Teach a Same Lesson: A Professional Development Strategy in China

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In this study, a professional development strategy, i.e., teach a same lesson from a textbook was focused on. Three videotaped exemplary lessons given by three young teachers were analyzed to summarize the similarities and differences between their teachings. It was found that they tended to set up high-level tasks when they interpreted the same written curriculum but the cognitive demands of these tasks often declined at the implement phrase. Teaching a same lesson could provide a big platform for teachers to display, explore, discuss and share with others about their beliefs, understanding and strategies of mathematics instruction.

Introduction

In the past twenty years, there has been increasing interest in examining and understanding Chinese mathematics teachers and their instruction. According to the "Teachers Law" released in 1993, the minimum requirement for acquiring a primary school teachers' qualification certificate is the completion of a 3-year programme of study at a normal school that admits junior secondary school graduates. With so limited years of education, how could Chinese primary school teachers' subject matter knowledge of mathematics was markedly more solid than that of the U.S. teachers (Ma, 1999)? Chinese students learn in teacher-dominating classrooms. With the passive learning environment, how could Chinese students give very good performances in The International Mathematical Olympiad (IMO) and other international comparative studies? Statistics from the *Communiqué of the Ministry of Education* issued in 2011 (Ministry of Education of the People's Republic of China, 2011) shows that in 2010, there were 257,400 primary schools with 5,617,100 teachers, 54,900 junior secondary schools with 3,525,400 teachers, and 28,584 senior secondary schools with 1,518,200 teachers. With such a huge number of teachers, how Chinese teachers are trained to meet the challenges of the curriculum reform? The answers for these questions are not simple. However, they must be related to two factors – what to teach and how to teach. This paper focused on how teachers interpreted and enacted curriculum in their own ways when they were required to teach a same lesson from a textbook in a teaching contest. Three first prize-winning lessons were analyzed to summarize the similarities and differences between their teachings. Based on the results of this study, some further discussion topics were suggested to elicit teachers' reflection on the three lessons.

Overall, the Chinese education system is a national system governed by the Ministry of Education. Firstly, China has National official curriculum with long history. Secondly, several series of textbooks are approved and used at school level, but more than 60% of school students in Mainland China are using the People's Education Press (PEP) mathematics textbooks. The press is directly affiliated with the Ministry of Education in China. As Ma indicated that "studying teaching materials intensively" is an essential way for schoolteachers to attain their mathematical knowledge (Ma, 1999). Finally, the four-level teaching research network is another national system in China. It consists of Teaching Research Offices at the provincial level, Teaching Research Offices at the city level, Teaching Research Offices at the county level, and teaching research groups in schools. The main duty for the officers in this system is to organize all mathematics teachers in China and support their professional development. For each school subject, there's a fixed time in a week for doing teaching research activities in that subject. On the website of Teaching Research Office in Jiangsu Province (http://www.jssjys.com/), we could find a lot of information of teaching research activities organized at province level in the past years and a lot of remarkable written resources and video lessons - cover all subjects and all school levels.

Following the same written curriculum, Chinese teachers share a lot of common issues or challenges in their teaching and the teaching research organized at different levels help them to solve these problems together. They could even share their experiences (successful or unsuccessful) with other mathematics teachers in the country in dozens of periodicals targeted at schoolteachers (Yang, Li, Gao and Xu, 2012).

"Teach a same lesson" means that different teachers teach a same lesson from a textbook basing on their own teaching styles and understanding of the teaching content. As a collaborative teaching research activity, other teachers who teach in the same year level are required to observe the lessons, reflect on their own teaching and discuss around a specific theme or issue after the teaching. It has various forms to meet different needs, e.g., to invite teachers have various backgrounds or have similar background to teach. Within teaching research group at school, discuss and revise one lesson in practical teaching continuously is often used.

In the past decade, Jiangsu province used "Teach a same lesson" in its teaching contests. In 2007, there were 14 teachers, recommended by 13 cities in the whole province taught a same lesson - average rates of change in the contest. This lesson was selected from a Grade 11 textbook. The three lessons discussed here are first prize-winning lessons. Teacher A, B and C had 4, 15 and 16 years of teaching experience respectively. Besides of the video records, "lesson explaining" (includes teaching objective, the important and difficult content points of teaching, teaching methods and strategies, teaching process, blackboard writing design, teaching design explaining), the e-resources used in teaching and the teaching plan for each lesson were collected.

Methodology

Mathematics learning is usually occurred in working through mathematical tasks. Stein, Remillard and Smith (2007) argued that the cognitive demands of a task could

change as the task unfolds (see Figure 1). Based on this belief, this study tried to identify the similarities and differences when the three teachers interpreted the same textbook before the teaching and implemented their own teaching plan in the teaching. What and how tasks were kept, adapted, replaced or ignored in three teachers' teaching plan were examined. Then, the conversation between the teachers and their students during the classes were illustrated to highlight whether the tasks as implemented remain consistent with the ways in which they were set up.

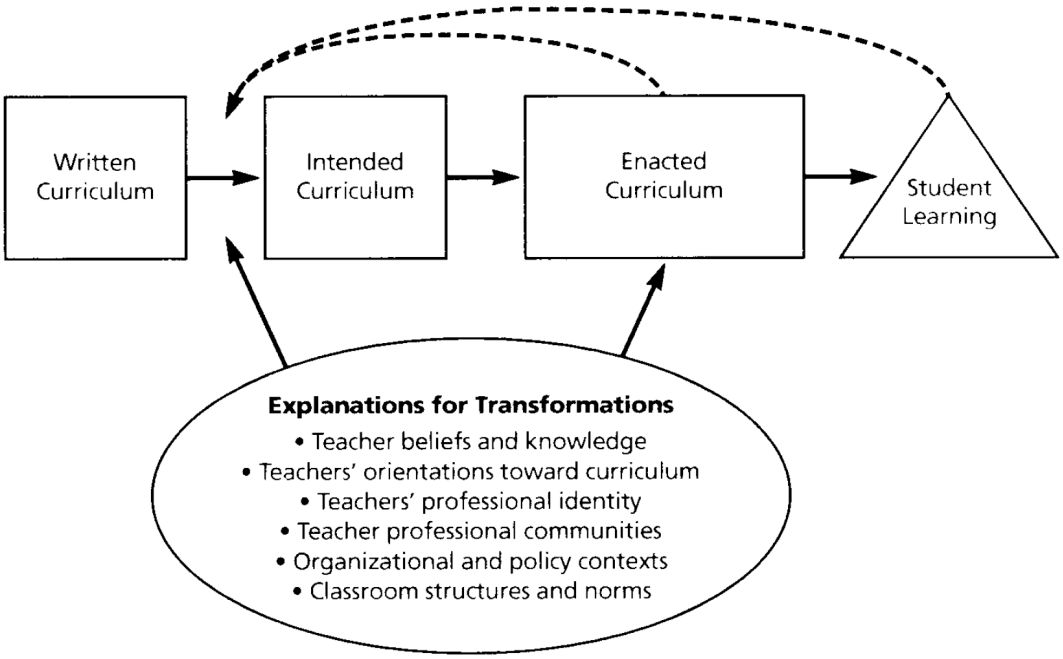

Figure 1: Temporal phases of curriculum use (Stein, Remillard and Smith, 2007)

The three lessons were transcribed verbatim, along with time recording for all the conversations that happened in the class.

Results

From written curriculum to intended curriculum

The lesson only has 3 pages in the textbook, half of it introduces the concept and the other half reinforces the concept. Before presenting the formula of average rates of change, the textbook firstly required the students to read the temperature line graph carefully. After they see the sudden rise in the last two days, they are expected to use mathematical language to express the information. Then the textbook suggests using slope to approximately measure the steepness of a curve between two points and defined it as the average rate of change. This is a "doing mathematics" task. Next, the textbook arranges 4 examples and 4 exercises for practicing. One example is a "doing mathematics" task and other three are "procedures with connection" tasks. "Procedures without connection" tasks only used in exercises in the textbook.

All the three teachers either kept the tasks in textbook but adapted some of them to a higher cognitive level, or they introduced additional tasks for scaffolding or

providing ample opportunities for practice. It is not a surprise that teachers elaborated and supplemented the textbook with other materials as the book only presents the essence content of the lesson. Three teachers had their own strategies to assist students' learning through the design of their lessons. Using realistic context problems, discussing misconceptions with students or connecting and making use of previous knowledge are main strategies.

From intended curriculum to enacted curriculum

During the lesson, all three teachers talked clearly and coherently, modeled high-level performance to the whole class, and tried their best to engage students in mathematical thinking and sense-making. They dominated the lessons by introducing well-organized tasks one after another, frequent interactions with the whole class and asking very few divergent questions.

Teacher A, who had 4 years of teaching experience seemed to follow her teaching plan more closely than the other two teachers. She asked more high-level divergent questions than the other two teachers, but very few of her questions were poorly worded. Teacher B did not ask many questions. Instead, he preferred to explain the contents with words, symbols and graphs, using multi representations. He also asked the students to read textbook quietly and reflect on what they had learnt deeply. Teacher C used a lot of questioning in her teaching. The frequent dialogues helped her diagnosing, scaffolding and orientation. However, during the conversation, some higher-level demands tasks were implemented at lower level and challenges to her students' thinking were limited.

Based on the findings of this study, the following questions were suggested to teachers for their further reflection on the three lessons:

- To form the concept of average rates of change is the important point of this lesson. Besides of the concept slope, what other previous knowledge could be connected? What is the big idea we should highlight in this lesson? What is your way of deepening students' thinking beyond calculation? What we can learn from the three teachers?
- There are two difficulties in teaching of this lesson. One is related to mathematics, i.e., how to help students find out that we could use the slope of the secant line to measure the steepness of a curve. The other is related to motivation, i.e., how to engage students and capture their interest in learning the formula? What is your way to deal with it? What we can learn from the three teachers?
- Teacher C mainly used questioning model in her teaching. Select two good questions from the transcript of her teaching and explain why you think they are good questions. Select a piece of dialogue try to replace it with bigger step questions.

After teaching and open discussion, teacher educators or the leaders in teaching research group usually presented some topics for further discussion and reflection. These sample questions could be used for this purpose. Written curriculum reflects some features that reformers have suggested in the new curriculum, for

example, advocating active, constructive, inquiry-oriented learning, developing students' higher-order thinking, and teaching for understanding. Bridging theory and practice in teacher education is important.

Discussion

The three lessons illustrated in this study are first prize-winning lessons at the province level in 2007. According to my experience, the feature of mathematics classroom instruction identified here - direct instruction by teacher combined with frequent teacher questioning is still a dominant teaching strategy used in China. It seems that Chinese teachers tend to use much higher quantities of whole-class interactive instruction and this direct but interactive teaching method appears to be very effective in ensuring that skills and concepts are thoroughly practiced, applied, and understood by all students (Westwood, 2004). Ausubel's meaningful learning theory and the Chinese culture of learning (Jin & Cortazzi, 1998) could be used to explain why both teacher and student in China value this teaching approach (Mok, 2006).

To effectively support teachers to develop their professional knowledge and skills is a practical issue for teacher educators. "Teach a same lesson" is embedded in the Chinese teaching culture. It might not be so valued by Australian educators, as different counties often have different issues. However, situate teacher education in classroom practice and create collaborative learning environment for teachers should be basic principle.

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