

Study on Cultivating Students' Critical Thinking Ability Through Higher Order Questioning

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Abstract—In the contexts of unusually intense competition for international talents, no one denies the importance of cultivating students' critical thinking ability. Teaching students to think critically and creatively, however, is a great challenge to every classroom teacher. This article examines the role of teacher questions, discusses the connotation of higher order questions and classifications of questions — Bloom's Taxonomy of questions, Socratic questions and metacognitive questions, explores the relationship between teacher questions and students' critical thinking development, and provides effective suggestions for asking higher-order questions. It intends to help classroom instructors gain a deep understanding of teacher questions and train students to think critically through higher-order questioning.

Keywords—critical thinking ability; teacher questions; higher order questioning; bloom's taxonomy

I. INTRODUCTION

Western countries attach increasing importance to cultivating students' critical thinking ability in the background of fierce international talent competition. As early as the beginning of 1980s, Siegel (1980) and McPeck (1981) made an intense appeal: cultivation of students' critical thinking ability is an essential link of school education, the necessary condition to accept education. Michael S. Roth, president of Wesleyan University, even proposed to regard cultivation of students' critical thinking ability as a major goal of higher education in a speech in 2010.

Some people of vision start to be aware of the importance of cultivating students' critical thinking ability. The first national education plan in the new century — Outline of National Program for Medium- and Long-term Education Reform and Development (2010-2020) (Ministry of Education, 2010) issued by Ministry of Education of the People's Republic of China in July 2010 clearly points out that, in order to have a long-term development, education should be "for all students to promote their all-around development, and should focus on improving students' social responsibility of serving the country and the people, innovative spirit of exploration and practical ability to solve problems". Article 32 of Chapter 11 of the Outline (Innovative Personnel Training Mode) specially emphasizes that school education should "combine learning with

thinking, advocate heuristic, inquiry, discussion and participatory teaching to help develop students' learning ability. Inspire students' curiosity, cultivate their hobbies and interests, and create a good environment for independent thinking, free exploration and innovation". It can be seen that, the development of students' critical thinking ability is one of the strategic tasks for national long-term development (Ruan Quanyou, 2012). "Students will enjoy a lifelong benefit if the critical thinking ability to solve problems is regarded as an educational goal". (Wen Qiufang, 2010: 350)

There are many ways for cultivating students' critical thinking ability, and high order questioning by teacher is one of the effective ways. Unfortunately, most teachers can ask students questions (Dillon, 1982), but not all teachers can raise high-level questions. According to observation and research, most questions raised in the class by teachers are low-level ones in terms of their cognitive process (Khan & Inamullah, 2011). It can be found, by attending traditional classroom teaching, that teachers haven't fully appreciate the role of questioning to teaching, and they prefer to stress textbook knowledge instead of cultivating students' independent thinking ability (Elder & Paul, 1998). In order to improve the quality of teacher questions in classroom teaching, in this paper, the role of teacher questions is discussed; the connotation of higher order questioning and its three types, namely Bloom's Taxonomy of higher order questions, Socratic questions and metacognitive questions, are described; and in the end, specific suggestions regarding how teachers raise the higher order questions are put forward, aiming to help teachers gain a deep understanding of teacher questions and master methods to design higher order questions to cultivate students' critical thinking ability.

II. SIGNIFICANCE AND ROLE OF TEACHER QUESTIONS

In classroom teaching, questioning is one of the teaching methods commonly adopted by teachers (Brualdi, 1998), and one of the most commonly used teaching strategies. Teacher questions can urge students to response to information simply memorized, and to abstract processes such as application, synthesis and evaluation (Zepeda, 2009). Considering from another perspective, teachers provide more information to help students understand the article through higher order questioning. What is more important, students' higher order thinking ability can be stimulated by

questioning (Elder & Paul, 1998). Teacher questions determine the development level of students' critical thinking ability to a certain extent, and only by thinking can students gain something of real value. Teachers can help students to deepen their understanding of knowledge and to think critically and creatively using questions. With artistic questions, teachers can explore students' potential and complete teaching objectives more effectively.

It is good questions instead of correct answers that stimulate thinking, and the most effective method to think or rethink is to raise question that inspires individual thinking. While questioning, "teacher questions must define the tasks, illustrate the question to be solved, describe the focus of disputes. But getting the answer generally marks the ending of thinking; yet thinking cannot be continued until an answer generates another question" (Elder & Paul, 1998). The art of questioning in teaching process is one of basic skills of high-quality teaching (Khan & Inamullah, 2011), the quality of teacher questions determine the quality of students' thinking, and only those who accept questioning can really think and learn. Living in such a complex and changeable society, no one denies those good questions raised by teachers in the class.

III. CONNOTATION AND TYPES OF HIGHER ORDER QUESTIONING

Higher order questions raised by teachers are high-level questions of educators based on their higher order thinking

skills for the educated, to help them connect learning experience with new knowledge (Nappi, 2017), so that their learning can be meaningful. Generally, American educator Bloom's questions relating to analysis, evaluation and creation in human cognitive process are regarded as higher order questioning in academic circles (Anderson & Krathwohl, 2001). According to Bloom's taxonomy of educational goals (Anderson et al, 2009), analysis refers to decomposition of material into its constituent parts, determining the interrelationship between parts, and the relation between various parts and the general structure or purpose, including distinction, organization and attribution; evaluation is to make a judgment based on criteria and standards, including inspection and review; creation is to form an internally consistent integrity or functional integrity with the elements, to reorganize the elements into a new model or structure, which process includes producing, planning and generating. In actual teaching, most teachers are familiar with concepts of these three dimensions, but according to research, only half teachers are able to practice and apply these higher order questions (Yusoff & Seman, 2018; Lemons & Lemons, 2013).

First of all, viewing from higher order thinking of Bloom's cognitive hierarchy, teacher's higher order questioning is divided into the types of analysis, evaluation, illustration, reasoning, explanation and creation. The tasks contained in each type of question are listed in "Table I" (Yesoff & Seman, 2018).

TABLE I. HIGHER ORDER QUESTIONS UNDER BLOOM'S COGNITIVE HIERARCHY

No.	Type	Connotation
1	Analysis	Examine the ideas; establish an argument; identify assumptions; find out contradictions.
2	Evaluation	Compare advantages and disadvantages; evaluate the criterion; make a judgment.
3	Illustration	Classify; clarify the meaning; communicate in various meaning; decode the meaning.
4	Reasoning	Draw a conclusion; challenge the evidence.
5	Explanation	Describe the methods and results; prove the process; make a point and defend it with reasons that stand up to rigorous examination.
6	Creation	Create; design; modify; adjust; produce; remodel.

Second, Socratic questions are also an aspect that cannot be ignored for teacher's higher order questioning. Such questions refer to that teachers raise a series systematic and prearranged questions to help students reflect on themselves, so as to improve their thinking ability and to better understand their beliefs and thoughts (Nappi, 2017). Elder and Paul (2017) summarized the Taxonomy of Socratic questions, and divided higher order questioning into clear questioning, precise questioning, accurate questioning, relevant questioning and in-depth questioning. Clear questioning requires the individual to explain, illustrate or exemplify the questions; precise questioning requires the individual to provide details; accurate questioning requires the individual to answer with facts and data; relevant questioning advocates that thinking will be meaningless

unless the supporting arguments are test and applied; in-depth questioning depends on complexity of thinking.

Third, higher order questions also include metacognitive questions, which encourage students to reflect on their thinking and learning. Metacognitive questions require being proactive in asking questions, and students should be aware of their need to cultivate cognitive skills (Christensen, 2017). Metacognitive questions require teachers to use some strategies that can inspire students to think, such as, allowing students to make predictions according to the reading activity and class activity; asking students to combine existing knowledge with new knowledge; inspiring students to ask questions based on their own and others' questions; asking students to explain how they are trying to solve the problem independently (Nappi, 2017). The research shows that, carefully designed high-quality questions can enable students

to associate what they have learned with their own experience (Nappi, 2017), so that students may have a more comprehensive and profound understanding of old and new knowledge. Such questions include “do I have enough information about the question?”, “what else can I do?”, “do I know where can I get more information?”, “what learning strategies can I use to gain these knowledge?”, “how do these thoughts affect my thinking?”, “can I be sure of the error?” and so on.

IV. STRATEGIES AND SUGGESTIONS FOR TEACHERS’ HIGHER ORDER QUESTIONING

Cultivating students’ thinking ability, especially higher order thinking ability, is a great challenge for both new teachers and experienced teachers. It is important for teachers to have an in-depth understanding of the types and role of lower and higher order questions, but with respect to how to help students cultivate higher order thinking ability, teachers need a series of feasible strategies about “how to” raise a question. Three suggestions are listed below for teacher’s higher order questioning in class.

The first is taking initiative to create an environment for developing students’ high-level thinking ability. It is necessary for teachers to create a safe, relaxed, inspiring and respectful environment in order to facilitate students’ thinking ability development through questioning. Students’ thinking will be more active and their thinking will also go to a higher level if they have no pressure in answering the question. Learning atmosphere during questioning is greatly influenced by teacher’s behavior, so teacher’s tone, facial expression, body language and other non-verbal cues must be suitable for students, so as to create an atmosphere of inspiration and promotion to encourage risk-taking and trigger their divergent thinking (Shaunessy, 2000). The creation of a harmonious environment is of essential importance to the success of inquiring class, and mutual support and respect between teachers and students is needed. Only in such classroom environment can students’ critical thinking ability be developed well.

The second is increasing the awareness of higher order questioning. In classroom teaching, the question having only one correct answer is unable to cultivate students’ critical thinking ability. Students can reflect on their own thinking by thinking about higher order questions, and then they can see through the appearance to perceive essence, and try to deal with complicated and changeable things, so as to improve and develop their critical thinking ability and innovation ability. The study shows that, students will forget 80% of what they have learned from lower order questions, but 80%-85% of knowledge learned from higher order questions will be remembered (Savage, 1998). Unfortunately, a large number of studies about teachers’ questioning behavior and mode show that, teachers spend 80% of their teaching time asking students questions, but 70%-80% of those questions only examine students’ memory (Brualdi, 1998), while memory is lower order questioning in Bloom’s educational goal generally accepted in academic circles. As a result, teachers should enhance their understanding of higher order questions further and strengthen their awareness of

using higher order questions in teaching. Only when teachers change teaching philosophy can higher order questions be integrated into each link of teaching and be helpful to students in understanding what they have learned and to the cultivation of their critical thinking ability.

The third is using the “waiting time” wisely. “Waiting time” refers to the interval between when teacher starts asking questions and the next verbal act. In general, “waiting time” is 3-5 seconds. According to the analysis and research of Stahl (1994), information processing involves multiple cognitive tasks, and this process takes time. Students need a continuous period of time to deal with the information, thinking what has been said, what has been observed, what has been done, and then consider how to answer teacher’s questions. In the past two decades, a series of relevant researches show that, the discussion atmosphere in class will become more positive if teacher waits for 3-5 seconds after questioning. At this time, more students will answer the questions with more accurate, detail and reasonable answers, and get responses from other students. In other words, students’ answer will have a high cognitive level. As a result, to cultivate students’ critical thinking ability and innovation ability by making good use of higher order questions, reasonable utilization of “waiting time” is of important practical significance of teaching. Providing appropriate “waiting time” for students’ higher cognitive process will encourage students think deeply about the questions (Wigle, 1999).

V. CONCLUSION

The innovative talents with thoughts, ability and pioneering spirit are in urgent need in the society with rapid development of internationalization of talent market. In this context, cultivation of students’ critical thinking ability has become an organic component of classroom teaching, and is of strategic significance of national development. Nevertheless, as far as the actual situation of classroom teaching is concerned, cultivation of students’ critical thinking ability has not received adequate attention. In the light of this problem, professor Wen Qiufang, a famous scholar in foreign language field, has seriously indicated three years ago that “there is a significant gap in China’s researches compared with those of foreign countries, which gap lies in action not in concept” (Wen Qiufang, 2010). If the cultivation of students’ critical thinking ability is neglected due to traditional teaching thought, then it is time we did something about it. It is necessary to train the in-service teachers and normal students in terms of “Teachers’ Questioning Strategies and Students’ Critical Thinking Ability Cultivation”. Teachers will have a deeper understanding of connotation, classification and role of higher order questions, be proficient in designing high-quality higher order questions and master abundant and effective questioning strategies through educational training. To understand teacher questioning from the strategic height of national talents is of important significance to facilitating students’ critical thinking ability and innovative ability development.

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