the rattlesnakes. It conducts "heat positioning" by detecting the traces of infrared rays produced by the heat of the animals, which are moving in faraway places. From this, the American missile experts formed an **association**—if electronic parts are used to produce an "electronic infrared sensor" similar to the biological infrared sensor of the rattlesnakes, and able to detect the infrared rays radiated by the working engines of planes, then automatic tracking of targets might be achieved with this "heat positioning". The infrared tracking Sidewinder Missile was designed based on this "association".

Case 3: The establishment of the theory of conic sections

In imagery thinking, inspirations or insights are not only formed by association or imagination, as in the two examples above, **but they can also be formed by conducting analysis, integration, abstraction and generalization on the representations of objects**. The establishment of the theory of conic sections is a typical example of this. As early as the time of Aristotle, people possessed the geometric concepts related to circle, ellipse and hyperbola. However, at that time, these concepts were still isolated and unrelated. Later, by "analysing and integrating" the different cross sections of cones (the representations of objects), Kepler, Desargues and Poncelet found that there are only three types of cross sections: circle, ellipse and hyperbola. By conducting "abstraction and generalization" on this finding, they found that these three representations have a common essential characteristic—they are all formed by cutting across a cone, and it is the relative direction of the cross-cut that makes them different. (Cutting across a cone horizontally creates circles, vertically creates hyperbolas, and obliquely creates ellipses.) This is the theory of conic sections, which links the three originally unrelated geometric figures together, and creates a geometry system with a close structural relationship.

Up till now, in our country's philosophy and psychology teaching resources for institutions of higher learning edited by the Ministry of Education (former State Education Committee), the dominating opinion has been that only logical thinking can reveal the nature of objects and the patterns of internal relationships between objects. Logical thinking was seen as a type of rational and advanced thinking. Other types of thinking (such as imagery thinking and intuitive thinking) could not reveal the nature of objects and the patterns of internal relationships between objects, but only sensory knowledge. Thus, they were regarded as irrational thinking (which also means they are low level thinking). Actually, the differences between the three basic forms of human thinking are merely their mental processing materials and methods. There is not a difference of *level* between them. These three forms of thinking are interrelated, mutually supportive and inseparable. In terms of exploring the nature and pattern of new objects, i.e. creative activities, as imagery thinking and intuitive thinking embrace the integrity and leaping nature of three-dimensional space (rather than operating on a one-dimensional timeline in a linear and sequential manner as logical thinking), they are more suitable for the exploration and innovation of breakthroughs than logical thinking. However, representation-based imagery thinking and intuitive thinking also require the guidance, regulation and control of logical thinking; Logical thinking will help them to bring into full play their ability to make breakthrough during the formation of inspiration or insight (see also (He 2000).

Examples of making innovative breakthroughs through imagery thinking are very common in scientific discovery and technological invention, and they are also numerous in literary and artistic creation. It can be said that all literature and art masterpieces that have been passed down through generations and are able to stand the test of time are products of advanced imagery thinking with extremely rich creativity. This applies not only to monumental literary works, but also to

short passages of some tens or hundreds of characters, such as "Inscription on a Crude Dwelling" and "Song of the Lotus" mentioned above.

6.5.4 Focusing on the Cultivation of Logical Thinking

As stated before, logical thinking is linear and sequential thinking on a one-dimensional timeline. (Thus, it is also called "temporal logical thinking" in Chinese.) Although it is nearly impossible for it to directly form inspiration or insight like imagery thinking and intuitive thinking, it is an essential element in the process of creative thinking. This is because both imagery thinking and intuitive thinking require the guidance, regulation and control of temporal logical thinking to achieve their goals to create.

For example, though the aforementioned "Theory of Continental Drift" originated from the observation and imagination of the world map, Wegener of Germany was not the only person who had such observation and imagination in the early twentieth century. American geologists Taylor and Beck and perhaps others too had the same observation and imagination at that time. They also suspected that there might be a continental drift, and they had written essays about it. However, they were not able to form an integral theory like Wegener's. This is because when the concept "continental drift" was first proposed, it triggered strong opposition from traditional "fixism" scholars (who believed that the relative positions of the continents are fixed). As Taylor and Beck lacked the firm support provided by logical analysis and inference, they did not dare to make further exploration, but remained at the imagination level. Wegener (who was originally a meteorologist) was the only one who conducted logical analyses and inferences on the paleoclimate and ancient glaciers on both sides of the Atlantic with his knowledge on meteorology. The outcomes of this study not only fortified and enriched Wegener's original imagination, but also caused him to make up his mind to carry out thorough researches on the geological structures and fossils on both sides of the Atlantic. It was also the guidance, regulation and control of the outcomes of such analysis and inference that allowed Wegener to overcome all difficulties, and he completed his research on the issue after 4–5 years of unremitting effort. Finally, in 1915, he published the famous book *The Origin of Continents and Oceans*. In this everlasting work, Wegener proposed the complete "Theory of Continental Drift" with much convincing evidence.

Another example is Archimedes' discovery of the intrinsic relationship between the volume of the elevated water and that of the part of his body in the water when he was in the bathtub. This discovery is, no doubt, an insight produced by intuitive thinking (through mastering the relationship between objects). However, such insight did not come from nothing, but from Archimedes' prior analyses and inferences. As the density of a pure gold crown is known, together with its particular volume, it is easy to know its weight through calculation. Then, by comparing the result of this calculation with the measured weight, one can verify whether a

crown is made of pure gold. In other words, knowing the volume of a crown alone will allow one to calculate its weight, and determine from the calculation whether the crown is mixed with impurities. Thus, the key of the question becomes how to measure the volume of the irregular crown. It was under the guidance of that conclusion of logical thinking that Archimedes focused his intuitive thinking on matters related to the measurement of the volume of a crown, which allowed him to gain insight in the bathtub. Before that, even though Archimedes had seen the same thing for hundreds of times in the bathtub, he never came up with such an insight, as he lacked the guidance of the aforementioned logical thinking.

A further example is "Song of the Lotus". This piece of literature enjoys everlasting artistic charm and a powerful spiritual strength to purify people's soul, not only because of the author's extraordinary imagery thinking and excellent writing skills, but, more importantly, because it is closely related to the author's tens years or so of insight on life. This "insight" comprises the personality traits and values of life that the author concluded from his in-depth logical analyses, judgments and inferences on the various interpersonal relationships in society. It is because of this that the artistic charm and spiritual strength of the piece became inseparable from the author's logical thinking.

The facts above prove that though logical thinking cannot produce inspiration or insight directly (these originate directly from imagery thinking or intuitive thinking), it provides guidance, regulation and control to the achievement of the goal of creation. Without these functions of logical thinking, and by relying on imagery thinking and intuitive thinking alone, creative activities are impossible. This is the reason why, although Taylor and Beck had the same observation and imagination as Wegner (that means they had the same inspiration or insight), they continued to remain at their initial level of imagination rather than producing an innovative theory.

6.5.5 Focusing on the Cultivation of Dialectical Thinking

Dialectical thinking means observing and analysing objects from the perspective of dialectic. That means respecting objective laws and valuing researches and investigations, being realistic and seeking truth from facts. It also means viewing matters with the view of unity of opposites—one should be able to see both the confrontations and the unity between objects, as well as the reciprocal transformation between objects under certain circumstance; one should be able to see both the positive and negative sides of objects; and detect the adverse factors in the favourable factors, and vice versa. All in all, it is a belief that everything has two aspects rather than one.

In our country's excellent cultural heritage, examples of using dialectical thinking can be found easily. Some of them are known by everyone and enjoy popularity, for example, "Cook Ding's Method of Slaughtering Cows", "Cao Gui's Debate on War", "Cao Chong Weighted the Elephant", "Zou Ji Persuades The King of Qi to Accept Advice" and the poems of Liu Yu Xi. All of them consist of high level dialectical thinking. Most of them are incorporated in the language or history

teaching resources of primary or secondary schools. If they are used appropriately, they will produce incalculable effects in cultivating the creative thinking of our country's teenagers. The story of "Cao Chong Weighted the Elephant", for example, is an excellent model for the cultivation of dialectical thinking in teenagers.

"Cao Chong Weighted the Elephant" is a well-known story. A broad outline of the story is: One day, Cao Cao got an elephant and he wanted to know how heavy this giant creature was. So he asked his officials for a method to weigh it. (This was a very difficult problem in the Three Kingdoms period, which was about 1800 years ago.) One of the officials proposed felling a huge tree to make a big scale. Cao Cao shook his head—even if a scale strong enough to bear the weight of the elephant was made, who had the power to lift it? (In ancient times, people needed to lift the scale beam by hand or on their shoulders in order to weigh something.) Another official suggested killing the elephant and chopping it into pieces, so that it could be weighed easily. Cao Cao was even more dissatisfied—he wanted to have a complete and living elephant. At this time, little Cao Chong, who was only seven, proposed a good idea: Lead the elephant on to a boat, than mark the waterline on the side of the boat. Lead the elephant off the boat and put some rocks in the boat after that. When the amount of rocks in the boat was heavy enough to reach the marked waterline, unload the rocks. Weigh these rocks separately, and the sum of their weights would be the weight of the elephant.

It is difficult to prove whether Cao Chong really possessed such wisdom when he was seven (may be it is the wisdom of the author of the story), but that is not important. The important point of this story is the **dialectical thinking** it embraces: detecting the adverse factors in the favourable factors, and vice versa; and more importantly, being **good at extracting rational opinions from false ideas**. The suggestion made by the first official seems unrealistic, for no one can lift such a heavy scale by hand (or on his shoulder). However, it indeed consists of a rational idea—the problem could only be solved with a scale that could stand the weight of the elephant. The suggestion of the second official is even more ridiculous. How could one kill a living elephant for such a purpose? Yet, in this seemingly ridiculous idea, there is a very valuable thought—breaking up the whole into parts. Cao Chong absorbed the rational opinions from the two officials' false ideas—trying to find a huge scale which can stand the weight of an elephant, but does not require someone to lift it by hand (or on shoulders). Based on his careful daily observation and association, he found that a boat is something that fulfils this requirement. Then, there was the question of how to break up the whole into parts. Based on general scientific knowledge and rigorous logical analysis (in order to break up the whole into parts, the whole needs to be divided into a number of parts; if the objects of such process is a living creature, a lifeless substitute is needed to avoid harming that creature), it is obvious that substituting the elephant with rocks or sand is the easiest and most effective method. It was the integration of imagery thinking (careful observation and association) and logical thinking (general scientific knowledge and rigorous logical analysis) guided by dialectical thinking that enabled Cao Chong to creatively solve a difficult problem which normal people failed to solve in his time.

Dialectical thinking provides the train of thought and strategies that help to solve problems in creative thinking activities from a philosophical angle. Thus, it is not only significant to the formation of crucial breakthroughs in creative thinking activities, but is also an important guide in the whole creative thinking process. For example, at the initial stage of creative thinking, as mentioned, divergent thinking is needed to determine the goals of thinking, so as to determine the direction of thinking. Divergent thinking relies on three guiding strategies to determine the correct direction of the basic thinking process. These strategies are: **seeking variety from the uniform, seeking the opposite from the positive direction, and multi-directional radiation**. It is not difficult to discover that all these strategies embrace the unity of opposites (uniform—variety and positive—opposite are two sides of a contradiction, while "multi-directional radiation" forms the relationship of unity of opposites with the "single directional focus" of convergent thinking) and are the manifestations of dialectical thinking. Thus, divergent thinking can indeed be regarded as another expression form of dialectical thinking at the initial stage of creative thinking.

Imagery thinking, intuitive thinking and logical thinking are the basic forms of human thinking, and thus they do not resemble divergent thinking. Essentially they are equivalent to dialectical thinking. However, the aim of thinking is to make a general reflection on the nature and properties of objects or the patterns of internal relationships between objects (that is, the spatial structural relationships between objects). Thus, there is a question of how to gain such reflection more efficiently. It is common sense that materialist dialectics is the world view and methodology of Marxism. It is the fundamental guarantee of comprehensiveness, profundity and perspicacity in human thinking. Thus, it is only using the viewpoint of dialectical thinking as a guide that the basic forms of human thinking (no matter which form) can effectively satisfy the above requirement of the aim of thinking. Actually, the above analyses clearly reveal that in the story of "Cao Chong Weighted the Elephant" is a typical example in which dialectical thinking was the guide that allowed imagery thinking and logical thinking to have a more accurate goal and direction. Dialectical reasoning also enabled a more effective integration of these two types of thinking, which in turn allowed human thinking to possess real comprehensiveness, profundity and perspicacity.

All in all, dialectical thinking should be used throughout the whole creative thinking process. It is only in this way that the contents and results of our thinking can become more comprehensive, thorough and perspicacious. This will also enable us to attain more and better creative breakthroughs quicker.

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Appendices: Language Education Reform Based on the New Theory of Children's Thinking Development

Appendix 1
Primary School Language Education Based on the New Theory of Children's Thinking Development

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Abstract On the foundation of the reflection of the current situation of primary school language education, this paper reconstructs the teaching theory and approach of primary school language subjects based on the new language curriculum standards and the New theory of Children's Thinking Development. With more than 3 years practice in the "innovative experiment on an leapfrogging development approach in language education", the specific strategies to incorporate the proposed teaching theory and approach in different types of primary school language lessons are also set out.

Keywords Language education · Accelerated development · New theory of children's thinking development · Extended reading

1. Reflection of the Current Situation of Primary School Language Education

For years, the language education reform has enhanced the development of language education to some extent and has accumulated many precious experiences. Yet, without any breakthrough in teaching ideology and theory, and especially without recognizing the profound influence the advancement of time has brought to the way children study language, it resulted in various problems and even errors in the actual practice of primary school language education.

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1. Neglecting the Original Learning Basis of Children

All learners will incorporate their acquired knowledge, skills and attitude into a new learning process. In designing and conducting teaching, this is the prime point that should be considered, and this is also what we usually referred to as the starting point of learning. It is only in this way that our education will have a well-defined objective. However, in our researches and practices of primary school language education, the strong learning basis initially possessed by children has long been neglected both intentionally and unintentionally.

The New Theory of Children's Thinking Development stated that [3], according to the researches by our country's psychologists, pre-school children aged 5–6 possessed more that 3500 verbal vocabularies [1]. Professor Li Yu Ming's research on children's learning and mastery of the "interrogative sentence subsystem" also states clearly that after 4 years of age, children's mastery of the various Chinese verbal sentence patterns has gradually become perfect and mature in our country. This proves that pre-school children have a very strong foundation of their native spoken language. Yet, the language teaching resources and language education in primary schools has failed to fully recognize this point for many years, for example, in pinyin teaching, focus is only put on how to pronoun, spell and write the pinyin. The learning basis originally possessed by students is not utilized together with the newly learned pinyin and phonetic notions to read some nursery rhymes, riddles or tongue twisters. This turns pinyin learning into a dull process, and wastes a lot of precious times; In character recognition teaching, excessive times are spent in explaining the pronunciations and meanings of the characters and phrases. A variety of activities are conducted to analyze the pronunciations and meanings of Chinese characters while the learning and writing of the "forms" of the characters are not emphasized; In teaching how to read the texts, many teachers fail to realize that only by reading the texts with the assistance of pinyin, students would be able to understanding the meanings of the texts through the context. They think that students know nothing and that students would understand the texts only by their repetitive lecturing, analyses and reading instructions. This wastes a huge amount of time.

2. Separating Pinyin, Character Recognition, Reading and Writing, Which are Originally Closely Connected

The *Language Curriculum Standards (Trial Version)* [2] clearly define the overall aims of language education in primary schools. However, for the actual ways and methods to conduct language education, it only emphasizes that the principle of independence, cooperation and investigation should be followed. Though this gives much freedom to the teachers, it also results in diverse understandings on how the new curriculum standards should be implemented. The conventional education idea of "character recognition first, then reading, and lastly writing" has created the strange phenomenon of teaching pinyin in isolation, character recognition in isolation, reading in isolation and writing in isolation for a long time. These four teaching sections, which are originally closely connected, are isolated and separated. Initially, the teaching efficiency of language in primary school should

be higher. Yet, with this separation, it becomes low in quantity, efficiency, quality and cost effectiveness, and this triggers discontent form society. This is mainly caused by a failure to recognize clearly the aims and patterns of children in learning language. In fact, the fundamental purpose of learning language is communication (that means exchanging thoughts and feelings), and communication is also the most effective way and method to learn a language. Children can only learn and master language swiftly in their interactions with others, i.e. in applying language. Pinyin, character recognition, reading and writing are necessary, and can also be fully incorporated in language application. In this way, students can learn in a relaxed atmosphere and a lot of teaching time can also be saved, which makes it possible to attain high-efficiency language teaching.

3. Neglecting the Cultivation of Students' Thinking Ability

For many years, on the issue of children's cognitive development, the teachers are greatly influenced by Piaget's "stage theory of children's cognitive development". They believe that "children at the pre-operational stage (2–6 years old) only possess representation-based thinking, but do not have language concept-based logical thinking; children at the stage of concrete operations (7–11 years old) only have elementary logical thinking which based on concrete objects, but do not possess abstract logical thinking on hypothetical propositions" [3]. This influence of Piaget's theory is manifested in the neglect of cultivating junior and middle grades primary students' logical thinking ability. The language education of junior primary school grades only focuses on recognizing and writing characters, as well as explaining characters and phrases. Extended reading and writing training are not required, for there is a wrong belief that primary students at this stage are still unable to compose a complete discourse. Thinking trainings only involve representation-based imagery thinking while language concept-based logical thinking is neglected. Even in the senior primary school grades, language education still only touches on elementary logical thinking which based on concrete objects, but not abstract logical thinking on hypothetical propositions.

4. Abuse of Questions and Reading During Lessons

During lessons, many teachers like to inspire students' thinking and aid students' understanding on the texts through raising questions. If the questions are inspiring and able to give appropriate guidance to the students, then raising questions is really a better teaching method. However, some teachers fail to have an accurate analysis and understanding of the teaching goals, and are unable to question on the key points in the comprehension of the texts. Instead, they raise factual questions and assign many students to answer them. A lot of time is used, but the students gain nothing. This is the typical case of "leading students by the noses". Apart from that, there are also many problems in the language teaching section on "reading and comprehending". Reading is originally very beneficial to the cultivation of junior grades primary students' logic and sense of language. Reading famous masterpieces aloud is especially beneficial to expanding students' scope of knowledge, and more importantly, to cultivating students' aesthetic tastes and nurturing their noble thoughts and feelings. However, the "reading and comprehending" sections

in junior primary school grades are abused by many teachers. No matter what the contents of teaching are, and no matter students have the relevant life experience or not, various types of reading would be used in an attempt to let students comprehend the texts. Even when some texts are memorized thoroughly by heart by the students after repetitive reading, students would still be asked to read them again. How can students "comprehend through reading" in such situation?

2. Striving Hard to Reform Primary School Language Education Based on the New Theory of Children's Thinking Development

The root of the aforementioned misunderstandings and errors in implementation is the failures to have a correct recognition of the objective laws of children's language and thinking developments, as well as a clear recognition of the relationship between language and thinking. In terms of the issue of children's language development, these failures result in upholding the linear education idea of "character recognition first, then reading, and lastly writing", as well as the isolation and separation of character recognition, reading and writing in teaching. In terms of the issue of children's thinking development, these failures result in employing Piaget's "stage theory of children's cognitive development" as the major guiding ideology, and believing that primary students below 11 years old still do not possess abstract logical thinking on hypothetical propositions. In other words, children in this age group are normally unable to compose writing with a certain degree of abstractness and generality with their native language. (This is because composing writings involve language expression ability and various types of thinking abilities, and that the abstractness and generality of writings are determined by the authors' abstract logical thinking ability.) By critically adapting Piaget's stage theory of children's cognitive development, and taking into consideration the new progress in brain science researches and the new characteristics of children's thinking and language development in the information era, the New Theory of Children's Thinking Development provides a new division of children's thinking and language development, and gives an interpretation of the development processes of thinking and language that basically conform to the actual situation of modern children. This new theory has at least the following two implications on primary school language education.

1. The Teaching Idea of "Language Use-Centred" must be Upheld

The New Theory of Children' Thinking Development points out that [3] children learn language in the processes of communicating with others (exchanging thoughts and feelings), i.e. in applying language. Children's learning processes of language must centre on language application. Children learn language because they would like to use it, and they must use it immediately once they learned it. They must also strive to use it within a certain context. Words and sentence patterns should never be memorized in isolation without the context. The education idea of "language analysis-centred" should never be adopted in teaching and learning language. This is because they violate the children's law of language learning.

To implement the education idea of "language use-centred" effectively, **character recognition, reading and writing** should be integrated dynamically in

language education. They should not be isolated and separated as in conventional teaching. In the actual practice, the teacher-directed—student-centred combined language teaching approach should be used, and it should include three sections, **lecturing the texts→extended reading→written expression**. Both junior and senior primary school grades should start teaching with reading and writing rather than character recognition. So, do these new language education idea and teaching approach have a firm theoretical and factual base?

(1) Pre-school children have a strong mother tongue foundation, making the implementation of the above concept and approach possible

As mentioned, children above 4 years old in our country have a more perfect and mature mastery of the various verbal sentence patterns of Chinese. When they are around 6 years old (before entering school), they basically mastered 3500 verbal vocabularies. This shows that they had mastered the "pronunciations" and "meanings" of the 3500-odd vocabularies, but they are just unable to recognize and write the Chinese characters of these vocabularies [1]. This is a very important fact for language education in primary schools. With such strong foundation, there will be a big drop in the difficulties of teaching vocabularies and lecturing the texts. Teachers will be able to attain the requirements of the curriculum standards by using appropriate methods in teaching the structure and writing of Chinese characters, as well as providing necessary explanations to the key points and difficult points of the texts. In this way, the lesson time can be greatly reduced without affecting the effect of teaching, and valuable time is spared for extended reading and writing. Other than that, students have basic knowledge on the pronunciations and meanings of vocabularies, as well as mastery of pinyin. Thus, by marking hanyu pinyin in the extended reading materials, primary one students will be able to read without any difficulty the popular literature, such as nursery rhymes, tongue twisters, short fairy tales, idiom stories and easy-to-read ancient poetry and even the simplified version of classics.

(2) Modern information technology provides the condition for extended reading and writing training

Extended reading is a vital part for realizing accelerated development in primary school language. It is only through extensive extended reading that a large amount of vocabularies can be acquired, and that the humanity of students can be enhanced effectively. After students read the online extended materials, they should express themselves through writing. This will foster students' high-level mental processing. They will have a more solid mastery of knowledge and deeper emotional experiences. Without any one of the two sections mentioned above (extended reading and written expression), the education idea of "language use-centred" cannot be realized. The multimedia and Internet-centred information technology provides the possibility to realize this education idea. On the one hand, there are rich and high-quality multimedia teaching resources with pictures, words and sounds (mainly refers to hanyu phonetics) on the Internet. They trigger students' interest in learning and reduce students' difficulties in reading comprehension. On the other hand, Internet message board is an ideal support tool.

By learning hanyu pinyin and learning to use the keyboard, students will be able to perform written expression with standardized pinyin input method. (It is impossible for primary one or two students to handwrite passages of a few hundreds or even a thousand odd characters. If this is forced to be done, it will bring a substantial increase in their homework burden.) Though the non-Internet-based Leapfrogging Development Experiment proves that without an Internet environment, extended reading and written expression can be carried out with printed materials and by handwriting, and it will also attain a better result than using normal teaching method. However, compared with reading online materials, reading printed materials has a slightly poorer result; For written expression, as handwriting places a higher demand on the stroke orders and strokes of the Chinese characters, it yields much higher difficulty than computer typewriting. Apart from that, as primary one and two students have a slower writing speed, the quality and quantity of the handwritten compositions are poorer than the typewritten compositions at the initial stage. Yet, by gradually acquiring more vocabularies, accumulating richer language and increasing the speed of writing, the differences between these two types of compositions reduced.

2. Cultivation of Language Ability must be Integrated with Training in Thinking Ability (Especially that of Creative Thinking Ability)

"Language is the material shell of thinking". Language and thinking are naturally inseparable, and their developments are closely related. Language is the foundation of thinking development. Advanced development of abstract logical thinking would be impossible without language, while thinking ability also exerts great influence on the formation of language ability. If the two of them are integrated dynamically in teaching, they will complement and enhance each others. Separating them will be harmful to both of them, and thus cultivation of thinking ability should be incorporated in language education. The New Theory of Children's Thinking Development believes that pre-school children possess proficient oral ability and have formed the elementary thinking quality. Although the reading and writing abilities of primary one students are yet to be developed, they possess basic representation-based imagery thinking and intuitive thinking, as well as basic language concept-based logical thinking. Thus, even in primary one and two's language education, the cultivations of these three types of thinking should be strongly emphasized equally without solely emphasizing or neglecting any of them. This is because these three types of thinking are initially interdependent, mutually supportive and inseparable.

3. The Implementation Strategy of Pinyin Lessons
1. Exerting the Teachers' Leading Role and the Advantages of Multimedia Courseware, Achieving the Requirements of the Curriculum Standards with High Efficiency

With the development of society and improvement of living standard, most of our country's towns and rural villages in the more economically developed area have normally developed pre-school education. In pre-school education, pinyin is an important content of teaching. Thus, for children of the developed area, who

just entered primary school, the consonants, vowels and compound syllables of pinyin are not unfamiliar things, but something that they have a certain foundation. (Some students are even able to write the pinyin, and to recognize and read many Chinese characters.) If students are taught as if they know nothing, it will surely affect their interest in learning. Certainly there does have some students who had not learned pinyin before they entered primary school, and the needs of this type of students must be met in teaching. After having a serious analysis on the teaching tasks of hanyu pinyin teaching, we believe that teachers should focus their efforts on instructing the key points and difficult points when teaching pinyin. They should provide necessary coaching on the pronunciations of the pinyin which are easily confused, as well as on how to write pinyin. The other relatively easier teaching tasks should be left for students' independent learning with the courseware. For example, when teaching *b p m f*, the courseware which teaches pinyin in the archives would be used first. With this courseware, students would learn to read the pronunciations of these four consonants, as well as the spellings and pronunciations of these four consonants with a single vowel by themselves. After that, the teacher would provide necessary instructions on the pronunciations of *b* and *p*, which are easily confused, and on how to write the four consonants. In this way, the learning enthusiasms of both students with or without pinyin knowledge would be fully triggered, and this would also enhance the efficiency and effect of teaching.

2. Using Extended Reading to Consolidate Hanyu Pinyin and Expand Vocabulary Acquisition

There are two aims to conducting extended reading at the hanyu pinyin teaching stage: (1) To consolidate hanyu pinyin; (2) To expand vocabulary acquisition. As students at this stage accumulate only a small number of the forms of Chinese characters, the reading materials must be carefully chosen so as to reduce students' difficulty in independent reading as much as possible. Research proves that [4] phrases used in daily life, things that students are interested in, and rhythmic materials are more attractive to students at this stage. Thus, catchy tongue twisters, nursery rhymes or riddles that are closely related to students' daily life are more appropriate extended reading materials for the pinyin teaching stage. For example, when teaching *b p m f*, we provided four nursery rhymes and two riddles that are closely related to school life to students; When teaching *ai ei ui*, we gave students 12 words related to daily necessities and 5 riddles. As children who just entered school have a weaker awareness of self-learning and students have varying levels of ability, we proposed that at the initial stage of pinyin teaching, extended reading should first be leaded by teachers, and then performed together with the whole class (or in a group), and at last transferred to the stage in which students read by themselves.

3. Setting up Various Language Practice Activities, Incorporating Cultivation of Thinking Ability in Pinyin Teaching

The new curriculum standards clearly stated that [2] pinyin is the tool for character recognition, reading and writing. Thus, the authors believe that using

pinyin to form phrases, construct sentences, read and write is the best method to consolidate pinyin teaching. Apart from extended reading, various language practice activities, such as forming phrases, constructing sentences, describing pictures verbally and creating nursery rhymes, should be carried out to allow students to speak and write with pinyin. For example, when teaching *b p m f*, we introduced the lesson with verbal descriptions of pictures and conducted various practice activities, including creating and answering riddles, composing nursery rhymes that aid the memory of pinyin, verbally describing pictures to consolidate pinyin and typewriting phrases; When teaching *ai ei ui*, activities such as forming phrases, answering riddles, reading tongue twisters and using vocabularies of daily necessities to form sentences were conducted. These practice activities do not only consolidate the pinyin learned in that particular lesson, but they also incorporate training in the elementary language concept-based logical thinking, and realized the dynamic integration of character recognition, reading and writing in pinyin teaching.

4. The Implementation Strategy of Character Recognition Lessons

1. Exerting the Teachers' Leading Role and Employing the Innovative Character Recognition Method, Achieving the Requirements of the Curriculum Standards with High Efficiency

There are two major teaching tasks in character recognition lessons: (1) Teaching the new words in the texts and character recognition method; (2) Understanding of the contents of the texts. Usually, the new words in a text can be divided into two categories: (1) The "doubles", which students are required to recognize and read; (2) The "quartets", which students are required to recognize, read, write and use. According to the New theory of Children's Thinking Development [3], children possessed strong mother tongue foundation before they entered school, and thus, it is not difficult for them to learn the pronunciations of the words in these two categories. Students are able to read most of the words with the aid of pinyin. In the teaching process, teachers do not need to attend to each and every aspect. They can attain the requirements of the curriculum standards by only providing necessary guidance on the correct pronunciations of the words which are difficult to read, and then letting students read them in the linguistic context. In other words, the forms of words, especially the strokes order, strokes and writing of the "quartets", are the key and difficult points of character recognition teaching. During lessons, there are a lot of innovative methods which can aid students' memory of the forms of the words, such as adding a stroke, reducing a stroke, changing the component, saying nursery rhymes, telling stories and answering riddles. The requirement to write the characters can be achieved by teaching students the stroke and stroke orders after they had memorized the forms of the characters. Most texts of the character recognition lessons are relatively easier. They are usually nursery rhymes, riddles, couplets and ancient poems. It involves little difficulty in instructing students to understand and read the texts, and less time is needed to finish teaching a text. Thus, a large amount of time can be saved for extended reading and written expression.

2. Consolidating and Transferring the Knowledge of New Words with Extended Reading

Expended reading in character recognition lessons centred mainly on character recognition and has two major aims: (1) Consolidating the new words learned from the text of the lesson with the linguistic context of new passages and gaining more understanding of the other Chinese characters. Thus, the extended reading materials in character recognition lessons should mainly be vocabulary stories, allusions of words, riddles about words, nursery rhymes and tongue twisters; (2) Transferring the character recognition method used in the lesson to other instants, so that similar methods can be used to acquire more Chinese characters. For example, when teaching *Vocabulary Acquisition 5* (learning words through riddles) in book 1 of the textbook by the People's Education Press, we used the following two types of resources: (1) Six short passages written with the new words of this particular text and four short stories which included the new words of this particular text; (2) Fourteen riddles about the new words of this text or other objects and one story about three children answering a riddle. A further example is when we taught *Vocabulary Acquisition 1* (four character idioms about spring) in book 2 of the textbook by the People's Education Press, in order to aid the memory, revision and application of the new words, we provided students with seven riddles and six nursery rhymes (about the sceneries of spring) related to the theme of the text. After teaching the text, we gave students 12 nursery rhymes, ancient poems and short passages which describe spring. In this way, students' understandings of spring can be deepened and they can also acquire more vocabularies. Extended reading should mainly be conducted independently by the students themselves since the initial stage of character recognition teaching.

3. Designing Various Composition Activities Related to Chinese Characters, Expanding Knowledge and Training Thinking Simultaneously

As mentioned, character recognition lessons have two major teaching tasks: (1) Teaching the new words in the texts and character recognition method; (2) Helping students to understand the contents of the texts. For the first task, we believe that both thinking training and typewriting expression during the lessons can be organized around the memorization of the forms of the characters and the application of vocabularies. In order to aid students' memorization of the forms of the characters and application of vocabularies, teachers can let them answer and create riddles about words, and compose their own stories. Some teachers may say, "There're numerous methods to memorize and apply vocabularies. Methods such as adding a stroke, reducing a stroke and changing the component can also attain the aims of consolidating and applying vocabularies." However, after analyses and comparisons, we found answering and creating riddles about words, and composing stories place more emphasis on association, imagination and meaningful memorization of words. They are more interesting and generate more active participation from students, which resulted in better recognition and memorization of characters. For example, for the character "旦" [literally means "dawn"], the adding a stroke method will say "add a horizontal stroke to '日'

[literally means "sun"] is '旦'", while a riddle will use "the sum rise from the horizon" to aid students' memorization of this character. It is obvious that riddles about words give a more figurative, meaningful and easy memorization of a character. More importantly, answering and creating riddles about words, and composing stories are also training in thinking ability. If they are carried out over a long period of time, students' thinking will become very active, which in turn enhance their character recognition ability. According to our experiences, students' abilities to learn and memorize vocabularies are well-developed when they are in primary two. Except words with especially complex orders and numbers of strokes, students are able to memorize words without much effort. Thus, more time can be saved for extended reading and writing. Some teachers may think that it is difficult for primary one children to produce good riddles about words or stories. Yet, practice proves that with appropriate guidance from teachers, students are able to compose some surprising and interesting stories and riddles. For example, when teaching *A Tiny Little Boat* in book 1 of the textbook by the People's Education Press, our students composed riddles such as "A person sits inside his home to look at the beautiful sky" (Answer: 闪[1]) and "Two children sit back to back on a mound to look at the stars. The stars are twinkling. It is really beautiful." (Answer: 坐[2]); When teaching the aforementioned *Vocabulary Acquisition 5* (learning words through riddles), our students created 85 riddles in the lesson and many of them continue to memorize words by composing riddles after lesson.

For the second teaching task, various activities, which help to deepen students' understanding of the texts and train their thinking, can be designed according to the different characteristics of the texts. For example, when teaching aforementioned *Vocabulary Acquisition 5* (learning words through riddles), we let students compose their own riddles and answer the riddles of others; when teaching *Walk for Two, Three Miles in One Go* in book 1 of the textbook by the People's Education Press, we designed a nursery rhymes composition activity; when teaching *Vocabulary Acquisition 4* (nursery rhymes of animals) in book 2 of the textbook by the People's Education Press, we let students write something about their favourite animal; when teaching *Vocabulary Acquisition 1* (four character idioms about spring) in book 2 of the textbook by the People's Education Press, we let students write about their feelings about spring after reading a lot of ancient poems and nursery rhymes related to spring.

5. The Implementation Strategy of Reading Lessons

Reading lesson is the most frequent and typical language lessons. Its major teaching tasks are reading instruction and text comprehension. In discussing the

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[1]The Chinese character "闪" (literally means "flash") composes of "门" (literally means "door") and "人" (literally means "person").

[2]The Chinese character "坐" (literally means "sit") composes of "人" (literally means "person") and "土" (literally means "mud").

implementation strategy of this type of lesson, the genre of the texts as well as the cognitive level of students should be put into consideration. This is because even for texts of the same genre, their key and difficult points in teaching would be different for students in different grades or students with different levels of cognitive development in the same grade.

1. Exerting the Teachers' Leading Role to Break Through the Key Points and Difficult Points in Teaching, Achieving the Requirements of the Curriculum Standards with High Efficiency

Most texts for primary one students are short and have simple logics. Thus, in arranging the two lessons devoted to a text, the first lesson should focus on reading through and gaining an overall feeling of the text, as well as on character recognition teaching; the remaining lesson should focus on reading instruction and comprehension of the text. Materials of extended reading and the requirements of typewriting should be determined in accordance with the teaching focus of a particular lesson. The teaching strategy of the first lesson is the same as the aforementioned one of character recognition lessons, and thus will not be repeated here. For the second lesson, as reading instruction and text comprehension is closely connected (reading the important sentences and reading expressively enhance students' understanding of the texts and the feelings of the authors; The understanding of a text in turn also influences the effect of reading.), teachers can use methods and strategies, namely, commenting and analyzing important sentences, reading demonstration and evaluation, asking inspiring questions and role play, to attain the requirements of the curriculum standards. Starting from primary two, texts become longer and richer in contents. Students also gained a huge number of vocabularies after a year (especially through extensive extended reading for 1 year). Continuous enrichment and perfection of the teaching methods and strategies for reading lessons are required. Thus, in primary two, apart from commenting and analyzing important sentences, reading demonstration and evaluation, asking inspiring questions and role play, methods and strategies, namely, inquiry, discussion, thinking in another position, providing framework and encouraging imagination, should be employed. For example, when teaching *We Success*, we took into consideration that junior grade primary students may not be able to understand the happiness and excitement people experienced after winning the bid for the Olympics described in the text. Thus, after gaining an overall feeling of the text, we gave students several passages which describe the difficult process our country experienced when bidding for the Olympics, and the profound influence hosting the Olympics brought to the politics, economy, culture and sport of a country. (This is equal to providing a "framework" to understand the text.) After that, we also asked the students some inspiring questions and organized a discussion so as to achieve the requirements of the curriculum standards.

2. Choosing the Extended Reading Materials Carefully to Consolidate, Deepen and Expand the Requirements of the curriculum Standards

Extended reading is an important strategy to consolidate, deepen and expand the requirements of the teaching aims. Based on the teaching tasks of the reading

lessons, and taking into consideration that the texts of primary two and three are longer and some texts are richer in contents, extended reading materials should be chosen from a variety of layers and angles. For example, the text *Where are you, Uncle Lei Feng* does not only require students to understand Lei Feng's spirit of serving the people, but also demand them to interiorize it and turn it into actual actions. Thus, in the teaching process, we chose and edited extended reading materials of two categories, "Lei Feng and his deeds" and "Lei Feng around us", and we let students express their thoughts by typewriting writing on "I need to learn from Uncle Lei Feng". A further example is when we taught the text *The Balloon by the Window*, our years of teaching experiences told us that students were able to understand the central idea that classmates should love each others. However, the difficult point was how students can interiorize this feeling and attitude, and turn it into their actual actions. In the first lesson, when the teacher asked, "What does a person need most when he is ill?" Most students answered, "Medicines." Though this answer is correct, it does not match the requirement of the central idea of the text. To guide students properly, we left them with a doubt after they answered the question, and let them read eight passages about the feelings and thoughts of patients. This allowed them to have a more proper and thorough understanding of theme of the text. When teaching the texts such as *The Three Sons* (the theme is filial piety) and *"Red Scarves" are Really Good* (the theme is loving the birds), the extended reading materials we chosen provided both the pros and cons of the issues. In this way, students could deepen their understandings of filial piety as well as harmony between men and nature from different angles and perspectives. Extended reading in reading lessons are usually carried out independently by students themselves. The genre of the texts and the needs of the teaching designs determine whether this extended reading would be conducted before teaching the text, together with the teaching of the text or after teaching the text.

3. Integrating Training of Thinking Ability with Reading Instruction

As stated, the integration of thinking ability training with character recognition teaching is realized mainly though methods such as creating riddles and using vocabularies to write stories. To integrate thinking ability training with reading instruction, flexible arrangement should be made in accordance with the genre of the texts. For example, for **texts which describe sceneries and seasons**, students can be asked to typewrite passages with topics like "Spring/ Summer/ Autumn/ Winter in My Eyes", "My Hometown", "Winter in Lingnan" and "Our School" after conducting extensive extended reading on well-written prose and poetries about the beautiful sceneries in the four seasons. For **narrative texts which are more informative**, students can be asked to compose reading reflections and imaginative writings after reading the extended reading materials about the relevant knowledge. For example, when teaching the text *Life in Space is Fun*, the topic for typewriting we designed for students was "One Day, I Went to the Space…"; when teaching *The Dream of De*, we let students dream about "A Day in 2050"; when teaching *Lan Lan Crosses the Bridge*, students were asked to design the "Bridge in the Future" in their imaginations; when

teaching *The Extinction of Dinosaurs*, we let students explore "The Mystery of the Disappearance of Dinosaurs " like scientists. For **fairy tales which are informative and didactic**, students can be asked to imitate, write an end or rewrite fairy tales after reading some stories with similar subject matter. For example, when teaching *The Paper Boat and the Kite*, we let students imagined themselves putting a paper boat into a small stream and then wrote an end to the text; when teaching *Little Gecko Borrows a Tail*, we encouraged students to create "A New Version of Little Gecko Borrows a Tail" through independent exploration. For **affective texts**, students are required to read the relevant materials from different angles and perspectives (including both pros and cons), and then write down their understandings, feelings and experiences after thinking seriously about their own thoughts, emotions and attitudes. For example, when teaching *The Three Sons*, students were asked to express their changes in feelings and attitudes after learning the text with the topics "To the Three Mothers" or "To the Three Sons"; when teaching *"Red Scarves" are Really Good*, we let students wrote about "Rescuing the Birds" to express their love and care for birds; when teaching *I am Proud of You*, students were asked to express their penitence for a wrong doing and their determination to reform by writing "A letter to…".

6. Attentions in the Actual Practice
1. Using Information Technology Scientifically and Reasonably
Technology is a double-edged sword. While modern information technology provides the ideal environment for primary school language education and gives possibility to accelerated development in education, it may also bring certain negative impact. If it is not used appropriately, not only will it fail to achieve accelerated development, but it will bring an exactly opposite effect. To avoid such situation, attention should be placed in the following in the actual practice:

(1) **Using information technology properly**
Information technology should only be used in teaching sections which it has an advantage position (such as extended reading and typewriting exercise). Traditional media can be used in other sections.

(2) **Using information technology healthily**
If teaching is conducted in an Internet environment, non-radiative products such as LCD monitors should be used. When actively conducting extended reading and computer typewriting in an Internet environment, students' eye exercises and extra-curriculum activities should not be neglected, but more attention should be placed to preserve them.

(3) **Emphasizing the cultivation of habit in an Internet environment**
Attention should be placed on this issue since the beginning, so that students can adapt to the mode of learning an Internet environment—forming the good habit of independent learning, collaborative learning and listening to others' opinions patiently, as well as using the various facilities in the networked classroom correctly.

2. Concerning About the Balanced Development of Students

No matter it is conventional teaching or teaching in an Internet environment, imbalanced development is an objective fact. As there are differences between students, the idea of "advancing in the same pace" is unrealistic. Compared with conventional lessons, the primary school language lessons of Leapfrogging Development Experiment provide a lot of opportunities for students to carry out independent learning and collaborative learning. As there are differences in the knowledge foundations and learning abilities between students, this implies a larger space for diverse development. Students who have a relatively weaker foundation, self-learning awareness and ability may be unable to catch up with the development of those students with better foundation, self-learning awareness and ability. That means the problem of imbalanced development may be more prominent. We should work hard to avoid the situation in which individual student is left far behind. To do so, teachers should pay more attention to this type of student in the teaching process (especially in the independent learning section), so that all students can gain a certain levels of development.

3. Handling the Relationship between Conducting Basic Teaching Approaches and Realizing Innovations in Teaching

"**Lecturing the texts→extended reading→written expression**" are the major teaching sections required by the accelerated development teaching approach of primary school language education. **There are methods to teaching**. The aforementioned approach is the basic requirement and feature of accelerated development teaching. It must be upheld in the teaching process, or else the targets of accelerated development cannot be reached. Yet, **there is no fixed method to teaching**. As there are differences in the teaching targets, as well as the contents and themes of texts, the handling approaches and teaching methods should alter in accordance with the specific students and text. In other words, the specific methods and teaching strategies can be chosen flexibly according to the teaching targets, features of the text and the personal teaching style of the teacher. The extended reading and written expression sections can also be creatively conducted in accordance with the teaching goals of different texts and the specific teaching situation, which in turn realize innovations in teaching. This reveals that conducting basic teaching approaches and realizing innovations in teaching are not mutually exclusive, but are contrarily mutually complementary to each other.

4. Insisting on Routinizing Accelerated Development Teaching

Students' development of language ability and cultivation of thinking ability cannot be completed in one or two lessons. Thus, it must be persistently done—the aforementioned language education ideas, approaches and methods should be routinized. The increase of vocabularies, accumulation of language knowledge, strengthening of language sense and improvement in reading comprehension and writing ability are all gradual accumulation processes. Teachers do not need to worry whether students are able to master all the words or passages of the extended reading materials. In other words, there is no need for teachers to raise questions about the contents of the extended reading materials every time, or

read the materials to students or check students' understanding of the words and phrases. It will be alright if students gain an overall feeling of the extended reading materials.

Notes

[1] Zhu, Z. X. (1998). *Child psychology (1993 Revised Edition)*. Beijing: People's Education Press.

[2] *Language curriculum standards (Trial Version)* (2001). Beijing: Beijing Normal University Publishing Group.

[3] He, K. K. (2004). New theory of children's thinking development and intensified reform in language education. *Pedagogical Research*.

[4] Zhao, J. S. & Lou, B. S. (2001). *Language education for pre-school children*. Beijing: People's Education Press.

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Appendix 2
Extended Reading of the Leapfrogging Development Experiment on Primary School Language Education

Yuan Yin, Lin Junfen and He Kekang

Abstract With years of experiences in the "innovative experiment on an leapfrogging development approach in language teaching", the authors point out that extended reading is significant to increasing acquisition of vocabularies, knowledge of nature and society, deepening the affective teaching goals and raising writing ability. It is the prerequisite to realize accelerated development in language education in terms of quality. Based on this, the authors also elaborate the requirements of choosing extended reading materials and the specific implementation strategies of extended reading in accordance with different types of primary school language lessons.

Keywords Teaching resources · Extended reading · Instructional design · Accelerated development

The "New Theory of Children's Thinking Development" points out that [1] preschool children have a very strong mother tongue foundation. (They master more than 3500 verbal vocabularies and are skilled in using the various Chinese sentence patterns.) Thus, in character recognition, which involves the teaching of the "pronunciations, forms and meanings", teachers can focus on the recognition and writing of the forms of Chinese characters, and do not need to spend too much effort in the teaching of pronunciations and meanings. In this way, much time can be spared in each lesson for students to carry out extended reading, and this also guaranteed the implementation of extended reading, which is a vital part of the leapfrogging development approach in language teaching. Then, in the primary school language education, what kind of resource would be regarded as high-quality extended reading materials? How should the high-quality extended reading

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materials be used in the lessons to enhance the attainment of teaching goals and implementation of the new curriculum standards? These are two important questions we language teachers should seriously think about and explore.

1. Existing Problems in the Selection and Use of Extended Reading Materials
Extensive extended reading in every lesson in a vital prerequisite to accelerated development in language education. However, currently, as many teachers are unclear about the meanings and functions of extended reading, lot of problems arise in the selection and use of extended reading resources. Sometimes, there are even situations in which the incidental is put in front of the fundamental.

1. Inaccurate analyses and mastery of teaching goals, breaking the contents of extended reading off from the themes of the texts
Extended reading aims at consolidating, deepening and expanding the requirements of the curriculum standards. In order to achieve this goal, the contents of the extended reading materials must be closely related to the themes of the texts. It is disappointing that many teachers are having an inaccurate and even wrong analyses and mastery of the teaching goals. Usually, they merely consider the genre or the form of the extended reading materials rather than the contents and themes when determining whether the materials are related to the texts. This problem is especially prominent in the selection of extended reading materials for texts about idiom stories, sceneries and texts which stated one's aspiration through objects. For example, for the text *The Four Suns* in book 2 of the textbook by the People's Education Press, the extended reading materials at present are all passages describing the sceneries of the four seasons. Their contents do not touch on the good wishes to benefit mankind and optimize the environment; for idiom story texts such as *Basking in Reflected Glory* and *A Frog in a Well*, though currently there are rich extended reading materials (nearly 20 passages), all of them are only idiom stories. Whether the themes of these stories are really related to that of *Basking in Reflected Glory* (or *A Frog in a Well*) is not considered in the selection process.

2. Over-emphazising the relationship between the knowledge of the texts and that of the extended reading materials, neglecting the humanity
The rich humanities contents of language subjects have deep and widespread influence on the people's spirits. This influence comes from the value orientation of the texts as well as from the artistic appeal of literatures. Thus, in the teaching process, other than teaching language knowledge (including understanding a character, phrase, sentence and passage, and trainings on reading ability and writing ability), cultivation of students' aesthetic taste should also be focused. The major difference between language lessons and moral education lessons is that the former enlightens students the ways to behave and act through gradual influence and love. This fact is known by many teachers. Yet, with limited time and difficulty in finding ideal teaching resources, they merely use resources which are more related to the knowledge of the texts, and neglect the cultivation of students' sentiment in their teachings. This turns many language lessons into environmental education

lessons and travelling knowledge lessons. For example, in a lesson on the text *The Clear Spring Water* which the authors visited, the teacher only provided students with a lot of passages about environmental protection (such as *How to Preserve Water Resources*, *Green Tips*, *Little Green Guardian* and *The Functions of Water*), but did not guide students to have an in-depth comprehension of the theme of this text. Another example is the lesson on the text *The Strange Rocks on Huang Mountain*, many teachers did not hold on to the word "strange" to inspire and train students' imagination and thinking. Instead, they gave students a lot of informative resources about Huang Mountain and other tourist spots, and imitated the tour guide in introducing Huang Mountain. As primary one and two students have little interest in reading informative materials, the aims of extended reading to consolidate, deepen and expand the curriculum standards naturally fail.

3. Having partial understanding on extended reading, turning extended reading into optional embellishment

"**Lecturing the texts→extended reading→written expression**" is the basic teaching mode of accelerated development for lower primary school grades. However, while implementing this teaching mode, many teachers do not have a thorough understanding on the relationship between these three teaching sections, which resulted in mistakes in the actual practice. For example, some teachers think that extended reading aims solely on increasing the acquisition of vocabulary. Thus, they only consider how many additional words and phrases students will learn in determining what to read and how to read; Some other teachers think that as extended reading is for the deepening and expansion of the curriculum standards, it should be conducted after the standards are achieved. If the text is longer and more difficult, then more time should be devoted to the teaching of it and extended reading is not necessary. These two types of understandings reflected in teaching turned extended reading into a dispensable section—If there is spare time, it would be conducted, or else, cancelled. Though extended reading does increase the acquisition of vocabulary, increasing the number of acquired vocabularies is not its major or sole aim. Though attaining the curriculum standards is a must, extended reading and attainment of the curriculum standards should not be put in confrontation. Contrarily, a lot of practices proved that it is the extended reading sections which enable a higher level and more in-depth achievement of the curriculum standards. Thus, extended reading is never an optional embellishment, but a vital part to accomplish accelerated development.

Since we joined the Leapfrogging Development Experiment, we had also made some of the aforementioned mistakes. After some years of exploration, the authors believe that the root of the above problems is a lack of clear understanding on the meanings and functions of extended reading. It is only by having a real understanding on the important meanings and functions of extended reading that a conscious adherence and creative implementation of this section in teaching is possible.

2. The Importance and Practicability of Extended Reading
1. The Importance of Extended Reading

After years of researches, American psychologists proved that there is a close relationship between children's reading ability and their future learning achievements. The developed countries in the West regard mastery of reading ability as one of the core goals of basic education, for example, the Department of Education of America had once organized the America Reads Challenge (http://www.ed.gov/americareads/), and Britain, Japan and Finland had organized the national year of reading to build a good environment for reading education. As mentioned, extended reading can consolidate, deepen and expand the requirements of the curriculum standards, and to be more exact, it involves the following three aspects:

(1) Increasing vocabulary acquisition

The new curriculum standards points out that [2] character recognition is the key point of junior primary school grades education. It can lay a firm foundation for reading and writing. Thus, how to enable students to acquire a pile of Chinese characters (including the pronunciations, forms and meanings) swiftly becomes a hot topic for researches on junior primary school grades language education. For many years, reforms in primary school language education has been centring on the issue of character recognition. (Such as the education reform experiments of "concentrated character recognition" and "phonetic character recognition, accelerated development in reading and writing".) These experiments attempted to let students acquire more vocabularies either by the forms of the characters or by the pronunciations. They were constructive to a certain extent. Yet, as they did not link the learning of vocabularies with reading and writing, they turned vocabulary learning into a process of mechanical memorization which was detached from the linguistic context. This increased students' cognitive burdens and the recurrent rate of vocabularies. Contrarily, extended reading enables understanding and consolidation of vocabularies in reading, as well as a further increase in vocabulary acquisition and mastery of more vocabularies and sentence patterns—Children naturally love listening to stories, and reading story books and picture books. Reading stories (extended reading) with immense interest allows children to unconsciously acquire more and enrich vocabularies. As these words and phrases are acquired in the reading process, i.e. the linguistic context, children are able to have a comprehensive mastery of the "pronunciations, forms and meanings". There will not be confusion of characters with similar forms as in "concentrated character recognition" and confusion of characters with the same pronunciation as in "phonetic character recognition".

(2) Gaining more knowledge about nature and society, deepening the affective teaching goals

It is common sense that any matter or logic in the real world is complex. To clearly grasp the true colours and natures of a matter, people need to explore it from different layers and perspectives. The aim of language education is to enable students to understand the objective world and comprehend the correct ways to behave and

act through the study of language, so that they can form a correct sentiment, attitude and values. Extensive extended reading creates a more favourable condition for the achievement of this aim.

For example, when teaching the text *Life in Space is Fun*, students did not have much feeling about space after learning the text, but only that it is newfangled. It was after reading a series of passages about knowledge about space, the physical and psychological trainings astronauts went through in preparation for the space journey, the various inconveniences of living in the spaceship and the feelings of the astronauts when they returned from space to the Earth that the students realized that: Life in space is hard and dangerous though seemingly "interesting", which in turn generated sincere admiration for the astronauts from the students, and determination to learn from them.

Another example is the lesson on the text *Beijing*. This text mainly describes Tian An Men, asphalt road and an overpass, and gives little descriptions about the other scenic spots and historic sites. After teaching the text, we gave students a lot of extended reading materials about the other scenic spots and historic sites in Beijing, and about Beijing in the past and now with pictures. After reading them, the students spontaneously praised, "Beijing is really beautiful!"; Students' adoration of Beijing spouted without the preaching of the teacher. Such in-depth understanding and feeling about Beijing are impossible by the short content of the text alone.

Still a further example is when teaching *Clapping* (a text that describes the psychological changes of a girl with polio before and after the two clapping her classmates), we provided students with a lot of textual information about the experiences of the disabled, the psychological world of the disabled and how the disabled become independent, as well as how normal people care for and respect the disabled. These information did not only assist students in understanding the text thoroughly, but also help to realize the affective goals of the text—Students learned to care for the disabled and knew that respect is the best care. The great achievements of the disabled even with their challenged bodies also deeply touched the students, and many of them said that they really admire such people. Students also learned that with such an unfortunate life, the disabled still strive for improvements ceaselessly, then as a health person, they should be more hardworking and promising so as to make the best out of their lives.

(3) Enhancing writing ability

Extended reading also enhances students' writing ability in the following specific ways:

- Extended reading expands the number of vocabularies students learned and helps them to master more vocabularies and sentence patterns. It also enables students to have better understandings of linguistic phenomena and enriches their language knowledge. These lay the foundation for writing.
- Extended reading broadens students' horizons and gives them wider and deeper understandings of matters. This further enriches the contents of students' writings by enabling them to have substance and targets in their writings.

- Extended reading deepens students' understandings about the themes of each text, which is beneficial to the formation of correct sentiments, attitudes and values. This guarantees the ideological and political contents of the writings.
- Extended reading provides a lot of excellent examples and references for students' overall conception, organization of the writings and writing skills.

2. The Practicability of Extended Reading

The extended reading stresses in this paper refer to one of the sections in the basic teaching mode of the Leapfrogging Development Experiment ("**Lecturing the texts→extended reading→written expression**"). It is to be conducted in the normal language lessons through a change in the conventional teaching concepts and structures while attaining the requirements of the curriculum standards with high efficiency. It does not require additional lesson hours and thus, is different from the common extra-curriculum reading. Then, is such extended reading practicable? To answer this question, let us first analyze the learning foundation of pre-school children and the requirements of the character recognition teaching goals.

(1) The strong mother tongue foundation of pre-school children creates the condition for high-efficiency attainment of the curriculum standards

The researches by our country's psychologists in the 1980s proved that preschool children aged 5–6 mastered more than 3500 verbal vocabularies [4]. This reveals that primary one students indeed master the "pronunciations" and "meanings" of these 3500 odd vocabularies, but are only unable to recognize and write the relevant Chinese characters. This has already greatly reduced the difficulty of vocabulary teaching in language teaching. Teachers no longer need to spend too much time on the pronunciations and meanings of Chinese characters as in conventional vocabulary teaching, but only need to focus on the instruction of the forms and writing of the characters. They would be able to attain swifter the basic teaching goals of a text by letting students practise writing the characters, and giving necessary explanation to the key and difficult points of that text. This will save much time for students to conduct extended reading. (Extended reading and the written expression section that follows further consolidate, deepen and expand the requirements of the teaching goals of a text.) If this is done persistently in every lesson, there will be a large surge in students' acquisition of vocabulary and their independent study ability will also improve swiftly. This further guarantees that there will be time for extended reading.

(2) Reading materials which are suitable for children and marked with pinyin eliminate the obstacle to extended reading

Children mastered the pronunciations and meanings of more than 3500 words before entering to schools. This reveals that once children are taught hanyu pinyin, and given pinyin-marked extended reading materials such as nursery rhymes, stories and fairy tales, which they are interested in, they will be able to read the materials by themselves and understand them through the context. Thus, extended reading materials for the first semester must be marked with pinyin. All characters in the extended reading materials for the pinyin teaching stage, in particular,

must be marked with pinyin. Starting from the second semester, the numbers of pinyin-marked characters and phrases can be greatly reduced. When it is the third semester, pinyin is needed only for difficult characters and phrases. Starting from the fourth semester, pinyin is no longer needed basically.

(3) The character recognition teaching goal of "more recognition, less writing" enables the implementation of extended reading

The new curriculum standards clearly points out that [2] the requirements on character recognition and character writing should be different. More focus should be put on character recognition and less on writing the characters in primary 1–2. This greatly reduced the difficulty of character recognition teaching because the goal of "more recognition" can be achieved completely through extended reading. On the one hand, students can re-recognize the learned words in the linguistic contexts of extended reading, and the words are also strengthened and consolidated through repeated occurrences in the reading materials. On the other hand, students can also learn many other characters and phrases. This shows that the character recognition teaching goal of "more recognition, less writing" enables the implementation of extended reading, and extended reading also provides the easiest and most effective methods to attain the goal of "more recognition, less writing".

3. The Selection of extended Reading Materials

To ensure that the extended reading section is effective, extended reading materials must be selected in accordance with the following conditions:

- The contents and themes of the extended reading materials must be closely related to that of the texts
- The genres of the extended reading materials must be the same as or similar to that of the texts
- The difficulty level of the extended reading materials must correspond to the cognitive development level of their student users
- The extended reading materials must be scientifically and politically correct, and be rather interesting, stimulating and informative

As texts have their own distinctive teaching goals, though all extended reading materials must be selected in accordance with the four conditions stated above, the selection of materials in different type of lessons still have some distinction. The following is a further discussion of this issue.

1. Selection of extended reading materials for pinyin lessons

Extended reading in pinyin lessons has two major aims: (1) Consolidating the recognition and reading of pinyin; (2) Using pinyin to learn new words. At the pinyin teaching stage, students accumulated only little Chinese characters and their ability to spell and read pinyin are still in formation. Thus, the selected extended reading materials must be short and catchy, and should mainly be nursery rhymes, doggerels, tongue twisters and well-known ancient poetry. Pinyin must be marked in all these materials, and reading demonstration is needed for some materials (such as poetry).

2. Selection of extended reading materials for character recognition lessons

There should be two types of extended reading materials for character recognition lessons: (1) Riddle about words, nursery rhymes, short passages and allusions of words (for example, the story of Wang Xi Zhi writing the character "鵝" [literally means "goose"]), which help students to memorize the forms of the Chinese characters in the texts. These materials aim at consolidating the words learned from the texts, as well as allowing students to re-recognize these words and understand their meanings in the actual language application context. The materials also enable students to realize that in different linguistic context, the words they learned have different pronunciations and functions. This helps students to accumulate materials and references for the writing exercise stage, when they need to use the words in a text to compose stories and nursery rhymes; (2) Materials which use a similar character recognition method as the text of that particular lesson. These materials enable students to have a better understanding and mastery of that specific character recognition method. This in turn laid a firmer foundation to the later typewriting composition, when students need to imitate the given models.

3. Selection of extended reading materials for reading lessons

Most language lessons in primary one focus on character recognition, and in primary two, there is a large urge in reading lessons. Compared with character recognition lessons, reading lessons have longer texts with richer linguistic context. When selecting extended reading materials for this type of lesson, we mainly take into consideration the background information of the texts, and would select textual materials which are closely related to the themes of contents of the text and have a similar genre to the texts. In other words, there are two types of extended reading materials for reading lessons: (1) Background information about the texts or materials which help to achieve the teaching goals (usually employed in the first lesson); (2) Materials which are closely related to the themes of the texts and share a similar genre with the texts (usually employed in the second lesson). For example, when teaching *The Dream of De*, materials of the first type included introductory information with pictures on the various technology products stated in the text, and materials of the second type included materials about the life and dreams of people in the technology era. A further example is when teaching *"Red Scarves" are Really Good*, materials of the first type included descriptions of birds and human living in harmony (such as *Zebra Finch*), which acted as the preparation for the formation of the feeling and attitude to love and care for birds in students. Materials of the second type included materials about the pros and cons of people's attitudes towards birds, which enabled students to consciously form a correct view on how to love birds through analyses and comparisons.

4. Implementation Strategies of Extended Reading in Different Types of Lessons

A failure to use the rich and fine extended reading materials will greatly reduce their effect. As mentioned, extended reading is crucial to the attainment of curriculum standards, and the selection and use of its materials must centre on the teaching goals. Extended reading must be conducted in carefully designed lessons. It is

only in this way that the efficiency and effect of the lessons can really be enhanced and accelerated development can be achieved.

1. Extended reading strategies in pinyin lessons

Traditional education concept believes that as character recognition teaching has not been conducted in the hanyu pinyin teaching stage, students know only little words, and thus are not suitable to carry out extended reading. However, reality proves that such concept and thought do not match the actual language and thinking development of children.

For example, when teaching the lesson one *a o e* of hanyu pinyin, after the students learned the forms and pronunciations of *a o e*, we let them accessed the website "Information City " and read some nursery rhymes about *a o e*. At the beginning, the teacher leaded the students to read together, and then, students read together with their classmates. This triggered strong enthusiasm for learning from students. Not only could they find and read *a o e* quickly and accurately, but they were also able to read their favourite nursery rhymes several times. Many students even memorized 2–3 nursery rhymes. The test conducted after the lesson found that students were able to remember clearly the pronunciations and forms of *a o e*, and they also learned a lot of Chinese characters through reading the nursery rhymes. A student called Ming Ming remembered 11 characters in just one lesson.

This case proves that not only are children able to carry out extended reading in the pinyin learning stage, but they are also able to gain a more solid and effective mastery of pinyin through extended reading. It is even more delighted to find that the originally boring pinyin learning becomes relaxing and joyous through reading nursery rhymes, creating tongue twisters and doggerels, as well as forming phrases and composing sentences. These activities also effectively enhance character recognition learning, which enable students to feel and experience the success and happiness of learning pinyin. However, it should be noted that in order to clear the barriers children experience when they begin reading and to better cultivate their interest in reading, extended reading in pinyin teaching stage would better start with teachers leading the whole class to read, and then reading together with the neighbours, and at last transit to students reading by themselves after they gradually adapted to it.

2. Extended reading strategies in character recognition lessons

According to the curriculum standards, character recognition teaching follows pinyin teaching. Character recognition lessons usually consist of two periods. The first period focuses on recognizing and reading new words, gaining an overall feeling of the texts and learning to write the words. The second period emphasizes reading instruction and comprehension of the texts. The text *Two, Three Miles in One Go* would be used in the following as an illustration to how extended reading can be conducted in character recognition lessons. The first period included two steps. In the first step, we checked students' pronunciations of the 12 words one by one. After that, students consolidated the pronunciations and forms of the words through reading and answering riddles, and then, composed their own riddles by imitating a model. In the second step, students read four nursery rhymes,

Let's Guess, *Mother Hen*, *Counting the Stars* and *Crossing the Bridge, Guessing the Piers*, by themselves after learning the 12 words. Reading nursery rhymes can effectively consolidate students' memory of the pronunciations and forms of the words while increasing their acquisition of vocabulary. Extended reading in the second period was conducted after lecturing the text. It mainly enabled students to read a group of ancient poems, which are closely related to the themes of the text, on the website "Information City" by themselves. This extended reading had two aims: (1) Increasing the acquisition of vocabulary; (2) enabling students to experience the charm of words—even simple and boring numbers can also produce beautiful poetry.

Extended reading conducted in character recognition lessons should place attention on the following three points: (1) Emphasis should be on consolidating the pronunciations and in particular, the forms of the new words; (2) Attention should be placed on the different pronunciations and meanings of some words in different linguistic context; and (3) Master the correct time for carrying out extended reading. Extended reading should be flexibly arranged in the first period according to the need of teaching. In the second period, it should usually be conducted after lecturing the text, but may be carries out before lecturing sometimes (see the example below).

3. Extended reading strategies in reading lessons

The extended reading strategies used in reading lessons are basically the same as that of the character recognition lessons stated above. That means extended reading can be conducted before or after lecturing the texts and completely by the students themselves. As reading lessons take up a large proportion of primary school language education, how to implement extended reading in these lessons receive general attention from language teachers. Thus, a group of real teaching cases is presented in the following for our readers.

(1) Arranging extended reading before lecturing the text, laying a foundation for learning the text

[Case 1] Text: *We Success*This text is not long, but the big gap between its content and the daily life of students make it difficult for students to understand the great joy and thrill it described. Reading instruction and attaining the affective teaching are the two different points of this lesson. How to prepare children for the learning of this text? We provided students with some articles from the website "Information City" and asked them some guiding questions. In this way, before lecturing the text, they already knew about the background and related knowledge of the text through extended reading:

① "Class, do you know what the Olympics is?" Most students answered, "The Olympics is an athletic meet." This revealed that students did not understanding the history and related knowledge of the Olympics. Thus, the teacher let them read the article *The Origin and Meanings of the Olympics*, and then named some of them to answer the following question: What do you get from the article? Students' answer told us that they had already knew the origin of the Olympics and basically understand the significant meaning hosting the Olympics has to our country.

② "Class, to win the bid for the Olympics, all people in our country has put in great efforts. Let us now look at what they had done for bidding the Olympics."—Guided students to read the article *We Use Our Own Ways to Support the Bidding for the Olympics*.

③ "People had done so much for bidding the Olympics, what would you do for bidding the Olympics then?" This question triggered a lot of responses from students. All of them raised their hands to express their ideas.

Li Jia said, "I'll use colourful colour pencils to draw a picture of our country's beautiful sceneries and send it to the Olympic Committee. They'll think of China soon as they look at the picture."

Chen Lei said, "I'll work hard to make the environment better. So that, when the Olympic Committee and the athletes from all over the world come, they'll like our country and let us host the Olympics."

Zhou Qi said, "I'll save my pocket money from now on and donate them to Beijing to build a big and beautiful house. So that, the athletes can live comfortably in it and let our country host the Olympics."

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The children took themselves as one of the members who bid for the Olympics and were willing to do something for the bidding in their own ways.

④ It was time to let the students experience the spectacular moment themselves. The teacher played a video of the scene when our country won bid for the Olympics. "Class, our efforts have not been in vain, the moment of excitement has come! What would you say and do now?"

Xiao Ming said, "I'll jump and shout 'We success. We finally success!'"

Xiao Fang said, "I'll faint with excitement! It's really exciting!"

Li Li said, "We've done so much and we finally success. I must go to the main street and tell everyone about that!"

……

Students' enthusiasm had been triggered by the above. When they were asked to open the textbook and read the text then, they were able to involve themselves in the text and read expressively without the lecturing of the teacher, but only a little guidance. This revealed that they already had quite an in-depth understanding about the text. At this time, when students read the article *I Work for a Better Olympics*, their thoughts were brought to a new level. Their urges to express themselves also became stronger, and this enabled a natural flow to the next teaching section, "written expression". With the above preparation, most students' writings were concrete and expressive.

The aforementioned case reveals that for texts that are less related to the daily life of students, incorporating the related teaching resources into the extended reading section before lecturing the texts enables students to gain more background information and related knowledge of the texts. In this way, extended reading found the base for learning the texts and acts as an important enhancing agent to students' thorough understandings and experiences of the themes of the texts, as well as their achievement of the teaching goals.

(2) Incorporating extended reading in the lecturing of the texts, breaking through the key points and difficult points of teaching

[Case 2] Text: *Little Rain Drops*In the process of reading comprehension, one student asked this question, "Why can big rain drops make red flowers and green grass grow in places without flower and grass? Why can small rain drops make the flowers redder and grass greener?" This is a good question. Obviously, when I asked my class to try to answer it, no one raised his hand. After the students carried out a group discussion, I named two students to answer it again. However, their answers were not satisfactory. At that time, I remembered that there was an article *Little Rain Drops have Great Power* in

the website "Information City". So, I thought of letting the students read it and solved the questions by themselves.

Just as expected, after the students read the article, the two questions raised above were solved.

Similar method was used in other lessons, such as in teaching *It's about to Rain*.

[Case 3] Text: *It's about to Rain*

This is an informative fairy tale. Extended reading materials related to its themes are usually related to idioms, such as "When the swallows're flying low, tomorrow'll be a rainy day. When the swallows're flying high, the sun brightly shines." To facilitate students' understanding about these idioms, necessary explanations were added after each idiom. However, how should we use these materials, so that while helping students to understand the natural phenomena described in the text, we can also enable them to have certain ideology education?

We broke the text into several scenes. After teaching the scene about the conversation between the rabbit and the swallow, we gave such direction to the students, "The swallow can foresee the weather. Through observing the behaviours of them, people concluded many idioms. These idioms are very helpful. Let us now look at them." Then, the students learned the idioms about swallows together with their neighbours. For the learning of the other scenes, we let students accessed the website "Information City" to read some idioms about animals and their explanations by themselves. This allowed students to know about the unusual behaviours of the animals before the weather changed and experienced the wisdom of people. Ideological education was performed imperceptibly: **With careful observation and by being good at learning, one can learn a lot in daily life**. In this way, the knowledge inside and outside the texts were integrated through extended reading. Students also gained a more comprehensive and in-depth understanding of the text, and the lesson became livelier as well.

The case above shows that conducting extended reading in the lessons enables teachers to use the related materials to solve the key points and difficult points of teaching. It also effectively cultivates students' reading ability, comprehension ability and self-learning ability, and realizes a real independent learning method which involves investigation and cooperation.

(3) Arranging extended reading after lecturing the text, deepening the understanding of the text

[Case 4] Text: *The Three Sons* This is an affective type of text with the theme "filial piety". As primary two students lack the relevant life experience, no matter how teachers repeated their teaching, it is still difficult for students to really understand the meanings of the old man's words in the text. In our teaching, we did not spend too much time on analyzing the old man's words, but let students read three types of extended reading materials on the website "Information city" by themselves (The first type are stories about unfilial people. The second type is a group of critical articles, which criticize people who only boast about respecting their parents, but without real actions. The third type are stories about people who really love and respect their parents.) and then wrote a reflection on these readings. After this independent learning and writing, students had a deeper feeling and understanding about the old man's words.

The lessons on the aforementioned texts, *Beijing* and *Clapping*, were also handled with similar methods. That means extended reading in these lessons was also conducted after lecturing the texts. This method enhances a deeper understanding on the texts. After gaining an overall feeling on the text, students further absorb the contents of the extended reading materials, and integrate the contents of the

extended reading materials with that of the text. In this way, not only can they deepen their understanding on the themes of the text (which is beneficial to the achievement of the affective teaching goals), but their horizons are also broaden and knowledge are enriched. This provides condition for the attainment of a dual-acceleration (not only achieve, but greatly surpass) of cognitive teaching goals and affective teaching goals.

All in all, extended reading is vital for realizing accelerated development in language education. The relationship between texts and extended reading materials is that of intensive reading and extensive reading. The application of extended reading should follow the principle of serving the teaching. The meticulous teaching designs of teachers and their necessary guidance to students are the important guarantees that extended reading will bring its functions into full play. Teachers should select and develop extended reading materials according to the need of teaching. The applications and implementation strategies of teaching resources should be made in accordance with the teaching designs and students' reactions during lessons. It is only in this way that the functions of the teaching resources can be effectively utilized. In actual practice, attention should be put on avoiding the wrong method of centring teaching designs on teaching resources.

Notes

[1] He, K. K. (2004). New theory of children's thinking development and intensified reform in language education. *Pedagogical Research*.
[2] Zhu, M. J. (2002). *About the new curriculum*. Beijing: Beijing Normal University Publishing Group.
[3] Zhao, J. S. & Lou, B. S. (2001). *Language education for pre-school children*. Beijing: People's Education Press.
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Appendix 3
Cultivation of Creative Thinking in the Leapfrogging Development Experiment on Primary School Language Education

Huang Hui, Lin Junfen and He Kekang

Abstract Cultivation of creative thinking is the core of cultivating innovative talents as well as the basic requirement of the Leapfrogging Development Experiment on primary school language education. This paper analyzes the cultivation of creative thinking in the junior and middle primary school grades' language education. Integrating this analysis with the teaching tasks of pinyin lessons, character recognition lessons and reading lessons, this paper also sets out the specific teaching strategies and the supportive environment for the cultivation of creative thinking at this teaching stage.

Keywords Language education · Creative thinking · Teaching strategies

Cultivating innovative talents is the basic goal of the education reforms and development of countries all over the world. "Innovative talents" (also called "creative talents") are people with consciousness to make innovations, creative thinking and ability to create innovations, and its core is creative thinking (also called "innovative thinking") [1]. Then, how can the cultivation of creative thinking be realized in primary school language education? The authors have joined the innovative experiment on an leapfrogging development approach in language teaching (abbrev. Leapfrogging Development Experiment) since September, 2001. This experiment stresses that development of language ability and cultivation of thinking ability (especially that of creative thinking) should be dynamically integrated in language education since primary one. The following is our years of thoughts and exploration of how creative thinking can be cultivated in the language education of junior and middles primary school grades. We wish that our paper can trigger discussions about the issue and provides a useful reference to related researches and practices.

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1. Thoughts bout Cultivating Creative Thinking in Language Education

Having a theoretical guidance guarantees the outcomes. Yet, if the theory itself is not scientific, then the expected outcomes will not be achieved, and it will even work just the opposite way. To realize the cultivation of creative thinking in language education, guidance from a scientific theory and a clear understanding about the relationship between language and thinking are needed.

1. About creative thinking

From the references that we had studied, we find that some theories only take into consideration the agility, flexibility and originality of thinking when discussing the cultivation of creative thinking. Some other scholars even simply believe that cultivating divergent thinking and imagery thinking is cultivating creative thinking. We think that the former viewpoint fails to grasp the nature of the matter while the latter is lopsided. These are caused by a lack of scientific understanding about the concept of creative thinking itself. Thinking is the brain's generalisation and indirect reflection of the intrinsic properties of objective objects and the patterns of the internal relationship between objects [2]. According to the "Inside and Outside Circulation Model" (DC model) [1] derived from contemporary psychological and neuro-physiology researches, the structure of creative thinking should be formed by six elements, which are divergent thinking, imagery thinking, intuitive thinking, logical thinking, dialectical thinking, and horizontal and vertical thinking. These six elements are not unrelated and isolated, and they are not arranged in a parallel manner without priority. Instead, they are arranged according to specific division of work. They cooperate with each other while exerting their own individual effects. Amongst them, language concept-based logical thinking, property representation-based imagery thinking and relation representation-based intuitive thinking are the three basic forms of human thinking. They form the core or main body of creative thinking. Divergent thinking solves problems related to the direction of thinking. It leads the cognitive subjects' thinking towards an opposite direction of conventional concepts, theories and methods. Dialectical thinking and horizontal and vertical thinking provide macro guiding philosophy and micro psychological processing strategies. In the process of cultivating creative thinking, the structure of creative thinking should be viewed systemically and comprehensively. Corresponding teaching strategies should be determined based on the specific psychological processing methods of different types of thinking. We believe that these viewpoints are more scientific and can be used as the theoretical foundation and guiding ideology of cultivating creative thinking in primary school language education.

2. About the relationship between language and thinking

Classics of Marxism and Leninism believe that "Language is the material shell of thoughts". This reveals that language and thinking are naturally inseparable. Based on this viewpoint, the New theory of Children's Thinking Development points out that [3], the development of language ability (listening, speaking, reading and writing abilities) and that of thinking ability are closely connected. Integrating the trainings of language ability and thinking ability (especially that of creative

thinking) in language education can create the ideal effect of mutually enhancing the developments of both with less efforts. The New Theory of Children's Thinking Development further points out that [3], the relationship between language and thinking is that of element and system, which are of different levels and have different connotations. This proves that in language education, we should integrate the cultivation of language ability with the training of thinking ability rather than equalizing the two of them or even putting them in confrontation. The methods to cultivate thinking ability should not be used to substitute the cultivation of listening, speaking, reading and writing ability of language. The methods to cultivate these language abilities should also not be used to replace the cultivation of thinking ability (especially that of creative thinking), or else it would be harmful to both language education and the development of thinking ability.

3. The cultivation of creative thinking in primary school language education

As stated, imagery thinking, intuitive thinking and logical thinking are the three basic forms of human thinking and they are the main body of creative thinking. According to Piaget's stage theory of children's cognitive development, children below 6 years old only possess representation-based imagery thinking. It is until they are 11 or 12 that they have abstract logical thinking on hypothetical propositions. Traditional language education has been strongly influenced by this view. In the junior and middle primary grades (primary 1–4), usually only visualized teaching is used while cultivation and training in logical thinking are neglected. In senior primary grades (primary 5–6), although the cultivation of logical thinking in language education is put into consideration, it remains within the confines of basic concrete object-based logical thinking and does not dare to touch on advanced abstract logical thinking involving hypothetical propositions, and intuitive thinking is even generally neglected [3]. Contrarily to this, the New Theory of Children's Thinking Development believes that primary one students possess proficient verbal language ability and their basic thinking quality have been formed. Not only do they have basic representation-based imagery thinking, but they also have basic language concept-based logical thinking. This shows that even in primary one, the cultivation of creative thinking in language education should also take into consideration all the aforementioned six elements of the structure of creative thinking. In particular, the cultivation of imagery thinking and intuitive thinking should not be neglected. For "horizontal and vertical thinking", which is one of the six elements, its major function is to provide psychological processing strategies to solve very complex problems. (That is, to foster inspirations or insights.) It is more directly related to significant art creations and scientific discoveries, and it would be more comprehensible only with the support of the theory of "thinking complexity". Thus, this element can be left out for the time being when discussing the cultivation of creative thinking in normal primary and secondary schools students. To conclude, in the language education of junior and middle primary school grades, the cultivation of creative thinking should focus on cultivating imagery thinking, intuitive thinking, logical thinking, divergent thinking and dialectical thinking.

2. Teaching Strategies for the Cultivation of Creative Thinking in Primary School Language Education

1. Strategies for cultivating imagery thinking

Imagery thinking is a kind of psychological processing ability based on the property representations of objects. It uses property representations for numerous psychological processing methods, including decomposition, assembly, abstraction, generalisation, association and imagination (including reconstructed imagination and creative imagination). The DC Model of the Theory of Creative Thinking [1] shows that both association, reconstructed imagination and creative imagination can realize the goal of creation, but there is only difference in the depth of their mental processing. Association and reconstructed imagination are the important parts of random creative thinking, while creative imagination, which satisfies the "reaction activities" of human thinking, is the crucial part of non-random creative thinking (which is usually referred to as "creative thinking").

The foundation of imagery thinking is observation, association and imagination (including reconstructed imagination and creative imagination). This is because the basic processing materials (property representations) of imagery thinking are gained through perception, which relies on observation and accumulation. The more and more comprehensive the representations gained through observation and accumulation are, the rich and deeper association and imagination become. Association includes **similarity association** (performing association on the representations of objects which have similar natures, functions, structures or appearances), **opposite association** (also called "contrastive association", which refers to performing association on the representations of objects which have sharply distinct natures, functions, structures or appearances) and **relativity association** (performing association on the representations of objects which have distinct natures, functions, structures or appearances, but are related logically or semantically in some way). This reveals that the cultivation of imagery thinking can be realized through cultivating observation, association and imagination. As the teaching tasks of pinyin lessons, character recognition lessons and reading lessons are different, there is also a greater distinction in their specific teaching strategies for training imagery thinking.

The tasks of pinyin teaching are to enable students to master pinyin and writing (of the forms of the pinyin), as well as to use pinyin in character recognition, reading and computer typewriting. The training of thinking ability should be closely linked with these language teaching tasks. Thus, in the pinyin teaching stage, teaching strategies, including composing nursery rhymes with the hanyu pinyin taught in that particular lesson, describing pictures verbally and creating stories based on pictures, can be used. (The contents of the verbal descriptions and stories should also be related to the hanyu pinyin learned in that lesson or in the previous lessons.) For example, when teaching the text *g k h*, with the use of this strategy, some students were able to express the illustrations of the text with the nursery

rhymes "The tadpoles swim near to the waterweeds, *k k k*.[3] My brother sits on a chair and drinks some water, *h h h*.[4] The doves fly happily in the sky, *g g g*."[5] Some other students typewrote sentences such as "I see some beautiful doves. They are flying happily in the sky. I also see some lovely tadpoles. They are swimming merrily in the water." Obviously, these writing activities are beneficial to the cultivation of basic observational skills and imagination.

The tasks of character recognition teaching include recognition (forms), reading (pronunciations), writing (forms) and usage (meanings) of the words of the texts, as well as comprehension of the texts, reading instruction and transfer of character recognition methods. For the teaching tasks about character recognition (including the forms, pronunciation and meanings), we usually use riddle composition to enhance the learning of the forms, pronunciations and meanings of words, and infiltrate the cultivations of observation and imagination into it. Other than that, to train students' imagination, we also created the activity of using new words to compose stories. For the teaching tasks about the comprehension and reading of the texts, we design activities to train students' thinking in accordance with the characteristics of the texts. These activities include composing riddles, imitating the texts to write passages, writing an end to a story and composing a new version of a story. For example, in the lessons on the text *Vocabulary Acquisition 4* in book 2 of the textbook by the People's Education Press, students used their imagination to compose the following passage, *The Interesting Episodes of Animals in Summer*, by imitating the text.

The Interesting Episodes of Animals in Summer

Summer has come. Let me share some interesting episodes of the animals in summer with you!

The cicada is shouting continuously on the trees, as if he is saying, "I'm roasting! I'm roasting!"

The spider says, "It's going to rain. It's going to rain. Bros, quickly weave our webs!"

The dragonfly said, "Great! I can come back to the pond for small insects again."

The bird also needs to learn to fly and searches for food by himself.

The butterflies crawl out from the cocoons and spread their wings, flying in pairs in the flowers.

The fish says, "Great! I can swim more freely."

Why all the tadpoles have lost their tails? Oh! They have all become little frogs. They are not only busy catching bugs, but are also jumping around while shouting loudly "Wa! Wa! Wa!"

At night, the little gecko is busy eating flying insects on the walls and under the eaves.

The seven-spot ladybird is busy helping the crops to catch the villain aphid!

In summer, many of the animals' children leave their safe homes and nests, and start making a living away from homes.

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[3]The hanyu pinyin of "tadpole" is *ke dou*, thus the students repeated the consonant *k* at the end of this sentence.

[4]Same as the above, the hanyu pinyin of "drink" is *he*.

[5]Same as the above, the hanyu pinyin of "dove" is *ge zi*.

This classwork shows us that students have very rich imagination.

The teaching tasks of reading lesson include character recognition, reading instruction and reading comprehension. For the character recognition section of reading lessons, its strategies of cultivating creative thinking is the same as that of the character recognition lessons, and thus will not be repeated here. The strategies of cultivating creative thinking abilities which are related to the processes of reading comprehension should be derived in accordance with the characteristics of the texts. For example, when teaching the text *The Flower Clock* in book 5 of the textbook by the People's Education Press, we let students observed a particular natural phenomenon carefully first, and then asked them to design an object (triggering students' creative imagination) with the scientific knowledge behind that phenomenon; when teaching *Little Rain Drops* in book 1 of the textbook by the People's Education Press, we let students carried out association similar to the text (that is, associations about the positive effects of rain such as beneficial to drought and deserts) and opposite to the text (that is, associations about the negative effects of rain, namely, floods) first, and then let them compose the writing *If I am a drop of rain…* based on their imaginations; when teaching *Lan Lan Crosses the Bridge* in book 2, students were asked to design the "Bridge in the Future" in their imaginations; when teaching *The Strange Rocks on Huang Mountain* in book 3, we gave our students some pictures of strange stones, green pines and interesting peaks. Students used their bold imaginations to give poetic names such as "Angel's Guide" to the sceneries in the pictures. This effectively trained their observational skills, association and imagination. Fairy tales take up a large proportion of the texts in the junior and middle primary school grades. For this type of texts, strategies such as writing a sequel, imitating the writing of the texts and rewriting the fairy tales can be used to cultivate students' association and imagination. In the lesson on the text *Little Rain Drops*, the strategy of "rewriting" was employed. The following is a student's rewriting of the text with his bold association and imagination.

> If I am a big rain drop, I will go to the lonesome deserts, so that beautiful flowers and grass can also grow there, and it will become an oasis. I want to go to Africa, which is droughty, so that the people, animals, plants and crops there can have enough drinking water, and do not need to search for water everywhere ever again. I also want to go to Beijing, which has a very dry weather, to cleanse the houses, trees and roads there, so that Tian An Men, the Imperial Palace, the Great Wall and the Summer Palace will look more gorgeous. I do not want to go to places where there are floods because if too many of us go, people and seedlings of cereal crops there will be drowned.

2. Strategies for cultivating intuitive thinking

Intuitive thinking is a kind of psychological thinking ability based on relation representations. It is an important component of creative thinking. It should be noted that though intuitive thinking makes swift judgments within a moment, these judgments are not unfounded subjective assumptions. Instead, they are based on rich practical experiences and knowledge, and are judgments about the patterns of internal relationships between objects, which are made through psychological

processing methods such as intuitive perspective, spatial integration and pattern matching. Famous American creativity specialist Parness had once pointed out that human's creativity is developed in the processes of using knowledge to solve problem, and that there is no creativity without the processes of problem solving. This is most obvious in intuitive thinking. Thus, to cultivate intuitive thinking, we attempt to use the following strategy: First, we give a problem to students and encourage them to think of solutions to it and to estimate the ultimate results. Then, we let students prove their solutions with logical reasoning. For example, when teaching the text *Sima Guang* in book 2 of the textbook by the People's Education Press, we asked our students to think of their own ways to save the child who fell into the water. We also asked them to take into consideration the actual situation at that time, and analyzed whether their methods can save the child safely. Some students proposed "putting a wooden stick on the water vat so that the child can grasp it". Some other students proposed putting a string down so that the child can grasp it and climb up. There were still some other students who thought that Sima Guang's method was the most reasonable one because the situation at that time was very urgent and the best way to prevent the child from drowned was to break the vast and let the water out. (This is because if we want to use a stick to save the child, then we must first be able to find a stick of a certain length nearby. If we want to use a string, then we must first be able to get a string of a certain length nearby first. However, if we want to break the vat to let the water out, we can use brick or stone, which can be found everywhere.) This analysis from the students shows us that they are able to grasp the **implicit relationship** between a brick or a stone and the child being saved (such implicit relationship is the internal relationships of objects which are hard for normal people to discover), and find the best method to solve the problem. **This is a type of intuitive thinking ability**. (Whereas the relationships between a wooden stick or a string and the child being saved are **explicit relationships** which normally people are able to find, and thus, intuitive thinking is not needed. Though using these explicit relationships can also solve the problem, the aforementioned prerequisites are required. Yet, given the situation at that time, these prerequisite are normally not fulfilled.) The scenario of the problem the teacher set in this lesson is obviously beneficial to the cultivation of such intuitive thinking ability.

A further example is when teaching *A Successful Experiment* in book 5 of the textbook by the People's Education Press, we set up an escape experiment for our students first (gave them a scenario and some usable objects); when teaching *Edison Saves his Mother*, we also employed similar method. Before lecturing the text, we set up some scenarios related to the principle of light reflection, and let students thought of solutions to them; when teaching *A Frightened Bird* in Book 6, we provided students with a lot of inference situations similar to that of the text and asked them to estimate the results with intuitive thinking. After that, we asked them to perform logical analyses and inferences on the situation, and compared the results of the inferences with that of intuitive thinking.

3. Strategies for cultivating logical thinking

Logical thinking is a kind of psychological processing ability based on language concepts. Its processing methods include using language concepts to perform analyses, integrations, abstractions, generalisations, judgments and inferences. The DC Model based on the Theory of Creative Thinking shows that [1] inspirations or insights are formed through divergent thinking, associations, imaginations or intuitive perspectives. Unlike imagery thinking and intuitive thinking, logical thinking does not form inspirations or insights directly. However, that does not mean that logical thinking can be ignored in the cultivation of creative thinking. This is because both imagery thinking and intuitive thinking need the guidance, regulation and control of logical thinking to ultimately reach their goals of creation.

As mentioned, the cultivation of creative thinking can be realized mainly through cultivating observation, association and imagination. Apparently, logical thinking seems to have little relevance to the cultivation of these three abilities. Yet, they indeed depend on the guidance and regulation of logical thinking. For example, in pinyin teaching, to ensure that activities, namely, composing nursery rhymes and writing sentences or stories based on a picture, are effective, teachers will stress that students should hold on to the major characteristics of the pronunciations and forms of the pinyin to compose their writings. When observing a picture, teachers will ask students to focus on the key and major characteristics of the people and scenes in the pictures. They will also remind students to pay attention to the order of observation. In character recognition teaching, the major characteristics of the pronunciations, forms and meanings of the new words should also be grasped when composing stories and riddles with them. The riddles composed for the riddle answering activities must meet a certain requirements while the nursery rhymes should rhyme as much as possible. Logical thinking is indeed involved in grasping the key points and major characteristics, selecting the appropriate materials, arranging the writings and refining the wording in he aforementioned activities, namely, writing sentences based on a picture, using new words to compose stories and imitating or re-writing a fairy tale.

For intuitive thinking, rich practical experience and accumulation of knowledge are needed for it to make swift intuitive judgments, and the accumulation of knowledge is obviously a product of logical thinking. Apart from that, to avoid intuitive judgments from remaining in the level of subjective assumptions, careful logical analyses and inferences are needed for the process of intuitive thinking. It is only in this way that the scientificity and validity of the results of intuitive thinking can be correctly judged or tested.

For activities such as writing reflections and comments which depend mainly on analysis, comparison, judgment and inference, they are already typical processes of logical thinking themselves.

The discussion above shows that training on students' logical thinking should be conducted throughout the cultivation of creative thinking. The specific methods for this include teachers' inspiration and question, coaching and guidance on key issues, providing background information for students to perform analyses

and inferences, appreciations and analyses of the model essays and well-written sentences, using extended reading materials to enrich students' knowledge and experience, and encouraging students to reflect their results of thinking as much as possible through writings.

4. Strategies for cultivating divergent thinking

The importance of divergent thinking to creative thinking is self-evident. To be able to innovate, divergent thinking must be emphasized. Without divergent thinking (also called difference thinking, reverse thinking and multi-directional thinking in Chinese), creativity will not sprout and blossom. It can even be said that all creation originates from divergent thinking. In the DC Model of the Theory of Creative Thinking [1], divergent thinking is a vital part for both random creation and non-random creation. The strategy to cultivate divergent thinking is very simple. There is only three points to remember: spotting out the differences, reversing the thinking direction and multi-directional radiation. By following these points in the cultivation of divergent thinking, effects can be quickly seen. For example, when teaching the text *The Rain in Autumn* in Book 5 of the textbook by the People's Education Press, as the autumn described in the text was an optimistic one, to enable students to express their own unique feelings, we let them read different articles about autumn (such as ancient poetry and prose). We encouraged them to experience autumn themselves and try hard to use difference, reverse and multi-directional thinking to compose their writings on "Autumn in My Eyes" from a new angle and perspective. The writings that students produced show that they had different views about autumn. Some students described the sounds, colours and weather of autumn while some wrote about the feelings that autumn gives. Some other students even thought of the different personalities of people from the four seasons. These are obviously the effects of divergent thinking. A further example is when teaching the text *"Red Scarves" are Really Good*, we designed this flow of teaching, "knowledge about birds→Love for birds→Protecting the birds". In the section about protecting the birds, the extended reading materials we chosen provided both the pros and cons of the issues, so that students could look at it from different angles.

Another effective strategy to cultivate divergent thinking is to encourage students to boldly express their unique thinking, reveal their own style and show their fruits of learning in their own personal ways. For example, in one of the primary three language activity lessons, the teacher asked students to record some of their favourite sounds a week before in a group and use these sounds to create a story. Then, students could search for appropriate pictures and illustrations from the Internet and express their stories in some way. As a result, in the report lesson, there were a variety of presentation methods, like, a group told *The Story of a Orchestra* with both singing and speaking, one group used the script in the textbook to perform *The Athletic Meet of the Forest*, another group read the poem *Listen, the Insects of Autumn are Twittering* with background music, and another group was even more creative, they had a live performance of a sonata *The Pots and Pans in the Kitchen*.

5. Strategies for cultivating dialectical thinking

As dialectical thinking provides guiding ideology to problem solving in creative thinking from a philosophical angle, it has an unignorable important effect on the whole creative thinking process. Dialectical thinking is a guarantee to the comprehensiveness, profundity and perspicacity of human cognition. Thus, the cultivation of it should be conducted throughout the processes of cultivating creative thinking. To better cultivate students' dialectical thinking, the following methods can be used:

(1) Cultivating students' scientific attitude of respecting the objective facts and valuing practices and researches

For example, when teaching the text *The Bees*, the teacher let students fill in the hypothesis, preparation, processes, results and estimations of Fabre's experiment first, so that students could experienced and learned to accurately record the data completely like scientists and the serious working attitude of scientists. After that, the teacher led students into the insects' world and guided them in going into their daily life to observe and discover. The teacher also asked students to raise a hypothesis of their own new experiment by modelling on the text, and to try and test their hypotheses into a group with scientific attitude. Many students read a large amount of extra-curriculum books during the process (including *The Marvels of the Insect World* written respectively by Li Sheng Yuan of China and Fabre of France), and they produced more rigorous experimental study programs and short science essays.

(2) Encouraging students to look at problem from the angle of dialectic

When teaching the text *The Pottery Pot and the Iron Tin* in Book 5, the students asked, "Why would the iron tin disappear with time?" and "Was the disappearance of the iron tin related to his arrogance?" To these questions, the teacher did not haste to answer immediately. Instead, an investigative teaching approach was adopted (students learn mainly through independent investigation and discussion) and students were also encouraged to look at the problem from the angle of dialectic. At the same time, the teacher also provided introductory information about the science knowledge of pottery and iron, as well as articles related to the implications of the text to students through extended reading. As a result, not only did the teacher attained the requirements of the curriculum standards within two periods with high efficiency, but he also enabled students to answer the aforementioned questions satisfactory by themselves—"The iron tin oxidized because it was old. The author grasped the characteristics of the properties of pottery pots and iron tins, gave them the corresponding personalities with personification and composed this fable with humanistic education value." The students did not understanding the implication of the text superficially, but analyzed the issue from the angle of dialectic, which enabled a better integration of scientificity and humanity.

(3) Helping students to analysis the reasonable and unreasonable factors in divergent thinking

To encourage students to have divergent thinking, many teachers agree with all ideas of the students no matter what. We think that there is nothing wrong in

encouraging students to have divergent thinking. Yet, the teachers need to give appropriate guidance to students' divergent thinking and help them to spot out the reasonable and unreasonable factors in it. For example, in the lesson of the aforementioned text *Sima Guang*, some students proposed using a wooden stick or a string to save the child. The teacher needed to inspire students that these two methods may work in other situation, but not at that particular moment of the text. This is because to do so, they must be able to get these tools first, and the child who fell into the water must be able to grasp these tools. If a string was to be used, then the one who pull the string must be stronger than the child who fell into the water, and yet, these conditions were unavailable in the scenario of the text.

(4) Using extended reading to enable students to understand the multiplexity and complexity of a matter

For example, when teaching the text *Clapping* in primary three, in connection with the experience of Ying Zi, who is a disabled person, the teacher asked questions such as "What is the care and love that the disabled need? Do they merely want material support? Or do they need spiritual respect and encouragement—Even as mere as a friendly smile or a handshake with an AIDS victim?" The teacher did not require students to answer them immediately, but let them read a group of articles which covered four aspects, "the psychological world of the disabled", "the experience of the disabled" (mainly cases of discriminations and abuses), "care and love for the disabled" and "the independent disabled", so that students could view the issue from different angles. In the latter visit to a welfare house, when the students met a group of mentally challenged children face to face, they did not dodge or discriminate against the children as they were before. Instead, they took the dirty hands of the children at ease and listened to the babbles and gestures of the children with smiles on their faces. After the visit, many students wrote touching passages such as *There is Love on Earth*.

3. Supporting Teaching Environments for the Cultivation of Creative Thinking in Language Education

To ensure that the cultivation of creative thinking can be conducted effectively in language education, an appropriate teaching environment is needed. This environment involves the following three aspects:

1. Extended Reading provides rich knowledge and experience, and accumulation of representations for students

Parness believes that accumulation of knowledge is needed for cultivating students' creativity, or else the cultivation will fail. There will be no foundation without accumulation. If students have a narrow horizon, the agility and extend of their thinking will be affected. Thus, the support of extended reading materials is needed for: (1) the accumulation of representation needed by imagery thinking; (2) the accumulation of practical experiences and relationship modes needed in the formation of intuitive judgments and (3) the background information and multidimensional information of both sides of a matter required in the cultivation of logical thinking and dialectical thinking. For writing, which is the actual

manifestation of language ability and thinking ability, a large amount of extended reading is needed. Extended reading provides the foundation for writing and acts as the demonstrations of writing skills on aspects including conception, material selection, layout, overall structure and even phrase selection, sentence formation. (For details, see the cases of extended reading in the lessons on the aforementioned texts such as *"Red Scarves" are Really Good*, *Clapping* and *The Pottery Pot and the Iron Tin*.)

2. The new teacher-directed—student-centred teaching structure provides favourable psychological condition for the cultivation of creative thinking

The famous special-grade teacher Xu Gu once said, "It's only in soft soil that wisdom sprout." The famous American psychologist Rogers also pointed out that, "Psychological safety and freedom are the general conditions that foster creative activities." These reveal that it is only in a free and relaxed psychological condition that creative thinking will sprout and bloom. The new "teacher-directed—student-centred teaching structure", which fully exerts the leading role of teacher and the principal position of students, provides a firm promise to such condition. This is because it is especially supportive to teaching and learning approaches which foster the creation of the aforementioned favourable psychological condition. These teaching and learning approaches mainly manifest in the following aspects:

① **Encouraging students to ask questions and raise doubts**, rather than treating textbooks and teachers as all powerful. Encouraging students to thinking differently, in reverse direction and in multi-direction

② **Employing developmental evaluation methods**, and focusing on encouragement, so that students' consciousness to make innovations would be triggered and persisted

③ **Employing an independent, investigative and collaborative learning approach**. This allows students to gain a multi-level and multi-dimensional in-depth understanding of a complex matter quickly through exposing them to a variety of viewpoints in independent learning and collaborative investigations, which is beneficial to the cultivation of divergent thinking and dialectical thinking.

④ **Vigorously enhancing students' independent learning while also emphasizing the exertion of teachers' leading role**. Teachers' inspirations, guidance and coaching, as well as their behaviours and personal charm are good demonstration for students' cultivation of logical thinking and dialectical thinking, and they also exert great influence on students' sentiments, attitudes and values unobtrusively.

3. Modern information technology provides strong technical support to the cultivation of creative thinking

The importance of modern information technology on the cultivation of creative thinking can be seen in the following aspects:

① **The Internet provides a large quantity of extended reading materials**, which are beneficial to the cultivation of imagery thinking, intuitive thinking, logical thinking and dialectical thinking

② Independent learning and collaborative learning which rely on **Internet resources and software** are favourable to the cultivation of divergent thinking and dialectical thinking

③ **Multimedia courseware** provide multimedia information such as pictures, videos and sounds, which greatly enrich the accumulation of property representation required by imagery thinking. They also provide a lot of excellent examples related to different types of associations and imagination (especially creative imaginations), which are beneficial to the cultivation of imagery thinking

④ **Multimedia courseware** create problem scenarios which are favourable to the cultivation of divergent thinking and intuitive thinking

To conclude, the firm double-bases training in primary school language education is the soil for innovation. Teachers should continue to exert the reasonable and positive factors in the tradition while abandoning the self-contained and conservative factors. It is only in this way that a firm foundation can be established together with the realization of bold innovation.

Notes

[1] He, K. K. (2000). *Theory of creative thinking: The establishment and evidences of DC Model*. Beijing: Beijing Normal University Publishing Group.
[2] Zhu, Z. X. & Lin, C. D. (1991). *Psychology of thinking development*. Beijing: Beijing Normal University Publishing Group.
[3] He, K. K. (2005). *New theory of children's thinking development and language education reforms*. Retrieved from http://www.edu.cn/20030724/3088619_5.shtml

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Appendix 4
Samples of Instructional Designs of the Leapfrogging Development Experiment in Primary School

[Sample 1] Instructional Design for Leapfrogging Development Pinyin Lessons Instruction Design for Teaching Hanyu Pinyin *b p m f*

Instruction Design for Teaching Hanyu Pinyin *b p m f*

Case	Third lesson of hanyu pinyin on *b p m f*				
Subject	Chinese	**Grade**	Primary 1	**Provider**	Guangzhou Dongshan East Dongfeng Road Primary School **Chen Zhou Yi**
1. Concepts of Design					

Hanyu pinyin is an important tool that assists students in recognising and reading Chinese characters, as well as learning Mandarin. Yet, in the conventional hanyu pinyin teaching stage, it is inevitable that students find the lessons boring and dull, which in turn generates reluctance to learn.

According to *The Theory of Language Perception* by Professor He Ke Kang, the most sensitive critical period of children's language perception is before the age of nine. During this critical period, language environment and language perception experiences are required for the semantic perception. If such environment and experience are lacking during this critical period, although the nerve centre of the brain inherently possesses a latent semantic perception function, it will not develop. Thus, we must make the effort of creating a language environment beginning from the hanyu pinyin teaching stage in primary one, and closely follow the idea of language-use centre.

The *Language Curriculum Standards* states that, in language education, emphasises should be placed on highlighting the principal position of students, changing their learning methods and changing the teacher-centred teaching approach. Thus, classroom instruction should be regarded as the major channel for the cultivation of students' innovation and practical ability. Each student should be the master of his or her own learning.

2. Analysis of the Characteristics of the Learners
1. Some students have learned hanyu pinyin before attending primary school, and thus have a certain knowledge about pinyin
2. The students have entered school only for three weeks. They are still unfamiliar with using courseware to conduct independent learning and need the teachers' guidance in carrying out extended reading
3. The students have just started learning the consonants of pinyin, and thus are still unable to perform typewriting exercises. Oral training is the current focus.

3. The Targets of Learning	
I. Knowledge and Skills	1. Mastering the consonants *b p m f*, and be able to pronounce, recognise and write them correctly
	2. Learning three words
	3. Gaining knowledge about syllable, and mastering the "Two Syllable Method", i.e. to correctly pronounce the syllables formed by *b p m f* and a vowel
	4. Learning to pronounce pinyin with tones
	5. Reading 3 – 5 nursery rhymes related to the text under the guidance of the teacher
II. Processes and Methods	1. Starting to learn to identify and distinguish objects by comparison
	2. Expanding the accumulation of vocabularies and consolidating the mastery of the consonants *b p m f* and the words acquired in the lesson in actual linguistic context through extended reading
	3. Learning to apply the acquired pinyin or phrases and sentences by making verbal descriptions of pictures
III. Sentiments, Attitude	Understanding the relevance of learning pinyin to the learning of Mandarin and cultivating initiative and interest to learn and use Mandarin

4. Strategies of Learning
1. Learning and applying pinyin by observing pictures and oral training
2. Integrating the recognition and reading of pinyin with extended reading dynamically

5. Teaching Environment and Resources	
Teaching Environment and resources	1. This lesson is conducted in a multimedia Internet classroom
	2. Volume one of the primary one language textbook (published by the People's Education Press) is used
	3. Making multimedia courseware for this lesson
	4. Alphabet flash cards are used

6. Processes of Learning (The First Period)		
Teacher's Actions	Students' Learning Activities	Purposes
(1) Creating the Scenario, Stimulating Students' Interest in the Introduction		
1. Introduction: We'll continue to meet new friends from the Consonant Family, do you want to know who are they? 2. Playing Flash courseware 3. Naming students to answer: Who are the four friends that we're going to meet to day?	Students observe the Flash animation and read the nursery rhymes after it	Using the courseware to stimulate students' interest in learning, and cultivating their observational ability. Allowing students to gain a basic knowledge of the consonants which they are required to learn in this lesson and conducting extended reading by letting them read the nursery rhymes after the animation
(2) Giving Verbal Descriptions to Pictures, Having Total Task Presentation		
1. Using slides to show the four pictures of the teaching materials 2. Showing *b p m f* respectively in accordance with the students' answers	Students select their favourite picture and give verbal descriptions of it	Training students' observational ability and language expression ability, as well as embracing the idea of use-centred language. Guiding students to pay attention to daily life knowledge and to the fact that the pronunciation of many characters involves the four consonants learned in this lesson. These activities also act as preparation for students' memorization of pronunciations and forms, as well as nursery rhyme composition later.
(3) Independent Learning, Recognising the Pronunciations and Forms Clearly		
Instructing students in the use of courseware to perform independent learning, and to recognise and memorize the pronunciations and forms of *b p m f*	Students launch *Pinyin Paradise* and use this courseware to perform independent learning	Letting students conduct independent learning with courseware and instructing them on how to conduct independent learning

(4) Creating and Reading Nursery Rhymes, Giving Feedbacks for Consolidation		
1. Feedbacks: Checking students' mastery of the pronunciations of *b p m f* (giving instruction to the important points in pronouncing the consonants) 2. Giving demonstration of composing nursery rhymes 3. Instructing students in writing 4. Paying attention to distinguish between *b* and *p*	1. Students read one by one 2. Students memorize the four consonants by composing nursery rhymes by imitating the model 3. Students have exercises on writing the consonants they learned in this lesson 4. Using movements to further aid the memory of the consonants *b* and *p*	1. Correcting students' pronunciations in feedbacks and teaching them the correct ways to pronounce the consonants 2. Cultivating students' creative thinking through teacher's demonstration of composing nursery rhymes with the pronunciations, forms and uses of consonants
(5) Spelling and Reading Happily, Conducting Extended Reading		
b p m f want to play hide-and-seek with the children. They quietly hide inside the nursery rhymes. Can you find them?	Students launch the courseware to conduct extended reading with nursery rhymes and click on the consonants *b p m f*	On the one hand, this consolidates the pronunciations and forms of the pinyin learned in this lesson. On the other hand, it conducts extended reading again
(6) Describing Pictures, Practising in Actual Situation		
Showing some pictures and letting students describe them verbally	Students compose nursery rhymes or say something based on the pictures	Cultivating students' ability to use the acquired pinyin

7. Assessment and Evaluation

Form 1 (In-class)	Evaluation items / Evaluation methods	Able to pronounce the phonetic alphabet and syllables learned in this lesson correctly	Able to learn independently	Willing to express opinion	Like this lesson
	Self evaluation				
	Evaluation from groupmates				
	Evaluation from teacher				

Form 2 (Outside class)	Evaluation items / Evaluation methods	Searches for characters of these pronunciations in daily life	Uses the characters that are found to form a phrase or compose a sentence
	Self evaluation		
	Evaluation from groupmates		
	Evaluation from teacher		

8. Flowchart of Teaching

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                            Start

    Courseware | Creating the Scenario, Stimulating Students' Interest in the introduction

    Textbook | Giving Verbal Descriptions of Pictures, Having Total Task Presentation

    Courseware | Independent Learning, Recognising the Pronunciations and Forms Clearly

  Recognising and Reading        Writing and Reading
    the consonants               Nursery Rhymes                Writing Exercises
     individually

    Courseware | Spelling and Reading Happily, Conducting Extended Reading

    Courseware | Describing Pictures, Practising in Actual Situation

                          Conclusion
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[Sample 2] Instructional Design for Leapfrogging Development Character Recognition Lessons

Instructional Design (The Second Period) for Vocabulary Acquisition 7 in Volume 1 of Primary Two Language Textbook (Published by the People's Education Press)

Designer: Liu Hui Yi Guangzhou Dongfeng Road Primary School

Analysis of the Teaching Contents
This lesson is the second period of *Vocabulary Acquisition 7* in Volume 1 of the primary two language textbook published by the People's Education Press. *Vocabulary Acquisition 7* uses a "clapping song" to describe the free life of animals in nature and to reveal the principle that "human and animals are friends, and protecting the animals is an important task". This text is lively, vigorous and delightful. It has a strong rhythm, and thus is very suitable for reading. Its form as a "clapping song" is also beneficial to the organization of classroom activities.

The clapping song of this text has ten rhyming and rhythmic stanzas with the same number of characters. With the inspiration and guidance of the teacher, the students will surely be able to gain some insights by clapping and singing the "clapping song", e.g. that the Earth is the common home of both humans and animals, and that animals and humans are interdependent.

Design Rationale

This lesson adopts a 3-in-1 teaching approach, which integrates character recognition, reading and writing, in an Internet environment. The rich Internet resources are used to create the scenario for students. A touching story will be used to guide students into deeper exploration of the theme of the text, to trigger their real feelings and emotions, as well as to provoke their desire to create.

Teaching Objectives

1. Able to recognize the following ten characters, "护, 牢, 孔, 雀, 锦, 鹰, 丛, 鹂, 灵, 嬉"[6] and to write the following eight characters "丛, 牢, 拍, 护, 保, 鸡, 物, 猫"[7]
2. Able to read the clapping song fluently and rhythmically and memorize their favourite sentences
3. Able to understand the text correctly and develop the will to love and protect the animals. Form the habit to learn by themselves and willingness to collaborate with others, which will foster the accumulation of language

Analysis of the Characteristics of the Learners

Primary two students are not unfamiliar with clapping songs and they may even have similar experiences and knowledge of it outside class. These experiences should be fully utilized in the lessons by integrating them with the contents of teaching and using the teaching resources. Students should be led to take the initiative to learn and accumulate vocabularies as well as to comprehend the themes of the text through language teaching activities, including: Let's Read, Let's Think, Let's Compete and Let's Speak. These activities should also enable students to start realizing their social responsibility and give guidance to them on correct values, which in turn will trigger their wish to love and protect the animals.

Selection of Strategies

Based on the aforementioned targets and characteristics of students, this lesson selects and adopts the following strategies:

Extend: That is, to conduct extensive extended reading which closely centre on the teaching materials. Character recognition is carried out in the process of extensive reading, and it is also by knowing a large number of words that reading is possible. Character recognition, reading and writing are 3-in-1.

Typing: That is, to carry out typing training earlier and to focus on both typing and writing. Students must be able to write the characters that the curriculum

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[6]These characters literally mean "protect, prison, hole, bird, brocade, eagle, cluster, oriole, spirit, play" respectively.

[7]These characters literally mean "cluster, prison, beat, protect, keep, chicken, thing, cat" respectively.

standards require them to learn to write. For characters which the curriculum standards require students to recognize, students only need to be able to type and recognize them. These characters are not to be typed mechanically and in isolation. Instead, they are to be used in writing. That means, typing in a linguistic context.

Leave: Encouraging students to leave posts on the message board, so as to train their writing skills. Students should be encouraged to express themselves and be allowed to write voluntarily and willingly. To encourage students to express their own feelings, teachers should try to stimulate and induce them rather than sticking to a single method. Even if students have only composed a fragment, or one or two sentences, teachers should give them timely encouragement if the compositions display the typical characteristics of children's interests and are innovative. This will give students a sense of achievement.

Passages: During the lessons, except for some difficult characters and phrases, too much time should not normally be spent on giving a careful examination of characters and phrases. Focus should be placed on the passages of the articles, and emphasize an overall perception of language and understanding of the linguistic context as a whole. Teachers should encourage students to guess and perceive the meanings of the words in an article, particularly when reading the extended reading materials.

Think: While cultivating students' listening, speaking, reading and writing abilities, efforts should also be made to cultivate their thinking abilities, in particular, that of creative thinking. Thus, when teaching, the teacher should guide students to carry out divergent thinking and in-depth thinking. Association, imagination and diversity of thinking should be encouraged.

Preparation of Resources

1. PowerPoint: Related characters and phrases, pictures and videos
2. Internet resources: Extended reading materials and BBS.

Teaching Procedure
Section 1: Revision and Consolidation (3 min)

1. PowerPoint is used to display the following phrases one by one in order to deepen students' knowledge and understanding of them (保护, 牢记, 孔雀, 麻雀, 锦鸡, 雄鹰, 草丛, 黄鹂, 百灵, 嬉戏, 球拍, 植物, 熊猫, 爱护, 猫头鹰, 机灵, 嬉笑, 野生动物, 环境保护[8])
2. Introductory words of the teacher: In the last lesson, we've learned the words in *Vocabulary Acquisition 7* and read this interesting clapping song. Do you still remember these words? (Students read the words one by one) (Fig. A.1)

Revises the key phrases and deepen students' knowledge and understanding of the phrases through reading the text

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[8]These phrases literally mean "protect, firmly remember, peacock, sparrow, golden pheasant, eagle, bush, oriole, lark, playing, racket, plant, panda, cherish, owl, clever, laughing and playing, wild animals, environmental protection" respectively.

Vocabulary Acquisition 7
You clap once, I clap once,
Remember firmly to protect the animals.
You clap twice, I clap twice,
Peacocks and golden pheasants are partners.
You clap three times, I clap three times,
Eagles fly in the blue sky.
You clap four times, I clap four times,
The wild geese in the sky can write.
You clap five times, I clap five times,
There are tigers in the heart of the forests.
You clap six times, I clap six times,
Orioles and larks sing endlessly.
You clap seven times, I clap seven times,
Pandas play in the bamboo forests.
You clap eight times, I clap eight times,
Both big and small animals have their homes.
You clap nine times, I clap nine times,
Human and animals are friends.
You clap ten times, I clap ten times,
Protecting the animals is an important task.

Fig. A.1 The clapping song of *Vocabulary Acquisition 7* and its translation

Section 2: Understanding the Text (15 min)
1. Students should understand the text while reading it, and pay attention to the rhythm

Introductory words of the teacher: You read really well. Let's read the text once. When you read, remember the phrases or sentences that you don't understand so that you can ask me or your classmates afterwards.
2. Guiding students to raise doubts: Do you experience any difficulty when reading the text?

Reads the sentence first before asking questions. Triggering students to think actively and deepening their understandings of the text

3. Discussion in groups of four: Asks students to read the sentences first and ask their classmates things that they do not understand

Collaborative learning in groups. Students interact with each other, learn from each other, investigate together and help each other

4. Presentations by students: What have you learned after discussion and exchange? The teacher displays appropriate pictures to aid students' understanding of the key points and difficult points (Figs. A.2, A.3, A.4, A.5, A.6 and A.7)

Fig. A.2 Peacocks

Fig. A.3 Eagle

Fig. A.4 Wild geese

Fig. A.5 Tiger

Fig. A.6 Orioles

Fig. A.7 Pandas

> The Teacher exerts his leading role by displaying the relevant pictures and videos and answering students' questions

Section 3: Break (2 min)
Neck exercise.

Section 4: Extended Reading (10 min)
1. Introductory words of the teacher: I like the ninth sentence of the clapping song. Who will read with me? (Stand up and read)

Write on the blackboard: Friends

Human -------------- Animals

> Brings in the main point of the text and explains the relationship between human and animals

2. However, I met a little student recently and he told me that humans and animals are not friends. Do you want to know why? Let's read the article, *The Crying Little Fish*, by this student.

> The teacher reads the extended reading material, *The Crying Little Fish*, affectionately and triggers students to think

3. Introductory words of the teacher: According to the observation of the scientists, the animal species on Earth are now decreasing and even disappearing at an alarming rate. The speed of species extinction is ten million times quicker than that of species formation.

Extinct species never reappear. With a large decrease in animal species, humans are losing their most precious biological resource and the biosphere that they rely on. The situation is so bad that it is threatening the survival of humans and the development of society.

Let's imagine in future, when a child asks, "Mommy, what is an owl?" The mother can only show him a picture. When a child asks, "Teacher, what is a pangolin?" The teacher can only give him a specimen. They will never be able to see some animals that are now in existence, just as we can never see a dinosaur.

> The teacher raises a hypothetical question to let students be aware of the seriousness of the problem and to trigger their thirst for knowledge

4. There are several stories about animals and the natural environment in "Classroom Forum". Would you like to take a look at them? After reading them, you can express your opinions by replying in your post.

> Students study the other extended reading materials by themselves. They are encouraged to post their reflections on the message board

Section 5: Typewriting Exercise (9 min)
After reading the stories, do you have any reflection? Today's typewriting exercise is posted in "You Say, I Say" in the Classroom Forum.

1. Do you know any interesting story about humans and animals? Please write a short story by modelling it on *The Crying Little Fish*.
2. Can you find any example of destroying the ecological environment or hurting the animals around you? How do you feel about it? What do you think we primary school students should do?

> Students select one from the two topics above for the typewriting exercise

Section 6: Conclusion (1 min)
The Earth is the common home for humans and animals. We can live joyfully and happily in our home only if all of us care for the animals, protect the environment and make friend with animals. Let us read the text and clap our hands once again with our love for the animals.

Attached are the extended reading materials for this lesson:

The Crying Little Fish
One day, when I was walking along a river near my home, I heard someone sobbing. "Who's crying so sadly?" I asked curiously.

"It's me, the fish!" A lovely little fish surfaced, wiping his tears and looking very sad.

I asked curiously, "You live merrily everyday. What are you crying for?"

The little fish cried and sighed, "People's lives become better these years, but they don't pay attention to preserve the water resources. They pour their rubbish here and throw plastic bags into this river…It's stinking here. When summer comes, groups of flies gather here and it's very dirty. The river water's seriously polluted and my friends have died in groups one after the other. In the good old days, the water here was as green as a flawless jade. I swam freely in the water with a carefree mind. But, now…" The little fish choked with sobs. Seeing this, I sighed and became heavy-hearted.

When I was home, I quickly got a wooden board and wrote nine big words, "The little fish is crying. Can't you hear him?" Then, I put it by the riverside.

I hope that in the coming spring, I will not hear the cry of the little fish, but his happy laughter.

The Monkey Saves People's Lives

One day, when a highlander was gathering herbs in the forest, there was suddenly a bang. A black ball fell from the tree. The highlander was scared to death and was about to run away. Suddenly, the black thing stretched out a hand and pulled his leg. The highlander looked down. Oh, a Francois' leaf monkey, about 2 years old, was looking at him sadly and giving a mournful wail. Its left hand was bleeding.

Without a second thought, the highlander held the leaf monkey in his arms and hurried back home. He helped the monkey to clean its wound and dressed the wound with herbs. The leaf monkey did not shout or move. After dressing its wound, the highlander tied a string on the monkey and let it move and rest in the house.

After a week, the monkey was healed. The highlander untied the string, but the monkey was unwilling to leave. It hung around the house every day, and even helped the highlander to work.

In the morning, the leaf monkey went to the farm of the highlander. If the wild boars, rhesus monkeys or hedgehogs came to steal the crops, then the monkey would dash forward and shout to scare them off. If they did not respond to its shout, then the monkey would shake the branches violently. Under normal circumstances, this trick is very effective. Only the rhesus monkeys were not afraid of this and would continue to steal the corns. In this case, the monkey would rush to them angrily, aimed its long black tail at the backs of the rhesus monkeys and hit forcefully until they ran away.

In this way, the monkey lived in the highlander's home for a month, and then one morning, it left quietly.

One day, at three o' clock in the morning, all the villagers in the highlander's village were sleeping. Suddenly, a fierce knock at the door and a horrifying shout woke the highlander. The leaf monkey was back! When the highlander was about to hug it, the monkey departed from its normal behaviour. It shouted anxiously and pointed at the mountain ridge behind. The highlander turned and looked. Oh, no, the big mountain was collapsing. The giant rocks on the mountain were rolling down. The leaf monkey stretched his long arm and forcefully pulled the highlander to run with it.

The highlander finally understood. He ran quickly back home to wake his family members and all of them ran outside. Then they knocked at all the other villagers' doors. Just as the five households, amounting to more than twenty members, of the village had run outside their houses, the huge rocks rolled down directly toward their village.

Many villagers cried. What a narrow escape! If it is not for the leaf monkey, we would all be dead.

A Story about Water

Eleven years ago, I was a soldier in the Gobi Desert and the events recounted in the following story about water occurred.

It was a place with a serious lack of water. For some months every year, the drinking water for humans and domestic animals had to be transported by water-carts from far away places. Everyone could only get two and a half litres of water each day (the amount of a large bottle of Coca Cola). Many locals tried to stop the watercarts midways, but even if they succeeded, they could only get half a small basin of water. As time passed, even the domestic animals would stop the water-carts. When there was more water, the soldier who drove the watercart would give it a small basin of water.

One day, when I was on duty and was on the way back after getting water, an old cow blocked my way. I honked the horn repeatedly, but the cow just did not move. So, I could only get off the watercart to drive it away. However, the old cow just stared at the watercart and did not move. At that time, water was in short supply and there was a regulation that we must first guarantee that humans had water. I became anxious and hit the cow forcefully with a belt. The old cow remained unshaken. It let the belt hit its body and did not move. After a while, I suddenly found that the old cow was crying! My hands froze, and finally, I gave in. I went back to the watercart and got a basin of water, "Okay, I let you drink it!" Yet, when I put the water in front of the old cow, it only sniffed it once. Then, it cried into the air. Hearing the cry, a calf ran out from the side of the road and drank the water happily. The old cow watched contentedly by the side and sometimes licked the calf. The calf finished the water very quickly. After that, the old cow left the road slowly and ran away with the calf.

Now, no matter whether it is the roaring river water, or the ticking rain drops, or the rushing tap water, it will make me think of the old cow in the Gobi Desert. I hate those people who do not turn off the tap when brushing their teeth. Nature seems to favour us who live in the wet zones. I always want to tell them: water is a precious gift from Mother Earth. It is a not good that you brought for some dollars a ton.

The Subtropical Rainforest of Xishuangbanna

The subtropical rainforest of Xishuangbanna is the habitat of a lot of wild animals, and many of them are rare or even endangered species of the world. It is a real "Kingdom of animals". In the forest, there are 20 species of first class national protected animals, including, red slender lorises, Assam macaques, pig-tailed macaques, Phayre's leaf monkeys, northern white-cheeked gibbons, bearcats, clouded leopards, snow leopards, tigers, Asian elephants, lesser mouse-deer, gaurs, black storks, Sarus cranes, peacock-pheasants, green peafowl, Hume's pheasants, monitor lizards and pythons, and 109 species of second class national protected animals. It has so many precious and rare animals not only because of its climate, but also mainly because the Dai people who live here love the forest and the water sources. They pay attention to protect the animals and have been living with harmony with the animals for generations.

The Dai people realize from their daily life experiences that human cannot do without animals and that human also depend on the protection of animals. For example, if there is no centipede to bite snakes, there will be too many snakes and human will be harmed. And, chickens eat centipedes. If there is no chicken, there will be too many centipedes and human will also be harmed. And then, snakes also eat chickens and eggs. If any of these three animals extinct, the balance and mutually restriction will be lost and human will be harmed. Thus, the Dai people pay much attention to protecting the animals and have learned to handle the relationship between human and animals properly.

Elephants are human's friend. Yet, sometimes, wild elephants will go into the stockaded villages and destroy the crops; and leopards and tigers will also go into the villages to hurt human and domestic animals from time to time. Thus, the Dai people plant fields of banana trees and bamboos on the slope near their villages. The wild elephants often come to eat the bananas and bamboos. The leopards and tigers are afraid of the elephants, so they dare not to come near to the villages. As the wild elephants are such a clever and human-friendly giant with enormous strength, the Dai people had learned to domesticate them a long time ago. The tamed elephants are used as transportation, as well as for opening up wastelands and pulling timbers.

The Miserable Black Bears

Once I visited a bear farming field in another place.

Bear is one of the second class national protected animals. Initially, I thought that bear farming fields should be built in spacious fields or small hills, and were surrounded by wire nettings or stonewalls or something like that to separate the fields from the outside. Though the bears' sphere of activities would not be very large, but at least they could move at their will in a certain area. Yet, the field manager brought us to a row of short houses.

After we entered, I saw that each bear was held inside a square cage made from wires that were as thick as a thumb. The cages were not big and were hanging half a metre from the ground. The cages were only big enough for the bear to turn their bodies inside.

Looking at the 20-odd black bear cages spread horizontally, I asked, "Why do you keep bears?" The field manager replied, "For their gallbladders! Do you know how useful bears' gallbladders are? They are good for the heart and eyes, and can relieve internal heat. They can also prevent and heal cancers, especially cancer of the esophagus and carcinoma of the rectum." However, the gallbladders are inside the bears' abdominal cavities. How can they get the gallbladders? They kill the bears?

The field mangers pointed at a device that the workers installed on the bears' bellies and said, "We use a tube to suck the bile out and collected them at a particular time."

What? Inserting a tube through the belly into the abdominal cavity and into the gallbladder, and the bears were still alive? I did not only break out in a sweat, but was also covering my belly unconsciously. It seemed that even my heart was aching.

If we inserted a tube in a human's gallbladder to let the greenish blue bile flowed out continuously, and still asked that man to live as usual, I bet that was definitely impossible!

I still could not calm down after leaving the bear farming field for a long time. If one day, an animal which has higher intelligence than human suddenly appeared on Earth or on the other planet, and they treated us in the same way, how would we feel? If only we human were left on the Earth, wouldn't we feel lonely?

[Sample 3] Instructional Design for Leapfrogging Development Reading Lessons for Junior Primary School Grades

Instructional Design for *The Story of Trains* (The Second Period)
Guangzhou Liwan Lu Di Xi Primary School Qu Qian Yan

Analysis of the Teaching Contents

This text is chapter thirty three of Book 2 of the primary school language textbook published by the People's Education Press. It is a text that gives students some common knowledge about different types of trains, including steam locomotives, diesel locomotives, electric locomotives and maglev trains. It also talks about the achievements of our country in railway construction, such as increasing the speed of trains and constructing the Qinghai-Tibet Railway. It reveals the speedy advancement of our country's railway construction, which aims at triggering students' love and interest in learning science. However, the descriptions offer by the text is relatively simple and cannot satisfy students' demand to have a deeper investigation. Thus, Internet extended reading resources are needed to enhance students' in-depth understanding of the text and the extension of knowledge.

Teaching Objectives

I. **Knowledge and Skills**

1. Able to read the text fluently and correctly
2. Gaining a better understanding of the trains described in the text and their characteristics from information on the Internet
3. Able to understand the extended reading materials in the website "Information City"
4. Able to model on the model essays in the "Information City" to finish simple sentence construction exercise on the Internet

II. **Processes and Methods**

1. Cultivating students' reading ability
2. Cultivating students' ability to carry out independent investigation with Internet resources
3. Cultivating students' abilities to use and type with computers
4. Cultivating students' imagination

III. **Sentiments and Attitudes**

1. Triggering students' interest in learning more about trains
2. Triggering students' love and interest in learning science
3. Allowing students to realize the swift advancement of our country's technology and gain a sense of pride
4. Cultivating students' willingness to compose online

Key Points of Teaching

1. Using Internet resources to aid students' understanding of the text
2. Triggering students' love of science

Difficult Points of Teaching

1. Understanding the characteristics of the four types of trains
2. Conducting online composition exercise

Analysis of the Characteristics of the Learners
Our class is a web-based experimental class. Students are familiar with the basic operations of computers and are able to surf the net. Most students have basically formed a habit to learn by themselves through the Internet and are willing to carry out online writing exercises. Many of the students are active and like to express themselves. Their thinking are relatively active and they like to learn through investigation. However, they are not very good at expressing themselves with Mandarin. They speak with broken sentences and have poor coherence.

Selection of Strategies

1. Using Flash games to revise words and trigger students' interest in learning, and then train their ability to form phrases by asking them to form phrases verbally
2. Using extended reading materials to let students explore on the Internet freely, which allows them to have an intuitive and personal understanding of the text
3. Using a game "Train Guessing" to make learning interesting and concentrate students' attention
4. Conducting written expression in an Internet environment, which integrates the training in writing with the training in creative thinking. This fosters students' accelerated development in both language ability and thinking ability

Organization of Teaching
Mainly adopting an independent investigation method with appropriate group games.

Preparation of Resources
Creating extended reading materials which embrace the teaching concepts of the "accelerated development" and present them in the form of web pages. This serves to fulfill the needs of independent investigative learning and the requirements to deepen and broaden the teaching targets.

Teaching Procedure

I. **Stimulating Students' Interest in the Introduction, Revising the Words**

1. Yesterday, we've made friend with the new words of chapter 33. They're now arriving on the train, let's greet them! (Playing the courseware)The words are: 弄, 速, 断, 创, 修, 名[9]

2. Forming phrases: Using "修" and "名" to form phrases respectively (Naming students to form phrases first, and then let students form phrases with their neighbours)

II. **Creating the Scenarios, First Reading of the Text**

1. Introductory words: Apart from the new words, we've also learned the first and second paragraphs of the text. Xiao Ming asked his father, "What does the train rely on to move?"

2. Does Xiao Ming's father give him the answer right away? Let's us look at the books and find the answer ourselves like Xiao Ming! (Displaying the courseware) Guides students to think of the following questions while reading the third paragraph:

   (1) What does to trains rely on to move?
   (2) What type of train does this paragraph describe?

3. Presentations by the students. (Writing their answers on the blackboard)

III. **Using the Internet Resources, Independent Investigation**

1. Students read the third paragraph of the text first and then browse the Internet resources. Asking students to introduce their favourite train after reading the text and browsing the web pages

2. Students carry out independent online learning with the teacher's supervision

IV. **Interacting through Game, Exchanging through Presentations**

1. Giving introductory words.
2. Introducing the game "Train Guessing".

Presentations and exchange: Naming students to answer which train it is and combining the information in the text and on the Internet to introduce different types of trains and conclude their characteristics together with the students.

(Playing the courseware) Writing on the blackboard.

   (1) Electric locomotives.
   (2) Steam locomotives.

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[9]These characters literally mean "make, speed, broken, create, repair, name" respectively.

    (3) Diesel locomotives.
    (4) Maglev trains.

3. Instructing students to read the third paragraph.
4. A brief summary: In future, we can consult Dr. Computer for more questions and collect more information from the Internet.

V. Studying the Text, Comprehending while Reading

1. Introductory words: How are our country's trains developing now?
2. Students study the fourth and fifth paragraphs by themselves on the Internet with the questions.

3. Presentations by students:

    (1) Our country's trains become quicker.
        Understanding of the phrase "夕发朝至" [literally means "starting a journey in the evening and arriving in the morning"]
    (2) Our country had constructed the world's highest attitude railway, the Qinghai-Tibet Railway.
        Understanding of the phrase "创举" [literally means "pioneering undertaking"]

4. Instructing students to read the fourth and fifth paragraphs
5. Giving guidance to students about reading the sixth paragraph: What does Xiao Ming dream of tonight?
6. Reading the sixth paragraph together with the students.

VI. Reading Online, Broadening and Extending

1. Introductory words: Do you want to know what Xiao Ming's new train looks like? Let's look at it in "Information City"!
2. Students read the online extended reading materials freely by themselves
3. Commenting a particular model essay in the extended reading materials. A brief summary: Describing the new train from its name and characteristics. (Writing on the blackboard)

VII. Online Composition, Practical Training

1. Class, can you describe your own imagined new train like the model essay? What is the name of your train? What characteristic does it have?
2. Naming students to answer the questions.
3. Triggering students' interest in writing and let them describe their imagined new trains in writings.
4. Students compose their writings with computers with the teacher's supervision.
5. Commenting a particular online writing exercise (Comments from students and comments from teacher).

Assessment points: The fluency of the sentences and the characteristics of the train.

VIII.   **Giving a Conclusion, Deepening the Theme**

You write really well and you've good imagination! If you learn to learn, pay attention to observe things around you and think seriously, you'd surely become a scientist in future! From today onwards, let us explore, discover and create science together!

[Sample 4] Instructional Design for Leapfrogging Development Reading Lessons for Middle and Senior Primary School Grades

Instructional Design for *That Green Patch of Boston Ivy*
Guangzhou Dongshan Experimental School Huang Wen

Analysis of the Teaching Materials
This text is an intensive reading text of Book 7 of the primary school language textbook published by the People's Education Press. It is an article written by Xiao Fu Xing in 1992 in memory of Mr. Ye Sheng Tao. It recollects the growth experience in which Mr. Ye Sheng Tao corrected the writing for "me" in 1963 and invited "me" to his home, which "I" benefited much from this experience. This text reveals that Mr. Ye Sheng Tao is meticulous towards "writings", and amiable and frank towards "people". He is a model of both writing quality and moral quality.

Teaching Objectives

1. Able to recognize the 13 new words of this text and write seven of them. Able to recognize and read "推荐, 眼帘, 删掉, 规范, 燥热, 融洽, 黄昏, 客厅"[10] correctly and to learn the three difficult characters "荐, 翻, 昏"[11] with the character recognition methods that they like.
2. Able to read the text correctly, fluently and with emotion and to memorize their own favourite paragraphs or sentences.
3. Able to comment on the key phrases, sentences and paragraphs of the text, and learning the methods to correct writings. Cultivating students' habit to correct writings seriously and enabling them to realize that one must learn to behave properly before learning to write.
4. Able to understanding the phrases and sentences which have deep meanings in the text by reading the relevant paragraphs or the linguistic context. Able to realize the writing method of "expressing emotions through sceneries".
5. Able to compare this intensive reading text *That Green Patch of Boston Ivy* with the text *Each has his Merits and Demerits* in this teaching unit and the extended reading materials for this text. Able to realize that in one's growing process, there are a lot of good teachers and friends who give helps and inspirations to one in different ways.

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[10]These phrases literally mean "recommend, eyelid, delete, specification, dry and hot, harmonious, dusk, living room" respectively.

[11]These characters literally mean "to recommend, to turn over, dusk" respectively.

6. Conducting written expression in the online message board. Students should be able to closely integrate the knowledge they gained from the text and reading with their daily life experiences. They should express their feelings and experiences in the form of a letter and with the method of "expressing emotions through sceneries".

Key Points and difficult Points of Teaching

1. Enabling students to understand the phrases and sentences with deep meanings in the text and to learn the writing method of "expressing emotions through sceneries". (That means expressing one's emotions through describing the sceneries.)
2. Enabling students to learn the methods to correct writings from the way Mr. Ye corrected the writing *A Portrait*.
3. Enabling students to using the method of comparative reading to realize the helps and inspirations that good teachers and friends give to one in the growing process.

Teaching Rationale

1. Through teaching students the method to learn, this lesson guides students to conduct independent investigation. Aided by the modern information technology, the teacher provides students with rich extended reading materials which are relevant to the themes of the text. This enables students to think seriously and have in-depth experiences when studying the text and reading extended reading materials, as well as to conduct written expression. Students' integrated language ability is improved in the processes of learning and applying language.
2. Selecting *Each has his Merits and Demerits*, which is a text that students are only required to skim through and that is closely related to the content of this text, makes the different sections in the lesson coherent and turns the teaching contents of the teaching unit into an organic whole.

Analysis of the Characteristics of the Learners

1. Students in our class possess a certain abilities to acquire vocabularies by themselves and to grasp the key phrases and sentences when commenting on a text. They are currently learning to write and correct writings. They had read other works by Mr. Ye Sheng Tao, such as *The Feet of the Boston Ivy* and *The Scarecrow*, and greatly admire this great author. This is quite useful to their learning of the new words and understanding of the text.
2. Students are able to use the courseware to learn by themselves, read the online reading materials and use the online message board correctly.
3. Students are very interest in carrying out language activities, namely, reading and writing, in an Internet environment.
4. Students have quite some experiences in life, reading and writing. They have relatively strong ability to express themselves.

Preparation of Resources

Vocabulary flash cards, online extended reading materials which are closely relevant to the text, reading report forms.

Arrangement in Different Periods

First Period	Giving the introduction with questions and reading the text for the first time; Learning the new words, reading over the text and concluding the major contents; Conducting extended reading on biographies and learning to "correct writing".
Second Period	Further studying the text with collaborative exploration in groups. Commenting on the key phrases and sentences and gaining a basic understanding of the writing method of "expressing emotions through sceneries". Gaining inspirations of growth through combining the text with the skim-through text and extended reading materials.
Third Period	Gaining a detailed understanding of the writing method of "expressing emotions through sceneries" by having extended reading on various articles that use this method, and trying to use this method to compose a letter when conducting the typewriting exercise. The topic of the exercise is: Write a letter to your best friend. Telling him/her the helps and inspirations that you have got in your growing process.

The Teaching Processes of the Second Period

I. Introduction by Means of Revision

Introductory words of the teacher: In the previous lesson, we've studied *That Green Patch of Boston Ivy*, understood its major contents and studied the part when Mr. Ye Sheng Tao corrected the writing for "me". Can anyone share with us what did you gain from that?

Guiding students to give presentations on two aspects, the methods to correct writings and Mr. Ye Sheng Tao's "meticulous" working attitude. (Green leaf bookmarks, which have the methods to correct writing written on them, are rewarded to students who have good performance.)

> Helping students to recollect the content of the first section (the meticulous working attitude of Mr. Ye Sheng Tao and methods to correct writings) with revision, which is beneficial to the following teaching activities

II. Investigative Learning, Commenting on the Text

i.   Recollecting the learning methods in the first section (reading, defining, discussing and commenting)

ii. Collaborative investigation, learning the part on "inviting to be the guest"

1. Showing the outline of independent learning:
    How does the part on "inviting to be the guest" reflect Mr. Ye Sheng Tao's amiable personality? How did "I" feel? Please study together with the method of "reading, defining, discussing and commenting".
2. Students start investigation learning in coloration.
3. Presenting and exchanging, commenting on the key phrases and sentences.
    * Which sentences in the text reveal Mr. Ye Sheng Tao's amiable personality?
    Giving comments on the following sentences according to students' presentations:
    "I was surprised. A great writer like Mr. Ye Sheng Tao would meet a junior secondary student!"
    "When old Mr. Ye saw me, he shook hand with me just as meeting an adult. I suddenly felt that our distances become much shorter."
    "We talked harmoniously. It seemed that I was no longer a child, but an adult, an old friend of his. There was seriousness in his friendliness, and expectations in his modesty. My tiny little heart was melted and became unnoticed of the arrival of dusk."

Offering guidance to students   What does "melt" originally refer to?
          (The process in which a solid is heated and become liquid.)
          What does it mean in the text?
          (The author's psychological change from feeling nervous to relaxed.)
          Have you realized his feeling when reading the text?

> Commenting on the key phrases and sentences, so that students can have a good taste of the text, and have a deeper understanding of the text and the feelings of the author.

* The feelings of "me"?
    Showing the two sentences that describe the Boston ivy in the second section in accordance with students' presentations. Guiding students to read with emotions, and to experience the author's excitement and happiness.

> Gaining an initial experience of using sceneries to express emotions in the commenting and reading processes, which prepares for the breakthrough of the difficult points

iii. Studying the last paragraph
The incident has passed for many years, but the author still has a vivid memory of the events in that year.

1. Naming students to read the last paragraph.
2. Commenting on the following key phrases and sentences.

    "His words made me feel that I seemed to understand or know vaguely: A writer should be like this and a writer's works should be composed in this way. The summer when I was fifteen had extraordinary significance."

    * Why does the author say "seemed to understand or know vaguely"?

    * Key phrases that students should understand: 堪称楷模[12] (guiding students to understand it through the linguistic context) and 意义非凡[13] (guiding students to understand it through combining it with the introduction of the persons). (Green leaf bookmarks, which have encouraging words written on them, are rewarded to students who have a correct understanding.)

3. Students read the last paragraph of the text with emotion by themselves.

> Deepening understanding of the text through collaborative investigation, reading and commenting on phrases as well as reading instruction

III. Returning to the Whole, Giving a Brief Summary of the Writing Methods

1. Do you still have any questions now? (Asking the students, "Why does the text use "That Green Patch of Boston Ivy" as its title?")
2. Showing students the sentences that describe the Boston ivy in the text and letting them discuss the questions which are raised in groups of four.
3. Presenting and exchanging with the integration of reading instruction (deepening students' understandings with reading) .A brief summary: Though *That Green Patch of Boston Ivy*, the author expresses his emotions and gives us a deep impression.Students who have got my green leaf bookmarks please stand up and read the words that I wrote on it. Let us think: Am I really rewarding merely a green leaf bookmark to you today? (Learning the methods to correct writings, Mr. Ye Sheng Tao's sincerity and modesty, as well as his meticulous attitude towards learning)

> Gaining a further experience of the writing method of "expressing emotions through sceneries" through exchanging ideas, discussions and reading.

Using the green leaf bookmarks to gain a deeper understanding of the text and its expression techniques

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[12]This phrase literally means "exemplary".

[13]This phrase literally means "extraordinary significance".

Fig. A.8 The webpage with the extended reading materials for this lesson

IV. Comparative Analyses

1. It seems that Mr. Ye Sheng Tao's behaviours and words have given us an unforgettable impression. In the text *Each has his Merits and Demerits*, the great writer Ke Yan helped a primary student Zhang Guo Qiang to solve his confusions in the growing process with letters. Read that text silently and see what we can learn from the replies of the writer. (Analyzing the relevant sentences in the text)
2. Students conduct independent learning first, and then exchange their ideas in groups

V. Extended Reading (Experiencing the inspirations different people gave us in our growing processes) (Fig. A.8)

1. Grouping students into groups of two. Students select the articles that they would like to read and fill in the following form:

	Article	Sentences that touched me	Inspirations to my growth
I	Visiting Old Jun Qing		
	To Little Reader Again		
	Gorky and the Children		
II	A String of Grapes		
	The Rain Drops of Spring		
	An Unforgettable Criticism		
III	A Touching Short Drama		
	The Inspiration of Fishing		

2. Exchanging and presenting

> Gaining a deeper understanding and experience on the inspirations of growth through having a comparative analysis with the skim-through text and conducting extended reading

VI. Assignment

In our paths of growth, each of us will meet some good teachers and friends. Let us use the correction methods that we have just learned to correct a piece of our old writings carefully, and send it as a gift to them to express our thanks.

> Extra-curriculum extension. This aims at deepening the cognitive goals and affective goals.

Writing on the Blackboard:

26. *That Green Patch of Boston Ivy*

Correcting writings	Meticulous	Works	⎫ Exemplary
Inviting to be the guest	Amiable	Personality	⎭

Notes

[1] Zhu, Z. X. (1998). *Child psychology (1993 Revised Edition)*. Beijing: People's Education Press.

[2] *Language curriculum standards (Trial Version)* (2001). Beijing: Beijing Normal University Publishing Group.

[3] He, K. K. (2004). New theory of children's thinking development and intensified reform in language education. *Pedagogical Research*.

[4] Zhao, J. S. & Lou, B. S. (2001). *Language education for pre-school children*. Beijing: People's Education Press.