

A TEACHER TRAINING CASE IN JUNIOR HIGH SCHOOLS OF GUANGZHOU

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Much teacher training has been carried out in China since the new curriculum reform began in 2001. By analyzing a particular case of teacher training, this paper reveals how the Chinese government has organized teacher training since 2001 and shows the merits and shortcomings of this approach. The aim of the paper is to share our experiences in mass teacher training and encourage other researchers to explore their own effective approaches.

INTRODUCTION

Researchers have suggested a range of approaches for teacher training. In terms of ‘how to bring teachers into reform process’, Grant, Hiebert, and Wearne (1998) proposed that in-service teachers observe others teaching their own classes in a reflective way. Vithal (2002) argued three methods about learning to teach statistics through project work: ‘a theoretical, imagined practice’, ‘an actual teacher-as-learner practice’, and ‘an arranged in-school practice’, drawing on theoretical tools for pre-service education. Lesson Study has been applied in Japan, Singapore, America, and other countries, and this approach (planning, acting, observing, and reflecting) enables teachers to learn from each other and to improve their practice (Masami, 2007). With the rapid development of internet communication, multimedia technology and training have been used to create electronic communities for facilitating district- or state-wide collaboration, and participants can observe lessons captured on video at any time, making scheduling easier and giving practitioners more access to classroom observations (Wolf, 2007).

In China, in-service teacher education has traditionally been lecture-centred, theory-orientated, and experience-led (Fu, 2001). In recent years, other approaches, such as ‘action education (aimed at promoting teacher professional development by action learning)’, ‘learning with colleagues through public lessons’ and so on, have been increasingly valued and widely implemented in schools (Xue, 2007; Lingyuan, 2003). In Guangzhou, teacher training has been organized by education institutions including Teaching Research Offices (TRO), education colleges, and normal universities. Because of language obstacles, research on teacher training largely depends on information published in Chinese. However, we have found that our approaches and findings are consistent with the overseas approaches.

In recent years, statistics has been part of the mathematics curriculum for primary and secondary school in many countries. In China, from 1980 to 2000, one chapter of the algebra textbook in grade 9 introduced descriptive statistics that needed about 10 teaching hours, and another chapter covering classical probability as optional content was included in the grade 12 algebra textbook that needed about 12 teaching hours (mathematics textbooks published by People’s Education Press). Because only one or two simple items in the examination test papers were related to statistics or probability, teachers and students tended to pay little attention to this content.

However, since 2001, according to the Chinese Ministry of Education’s demand for curriculum reform, statistics and probability education have been radically redesigned. Li (2004) illustrated the new standards, standards-based textbooks, statistics education, and some preliminary feedback from teachers. Following that, much teaching training has been financed and organized by educational institutions, and different kinds of school examinations have been researched to reflect the characteristics of the new national standards. By 2006, there were 341,600 primary schools with 6,120,000 teachers, 60,550 junior high schools with 3,475,000 teachers, and 16,153 senior high schools with 1,387,200 teachers (The 2006 Year National Educational Developmental Statistics Bulletin). From 2001 to 2006, almost all elementary

and junior high school teachers had participated in various kinds of teaching trainings, therefore many changes have been taken place in the classroom. Through a case study of in-service teacher training, this paper presents how Chinese teachers participate in the statistics curriculum reform.

TEACHING RESEARCH ORGANIZATIONS AND TEACHER TRAINING INSTITUTIONS OF JUNIOR HIGH SCHOOL TEACHERS IN GUANGZHOU

Organizations: The mathematical Teacher Training Programs (TTP) for Guangzhou junior high schools are guided by the Junior and Senior School Mathematics Division of the TRO of the Guangzhou Education Bureau and the Mathematics Teaching Research Association (MTRA) of Junior and Senior Schools. The MTRA is a non-governmental organization, and it consists of approximately 30 mathematics teaching researchers and teachers who are elected by the local teachers. The election of the members of the MTRA is conducted every three years. The MTRA is academically supported by the TRO. The TRO, which employs full time mathematical teaching researchers, plays a leading role in mathematics teaching and research in Guangzhou. Moreover, Guangzhou is made up of 12 administrative districts, and all the districts have their own teaching research offices and teaching research associations. The TTP at the district level are supervised by the TRO and MTRA in the district.

Teacher Training Systems: There are now about 4500 mathematics teachers who teach from Grade 7 to Grade 9 in junior high schools in Guangzhou. TTPs are regularly run two or three times in each term (about five months), and they are mainly supervised at district level. The training programs for senior teachers in every grade are held one or two times each term. The participants are checked on work attendance and credited for attendance. Five common types of TTP are: Municipal Level (trainings for senior teachers of each district, which accounts for 3.3% of all junior high school teachers); District Level (training for all teachers within the district); Inter-school Exchange (for studying schools of different or similar student backgrounds and schools between urban and rural areas); Seminars on Special Research Topics (usually the seminars are run by schools for teachers who have similar research interests); and Lesson observations (teaching supervisors observe lessons and provide teachers with coaching).

A DISTRICT LEVEL TEACHER TRAINING CASE ON THE MEANING OF MEAN

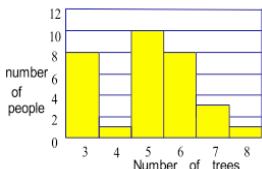
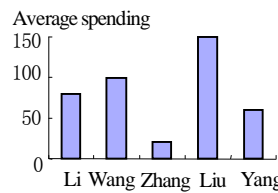
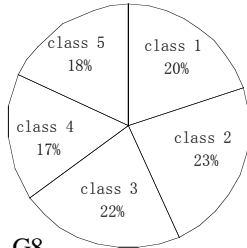
The method that is primarily utilized for TTP is called case-based action education. First, a lesson-preparation team is established, whose aim is to prepare an exemplary lesson for observation. They work together on topic selection, teaching design, pilot teaching, revision, revised teaching, and reflection. The research group spends time discussing their teaching beliefs, selection of teaching materials, key points for classes, and difficulties for learners. Teacher training is then conducted, including class-observation, post-class discussions, and reflections. The following describes how the training was organized and executed.

In the afternoon of June 1, 2007, a TTP for Year 8 of Tianhe District was held in No.18 Junior High School. The lesson topic was the meaning of arithmetic mean. It was selected to study a feature of teaching a statistical concept. The stages are described.

Preparation: A team was set up comprising five teachers from the central team of Grade 8 in the district and math group of No.18 Junior High School. They focused their discussions on the topic of the meaning of mean, drafted the teaching strategy and assigned Mr. Lv Yi from No.18 Junior high School to conduct the pilot. The teaching plan and the student worksheet were subsequently revised four times over a two-week period. The student worksheet has three parts: aims (3 learning objectives, 2 learning key points, 1 learning pitfall); tasks (3 review questions, 2 examples and 3 variation problems); and exercises (11 exercises, divided into three groups A, B, C, groups A and B to be finished in class and group C to be completed for homework).

Observation: There were 40 students in the class. Thirty-six teachers from this district observed the class, which lasted about 49 minutes, 4 more minutes than usual. The teaching (Table 1) was videoed.

Table 1. Contents of teaching

Teaching Stages	Contents of Teaching	Timing	
Topic Introduction	The Children's Day is coming; 40 kids are evenly divided into 10 groups and each group is required to find its average age. And then according to these 10 numbers, they are required to see whether the average age of the whole class exceeds 14 or not, which is to see whether they belong to the category of children or not.	3.5 mins	
Reviews	1. A set of numbers: 20, 24, 30, 35, 46; the total sum is_; the mean is_. 2. Yukai, a student of the class, whose math marks for 4 tests are 75,70,80,85; his average score is_. 3. A set of numbers: 9, 6, 4, 13; the average of the four numbers is_.	6.5 mins	
Learning New	<p>Example 1 (adapted from the textbook, Wang, 2006) On Arbor Day a tree planting contest was held. The Diagram shows the relationship between the number of people participating and the number of trees planted. Please do the following calculations.</p> <p>(1) There are___ people taking part in the contest. (2) In total ___trees have been planted. (3) On average, ___trees are planted per person. (4) According to the questions above, what is the relationship among the total sum of trees, the average of trees planted and the number of people taking part? (5) What should we notice in reading a diagram?</p> <p>Variation 1: The diagram on the right informs the average monthly spending of 5 boys. Which of the following is wrong? A. Zhang spent the least; Liu spent the most. B. The ratio of monthly spending of Li and Wang is 4:5 C. Liu's monthly spending approximates the average spending of the five boys the most. D. Zhang's monthly spending amounts to 20% of Wang's and 33.3% of Yang's.</p> <p>Example 2 (adapted from the textbook, Wang, 2006) There are 36 students in Class 5 Year 8. The following pie chart illustrates the proportion of students for each class in Year 8. The total number of students in Year 8 is___; Average number in each class is_-Please figure out the number of students in each class and finish the bar graph (omitted here). Draw a horizontal line across the bar graph to indicate the average number of people. Variation 2: The line-up of the Basketball Team of Class 4 G8 scores 6 points per player on average, according to the bar graph (omitted here) and the horizontal line of average scores, please supplement the bar chart of Da Luo. Variation 3 (adapted from the textbook, Wang, 2006). According to the statistics of Tianhe Department Store, the total sales from January to June 2006 are 6 million Yuan. The line chart below (omitted here) is drawn according to the monthly average sales from January to June 2006. Without calculating total sales, can you complete the diagram? (Tip: draw the horizontal line of monthly average sales first.)</p>	  	8 mins
Phrase Review	Mr Lv explained the solution of variation 3. Highlight the Key Points	1 min	
Exercises	5 filling-the-blank as Group A exercises. Mr Lv checked the answers with the whole class. The last task serves as the heads-up of weighted mean, which will be taught next class. Groups B and C are left for after class.	2 mins	
Summary	Key Points and key methods	1 min	

Post-Class Discussions: 36 teachers attended the post-class discussion, which lasted about 60 minutes. In addition, Mr. Lv posted the teaching plan on the teaching web of Guangzhou on 31st May, so that before and after the class other teachers could join the discussion on the web. The on-site discussion was mainly about the following four topics.

(1) Curriculum design and its implementation (discussed for about 25 minutes)

The textbook currently in use gives two examples and two exercises. It tries to focus the teaching on the meaning of arithmetic mean (the concept is first introduced in primary school) but also on reading data from a variety of diagrams. In the final version of the worksheet however, two examples and exercise 2 were included or modified, and exercise 1 was omitted. Additionally, 11 new questions were devised to supplement the teaching process. What follows are different perspectives from the teachers on the changes made. Mr. Lv tried to attract and motivate the students by incorporating the fact that it was Children's Day into the first task, which was well received by other teachers. Then, he asked students to do three additional fill-in-the-blanks tasks to help them refresh their knowledge of calculating the mean. After that came example 1 in the textbook. Questions 1, 4 and 5 of example 1 (Table 1) were added by the lesson-preparation team. Students were required to complete all questions individually first. Then, they discussed them in groups, which was followed by the teacher comments on students' answers. It is suggested that this design increased the relevance of the teaching. The team also made some modifications to example 2 and exercise 2 of the textbook in order to make the tasks more suitable for the students. Variation 2 provides an alternative practice to solve a problem using the meaning of the concept mean. Da Luo, whose name appeared in Variation 2, was asked to explain his answer in front of the class. This exercise takes the students' school life as context and draws the students into the teaching process, to promote learning and class solidarity as well as lay the foundation for exercise 2, making teaching and learning more effective.

However, in order to complete the lesson, Mr. Lv used an additional four minutes beyond the typical duration of the class, and this was not acceptable most of the teachers. During the four minutes, Mr. Lv explained the solution of Variation 3 (adapted from exercise 2 of the textbook), checked the performance of students on group A (some students did not finish the exercises on the spot) and then gave the class a summary of the lesson. This is typical in many Chinese classrooms: the teacher always intends to finish every part of his or her lesson plan, ignoring whether students are interested in the plan or not. Many teachers present felt that the number of exercises could be reduced. For example, they thought that pure number calculations could be decreased to give the students more time to think.

During the discussions, some teachers mentioned that the teaching should include more activities, such as data collection, data presentation. But they also admitted that it was difficult to present the statistics process in this lesson. The first author of this paper suggested that some examples could be redesigned to involve these activities. A few teachers felt that the class focused only on mean, which actually was not enough and suggested introducing the weighted mean as well. They believed that the students could learn both of the two concepts in one class. Yet many other observers did not share the view.

(2) The effectiveness of teachers' teaching (discussed for about 15 minutes)

The student worksheet fittingly reflected the principles of the new curriculum. The class time was appropriately devoted to the following different lesson stages - review, examples-based learning, exercises, and variations, each of which also consisted of four parts, stating the problem, problem solving, conclusion, and review. The tasks given to the students were well designed. In the class, the teacher always followed the pattern of letting students think about the problem first, then providing his explanations followed by concluding remarks, with each stage punctuated with question-and-answer as well as group discussions.

In the post-class discussions, all teachers agreed with the following: (1) an appropriate worksheet can immensely increase teaching and learning efficiency, thus saving time; (2) interesting and well

presented tutorial as well as the creation of a context in which the students feel familiar with can upgrade students' learning initiative and raise teaching efficiency; (3) exercises before explanations prompt students to think more about the problem; and (4) the use of a projector to show students' solutions to the whole class can promote the exchange and studying.

(3) Adoption of different resources and students' learning styles (discussed for about 12 minutes)

The observers were satisfied with the integration of the various resources. In the discussion, some observers hoped Mr. Lv would teach them how to use EXCEL to chart the diagrams and how to show the steps of drawing diagrams in PPT. Additionally, students' fondness for learning statistics were impressive. However, no student raised questions on their own initiative. The first author cautioned that this passivity or lack of overt curiosity and the failure to measure or address this was one of the weaknesses in the curriculum design. For instance, step-by-step details tended to replace students' own thinking. In the classroom, if the students are too busy finishing the tasks given them by the teacher, then they will lose the initiative to question and have too little space and time to think and act.

(4) Teacher training methods (discussed for about 2 minutes)

All teachers present at the discussions completed a questionnaire designed anonymously by the first author. There were six questions addressing training patterns, content and organization. 26 valid copies were returned, and the results follow. Note that five teachers did not submit the questionnaire while five others did not fill out the form because they were administrators. 21 teachers (80.8%) said that they liked the training model. Other findings included four major opinions: (1) Mr. Lv gave a very good lesson and observers' post-class comments were valuable; (2) they were able to learn new teaching approaches from the TTP, for instance: they were most impressed with the need to attract and motivate students by creating attractive problem contexts, and they could observe how to design the exercise variations, how to encourage students to participate, how to design the worksheet; (3) TRO supervisors provided many fresh and vivid ideas; and (4) teachers were more impressed by statistics teaching and learnt the difference between statistics and algebra. However, eight teachers suggested that two problems be addressed: (1) the TTP spot was a too remote; and (2) the discussion lasted too long. In addition, 26 teachers indicated their most and TTP. There were many voices wanting TTP to be practice oriented, topic oriented, provide information exchange opportunities, and develop On-net training to save teachers' time.

CONCLUSIONS

Since the teachers had strong mathematical foundations to teach precise and definite knowledge, they taught statistics with a mathematical approach. This study shows that by observing others teaching and discussing teaching strategies, the majority of the teachers become aware of the need for a different approach to teaching statistics. Through the series of TTPs, the teachers can learn some methods for teaching statistics, for listening to and discussing the students' mathematics and statistics activities, and for ways to use real data and/or technology and/or pedagogical methods to favor student's learning of statistics concepts. Secondly, by organizing such activities, teacher educators and supervisors can develop more ways to train teachers. Thirdly, many master teachers are cultivated through the teaching and research process, and they will become good assistants of teacher supervisors.

Nevertheless, we still have many problems in teacher training. For example, there are about 1500 mathematics teachers in every grade in junior high school in Guangzhou presently, which is a large number. The current training patterns can only directly reach and benefit a very small number of those (mainly senior teachers). Additionally, the appropriateness of training provided has hitherto been limited. Therefore, efforts to expand the reach of training programs and revise their content are necessary.

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REFERENCES

- Fu, S. (2001) Constructing various training patterns for teachers. *Education Exploration*, 116, 47-48 (in Chinese).
- Grant, T. J., Hiebert, J., & Wearn, D. (1998). Observing and teaching reform-minded lessons: What do teachers see? *Journal of Mathematics Teacher Education*, 1(2), 217-236.
- Li, J. (2004). Statistics education for junior high schools in China. In G. Burrill (Ed.), *Curricular development in statistics education. IASE Round Table Conference*. Lund: IASE. Online: www.stat.auckland.ac.nz/~iase/publications
- Lingyuan, G. (2003). Gaining experiences in teaching. A study on case-based teaching pattern for teachers. *Curriculum, Teaching Material and Method*, 231, 9-15, 232, 14-19 (in Chinese).
- Masami, M. (2007). A review of lesson study in Japan. Paper presented at *The World Association of Lesson Studies International Conference 2007*. Online: www.ied.edu.hk/wals/website/resources_2.htm.
- Middle School Mathematics Division of People's Education Press (2000). *Mathematics textbooks (grade 9 and grade 12)*. Peking: People's Education Press (in Chinese).
- Ministry of Education (2006). *The 2006 Year National Educational Developmental Statistics Bulletin*. Peking: Ministry of Education. Online: www.edu.cn/.
- Vithal, R. (2002). Learning to teach statistics through project work. In B. Phillips (Ed.), *Proceedings of the Sixth International Conference on Teaching Statistics*. [CD_ROM]. Cape Town: IASE. Online: www.stat.auckland.ac.nz/~iase/publications.
- Wang, J. (2006). *Trial mathematics textbooks (grade 8)*. Peking: East China Normal University.
- Wolf, J. (2007). Lesson study in the United States. Paper presented at *The World Association of Lesson Studies International Conference 2007*. Online: www.ied.edu.hk/wals/website/resources_2.htm
- Xue, H. (2007). Learning with colleagues through public lessons. Paper presented at *The World Association of Lesson Studies International Conference 2007*. Online: www.ied.edu.hk/wals/website/resources_2.htm.