

# Exploration and Practice in Training Research Mathematics Teachers in the Middle Schools Located in the Countryside of Western China<sup>1</sup>

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The middle school mathematics teachers of the countryside in western China have little chance to further their education and strengthen their research abilities. In this program, we should offer them chance to learn new educational ideas and teaching methods. There will be demonstration lectures and video teaching of course standards followed by group discussion and personalized instructions. These activities prepare the teachers to give their own demonstration lectures. This again is followed by additional personalized instructions.

The teachers come to the program with very limited knowledge of these techniques but will leave with the ability to write educational scientific research papers.

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## I. THE PROBLEM

The economy and culture in Western China, especially in the countryside, is underdeveloped. To narrow the gap between Eastern China and Western China, one urgent task is to boost the development of education in the countryside in Western China and improve the quality of the compulsory education. The training of teachers is an important part of this task.

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We took a survey of some middle schools in Xifeng County, Guizhou Province in Western China. We found that the mathematics teachers in the middle schools located in the countryside of Western China have little exposure to new teaching methods. They expressed their desire to learn about new methods from university teachers.

## II. THE DEVELOPMENT OF THE RESEARCH PLAN:

According to the information gathered from the survey, we made a deep consideration. We think that we should help those teachers meet their urgent demands by taking the training of their researching ability as the starting point. And we think the research teachers in the middle schools in the countryside of West China should have the following basic elements: the motives and ability to do scientific research, willingness to understand and accept advanced educational ideas and thoughts and to learn advanced teaching methods. They should develop teaching methods which fit their personalities and the learning styles of their students in combining the mathematics teaching practice with scientific research, take an active part in the reform of education in accordance with advanced educational ideas and thoughts and the requirements of quality education to improve the quality of education with great efforts. They should also be able to analyze the experimental results by scientific means of evaluation, write research papers on education which are based on these results and participate in the academic exchange to have dialogue and communication with the experts and their colleagues.

So we worked out the relative research plans to train research mathematics teachers by the following means of scientific research:

1. By holding academic lectures, providing books and learning materials or giving training courses, we made the trainees know why they should do scientific researches. And we made them know that if they participate the teaching research they may be exposed to advanced ideas of education and teaching methods and improve their ability for teaching designing and research faster so as to participate the research more positively.
2. By giving reports on a special topic, providing learning materials, visiting the model schools and making on-site observations, we made the trainees learn how to do scientific researches. To enable the trainees do research that is integrated with their teaching, one inevitable choice is to organize the training work that must be integrated with new reform of curriculums because all the teachers in the junior middle schools all over the country have to face the teaching job which must be done according to new course standard before the year 2005. At this premise the middle schools teachers in the countryside may make some research and

exploration on whether they can carry out the new educational ideas when they are still using the textbooks for the Nine-Year Compulsory Education. It is proper for them to begin the experimental research of teaching reform in small steps in such a way.

3. Provide the trainees guidance on what to study.

We will give the trainees direction in the following areas:

- 1) Study the synthetic recognition level of junior middle school students using psychological and pedagogical theories.
- 2) Study contents of the textbooks.
- 3) Study ways to use the contents in the textbooks with flexibility.

There is a huge gap between the rural areas and the cities and the students in the middle schools in the countryside have never seen many of the things of modern society presented in the textbooks. To enable the students learn such knowledge well, the teachers should create and design the situation for problem-solving which is good for their learning according to the actual condition of the countryside.

4) To study teaching method:

Developments in the mathematics education both at home and abroad and the implementation of new course standards in the primary and middle schools require us to adjust the teaching method. The new course standards demand the teachers to design and create a mathematics situation and raise a mathematics problem with examples taken from the familiar daily life of the students', teach them how to solve these problems and test the results in practice. Only in this way can the creative ideas and the ability to use mathematics of the students be well cultivated.

5) To study the teaching behavior of the teachers themselves:

Especially when the teachers have learned new educational ideas and thoughts and visited the schools where new course standard has been implemented, the teachers should compare their current teaching techniques and reflect upon the differences between their current practices and the new ideas after experimenting with them in the classroom.

6) They should write papers on educational research to show the process and results of their experiments.

### III. THE IMPLEMENTATION OF THEIR RESEARCH

#### 1. The field research in Heshenmiao and Dizhai Middle Schools

In June of 2003 we started our research work of training the research mathematics teachers in two village and town middle schools in Xifeng County, Guizhou Province. Our concrete steps are as follows:

- 1) We held several academic lectures for the teachers, covering the following aspects:
  - a) The basic quality of the research teachers;
  - b) Problems concerning the new course standard which is being implemented in the junior middle schools in China;
  - c) Methods of educational research in primary and middle schools and the management of educational research processes.
- 2) We provided various kinds of data to the two schools, such as the materials for the training of the new course standard and the multimedia lesson pieces; the materials of methods of educational research and the multimedia lesson pieces; the newly published book the New Course of Mathematics Teaching in Junior Middle Schools.
- 3) To have discussions about their demonstration lectures.
- 4) Let the teachers watch videos on the new course standards.
- 5) Conducting symposiums.

#### 2. Partnerships with city schools

Some teachers were sent to visit these schools and observe and emulate the demonstration lectures. And then they had workshops with the teachers who gave the demonstration lectures for a direct and free communication.

#### 3. Exchange of ideas

To exchange ideas individually with the teachers of the two schools on learning new educational ideas and on the actual problems they met in the course of the application, including personal talks, phone communication and direct guidance.

We did these jobs to enable the teachers to accept new educational ideas and thoughts as soon as possible and, direct them how to make experiments of teaching reform in a small scale, learn and explore new teaching methods and grasp necessary basic methods of scientific research of education. We also study how to improve their ability to sum up

their experiments and make a theoretical analysis, and guide them in the application of the new theories.

#### IV. MAJOR REVELATIONS

After a year of efforts, the Group successfully completed the research work. Our research shows: the teachers could learn, discuss and improve themselves in practice. Their progresses are manifested in two aspects: the reform of teaching methods and the writing of research papers on mathematics education.

##### **1. Through the open class discussions, the teachers have gradually learned the basic teaching method guided by the new education philosophy.**

Twelve of 40 math teachers in two schools were selected. They made theoretical study, attended academic lectures and watched VCDs. After some preparation, each of the two from the 12 teachers gave an open class, and then all members of the research group made a discussion on the classes.

Because the new course standard would not be implemented until September of 2004, the teachers in the two schools were still using the textbooks for the Nine-Year Compulsory Education and they taught in a traditional way, which fell far behind the teaching demand of the new course standard. When we emulated their demonstration lectures, we gave necessary positive opinions to their teaching according to the traditional educational ideas, but at the same time we urged them to evaluate their teaching in line with new educational ideas and the teaching demand of the new course standard and pointed out the goal for their reform. We encouraged the teachers to make experiments in a small scale on how to teach the old textbooks under the guidance of new educational ideas and on seeking teaching methods which meet the teaching demand of the new course standard.

When the first public teaching activities were launched in September 2003, two experienced teachers were selected from the Heishenmiao Middle School to teach two open classes for all the members of the research group. According to the traditional method of evaluation, the two classes were very successful, but they were very far from the teaching requirements as set by the new curriculum standards. The teachers gave too many explanations, taking too much time which the students should take to take the initiative to participate in teaching activities instead of accepting knowledge in a passive way. In their class, there was a lack of an atmosphere of teacher- student interaction and cooperative learning. And after the objective evaluation of their classes, many teachers

just could not understand why their lessons were a failure.

The two teachers from Dizai Secondary School learned the first lesson from the experience, they demonstrated two open classes for the second time after serious study, and there was much improvement. So we can see the prospect brought by the new teaching curriculum standards.

After further in-depth study, discussion and research, the teachers of the two schools made tests and researches in their own classroom teaching. Some of the teachers are too impatient, the pace was too quick, so they met with some setbacks. One example was that two teachers from Dizai Secondary School demonstrated two open classes in the end of December 2003. One of the open classes was successful, while another failed because it is too hasty. All members of this Group conducted serious, in-depth discussion and research on them and agreed that the study can not be made with undue haste, we must make the research step by step in a down-to-earth manner in the schools where the new curriculum reforms have not been carried out. We can only begin by taking small steps. Only when the results of the research have been obtained can we gradually quicken the pace of research work.

It was through constant summing up of experience and careful study; two open classes in April of 2004 were successful. People seemed to feel that the lessons were as good as those given, reaching above the middle level. In the after-school study, the majority of teachers agreed that their teaching methods must be changed, especially, the two teachers who gave the two open class in the first time deeply felt that there was a huge gap between them and the teachers in the school in curriculum reform experimental zones, and they may lag behind the situation if they do not try hard.

Mrs. Nie Peilian, who gave the above-said successful demonstration lecture, met a setback in the last term before this because she was too eager to succeed and did not make enough preparation. She began to doubt the possibility of implementing new course standard in her teaching. She summed up six "puzzles" from her doubts that it is impossible to apply the new course standard in the middle schools in the countryside. But we exchanged ideas through the telephone and achieved some agreements on seeking the ways to solve the problems. Based on these agreements, she restarted her research for a new teaching method with the help of all the teachers in her teaching research group. She began the experiment in a small scope and by small steps, made gradual probe and exploration and win the success finally. She worked out the six "puzzles" she summed up six months earlier by her own practice and now she has confidence for the new course reform which is soon to begin in her school.

Tian Jianjun, another teacher, made experiment on "the group cooperative study model." In the classroom teaching, the students are divided into groups in which they learn from each other and help each other and the teacher gave them instructions and

asked questions. The students in these groups were encouraged “to reach their answers collectively” and then the students of the whole class will reach the goal. A student, who always kept silent in the class, volunteered to make a speech in class for the first time after he had participated in this group learning. This was a surprise for Mr. Tian. The student told us that he didn’t have a chance to discuss with others when he couldn’t understand the lesson in the past, but now he had a chance to do so and understood the lesson. That’s why he volunteered to speak.

## **2. Beginning from the writing of summary, and gradually moving toward the writing of research paper on mathematics education**

In the beginning of the study, the teachers in the two schools did not know how to write research papers on mathematics education. The discussion group will first ask them to write the summary of the study, commented on those better-written ones and offered specific methods to solve the existing problems. When significant progress had been shown in the writing of summary, the teachers were asked to write the stage summing-ups, and to learn the retrieval of data and documentation with related content, increasing the proportion of some theoretical explanations. At the end of the first semester they were asked to write the final report. In this process some teachers could write relatively simple research papers on mathematics education, which, after the comments, made available to all teachers for reference

At the end of the second semester, most teachers were able to demonstrated their own research results in the whole year research papers in the form of the research paper on mathematics education. In this process, some teachers wrote a total of nine papers of different topics with a gradually increased quality.

## **V. ACHIEVEMENTS**

We conducted a poll of the teachers from the two schools in March, 2003 when we started the research program and took another survey in October, 2004 when the program was completed. Based on the results of the polls and the recorded data obtained in the course of the research, we have drawn the following conclusions.

### **1. The motives for scientific research of the teachers in the two schools have been greatly stimulated.**

One year after the research, the number of teachers who thought educational research was very necessary rose from 45% to 70%; the number of teachers who thought

educational research was very necessary for themselves rose from 38% to 75%; the number of teachers who thought educational research had a big impact on the compulsory education rose from 38% to 70%; the number of teachers who thought the educational research improved the personalities of the teachers rose from 47% to 81%

## **2. One year after the research program, the ideas and thoughts of the teachers were greatly changed.**

According to the poll, 67% of the teachers think that they will be able to adapt or well adapt the teaching done according to the new course standard; 28% think they will adapt it in some way; only 5% think they will still not be able to adapt to it.

- 1) 43% of them thought their educational ideas had been greatly changed, 24% of them thought their educational ideas had been changed rather greatly, and 33% thought their educational ideas had been changed in some way. For their future teaching, 86% chose "to design carefully the plan which will motivates the students to participate the teaching activities"; 90% chose "to learn new teaching methods constantly and apply them into the teaching"; only 10% chose "to teach in a traditional way with the combination of some proper new methods" and 57% chose "to take care to collect data in the usual time, make educational scientific research and write papers according to these researches".
- 2) Most teachers think they must change their teaching methods because there is such a big gap between them and the teachers in the experimental zones that they can not keep level with them if they do not try hard.
- 3) Most teachers can make experiment and reform on their teaching of their own cord after their educational ideas was changed in some way. In both schools, some teachers try to apply new educational ideas and new teaching methods into the teaching with the textbooks for the Nine-Year Compulsory Education. Some teachers even achieved remarkable achievements.

## **3. A dramatic change in the way they teach**

The teachers of the two schools gradually learned to apply teaching methods which embodies new ideas of course reform in their teaching although they still use the old textbooks. For example, on April 23, 2004, two periods of demonstration lecture were viewed by us in Heishenmiao Middle School and we felt as if they were taught by a teacher from the experimental zones where the course reform is being carried out. The lessons could reach the upper middle level even there. But in fact, the new course reform and experiment would not begin in the middle schools in the whole Xifeng County,

including Heishenmiao Middle School until the fall of 2004. The old textbooks were used in the two periods, and the success clearly showed improvement of the teachers' ability for research.

Now the teachers in the two middle schools are confident for the implementation of the new course standard for mathematics teaching in the junior middle schools which will soon begin. They think they are taking the lead in the middle schools in the whole county.

#### **4. A great improvement in the ability to write papers on scientific research of mathematics teaching.**

In the past the teachers from the two middle schools did not know how to write such papers. After they learned and studied they gained some experience. In March of 2004 we collected their summing ups of work for the first term and we found that some teachers summarized their teaching in the form of papers. One year after the research more teachers began to write papers the qualities of the papers are clearly higher.

Mrs Nie Peilian, whom we mentioned above, wrote three papers in just half a year. Her papers gave us a complete introduction of the whole course of her progress. The papers are vivid, detailed and convincing.

#### **5. A healthy attitude for collective teaching research has been fostered in the math teaching groups of these two schools.**

According to the demand of our research program group, the math teaching groups of the two schools should organize the teachers in learning the data issued by the research program group, and having groups discussions or study after they listened to the academic report, viewed the demonstration lectures and watched the videos. The leaders of both schools and the math teaching groups close attention to the research over the last year. This work made the teachers rapidly changed their ideas and an good air for collective teaching research has been fostered among them. The new course standard was implemented in Xifeng County in September of 2004. Several math teachers of the junior high would stay in the office to discuss the teaching of that day and plan for the teaching of the next day every afternoon.

This research program was made in combination with the learning of new educational ideas and thoughts preparing for the implementation of new course standard. Most of our goals have been reached. But this is only a way to train the research teachers in the junior high, which can't be finished with complete success within just one year. We think it is necessary to continue this job and the leaders and teachers in the two schools strongly demand a further cooperation with us to make deeper researches. Our first experiment has motivated us to do further research.

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