

# Research on the Status Quo of Senior High School Math Teachers implementing Teaching Materials in Huaihua City

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*The research on the status quo of senior high school math teachers implementing the New Curriculum teaching material shows: the teaching materials have the serious tendency of urbanization, the modern information technology requirements are too high, the convergences with junior high school teaching materials are not adequate, it is difficult to make sure what is easy and what is not, class hours are not enough, the students' burden is increasing, the teaching effect is poor and so on. Also, there are great differences among the urban and rural teachers in participation in training, using courseware for teaching, and the breadth and depth of dealing with the teaching materials.*

**Key words:** teachers, junior high school mathematics, implementation of teaching materials.

Huaihua City, in the western region of Hunan Province, is a prefecture-level city with a relatively backward economy, but it has been developing rapidly in recent years. The senior high schools began to carry out the new curriculum reformation in September of 2007. The mathematics teaching material is Version A by People's Education Press (2004). Although the teachers are required to take part in relevant training, because of the great changes in the materials and the requirements, what viewpoint do the teachers hold in the specific process of implementation? What are they confused with? What differences are there among urban and rural teachers in teaching ways and dealing with the teaching materials? With these questions, we took advantage of the opportunities of a teaching internship from October to November in 2008 and issued the questionnaire to a total of 52 teachers in four schools in Huaihua: No. 3 High School (the provincial key high school in the

urban area), No. 1 Middle School of Zhongfang County (the key middle school at the county level, in the county town), No. 2 High School of Zhongfang (the rural township high school, in the Tongwan town) and No. 2 High School of Xupu County (the general high school at the county level, in the town of Xupu). Fifty-one questionnaires were recovered, 51 valid, with recovery at 98.08%, and 98.08% efficient (An, Kulm, & Wu, 2004). At the same time, we observed classes and interviewed some teachers with the hope of truly reflecting the status quo of the city's middle school math teachers' implementation of the senior high school teaching materials and providing the writers with practical evidence in order to further amend and improve the teaching materials. We also hope to provide a realistic basis to the teachers to explore the ways and means of the professional development in the region. The results of this research are as follows:

### **Teachers' View on the Teaching Materials**

#### **The Serious Tendency of Urbanization**

During the interview, the teachers in the rural schools and schools at the county level pointed out that in the practical teaching process, they felt that the new teaching materials tend to attach great importance to the urban realities while deviating from those of the ordinary schools in rural areas. Some examples are too ideal and not easy to practice. In addition, practical or mathematical modeling tasks are mostly needed to complete with computers or calculators while the facilities in the rural schools and schools with poor conditions in town could not keep up with them and it is very difficult to carry out in the practice. For example, in Module 1, Chapter 3, computers are needed in all cases to solve the problems.

#### **High Requirements of Modern Information Technology**

In the teaching materials, modern information technology is used too frequently and is demanding in teaching knowledge, verification, drawing function images and examples. For example, in Chapter 3 of required Book 1, modern information technology is needed to draw function images. However, some students especially these from the rural schools, just know less about the modern information technology than they are expected to, which is due to many aspects. Students' passive studying habits will be easily cultivated in

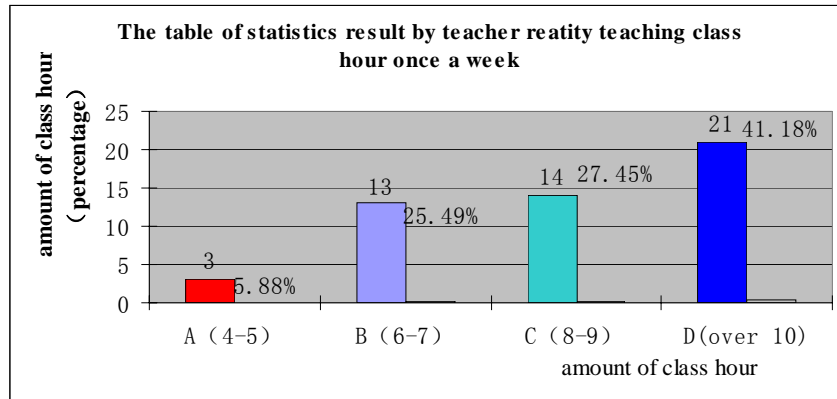
learning this chapter. Without the technology, students are unable to gain the upper hand to finish the exercises in this chapter and in *Great Vision of Learning*, they gradually lose the initiative and interest in mathematics. When studying the initial algorithm in Chapter 1 of the required Book 3, students without some computer knowledge, program knowledge and the opportunities and conditions to operate computers, feel that the study will be very boring, and that the knowledge will be difficult to understand, grasp and absorb. In the Electives 1 and 2, a lot of knowledge is applied with computers while many schools have not been equipped with them. Then, teachers have no choice but to speak in class and read the book. As a result, students easily lose interest in mathematics.

### **Lack of Convergence with the Junior High School Textbooks**

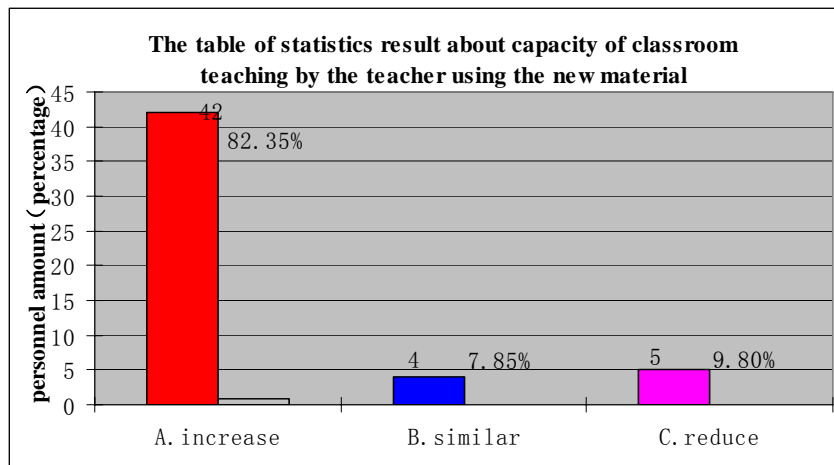
Because of the high level of adjustment of mathematical knowledge in the new high school mathematics curriculum, some contents that are expected to be studied in the junior middle school or university are compacted in the senior high school textbooks, which leads to the students' studying without understanding. For instance, cross-phase factorization of the multiplication, the split decomposition method and the denominator instruction in the junior middle school are weakened and even deleted, but the denominator is used for monotone function in the required Book 1 of high school mathematics. Another example, the Weda theorem appears in the textbook but is not required in the Entrance Examinations for High School, so most students do not master it. Additionally, the junior high school pays little attention to the letters computing, but it exists everywhere in the senior high school textbooks. Thus, teachers have to take some measures such as adding studies to bridge the gap between the junior and senior high school curriculum. But in this way it will increase the burden on students and it will make the teaching task difficult to complete in the required hours. In this case, both the teachers and students get more and more tired. The students only understand the knowledge superficially, not deeply and firmly.

### **Puzzles Teachers Encounter in the Use of the Materials**

#### **Inadequate Teaching Hours and Heavier Burden (Figures 1 and 2)**



*Figure 1. Class hour weekly.*



*Figure 2. Using new materials.*

From the above charts we can see: 25.49 percent of teachers actually teach mathematics (including exercise classes) for 6-7 hours per week, 27.45 for 8-9 hours, while 41.18 for 10 hours or more; 82.35 percent of teachers think that with the new materials the teaching capacity in the classroom is increased. Teachers figure that compared with the past, two required textbooks are now used in one term, and four textbooks are required in Grade One of senior high school, which includes almost all the information in the old textbooks both for Grade One and Grade Two. How difficult to teach! The head of Grade Two with a seniority of over 20 years in Zhongfang high School mentioned in our interview that the contents of the new teaching materials seemed to be superficial, not in-depth, but that the knowledge in the examinations are comprehensive and in-depth, which then completely puts the burden on teachers to explain the information. For example, collection in the

required Book One is in more detail but the later contents (the definition of domain function, image...) are relatively simple and shallow, and the actual exercises are far deeper and broader than those in the textbooks, even including what doesn't need to be explained. A teacher from Huaihua No. 3 High School wrote in the questionnaire that the textbooks are easy while part of the exercises in *Optimal Design* and *Great Vision of Learning* are very difficult with more information needed to be added. A teacher from Xupu No. 2 High School also spoke of the simple and shallow materials content but with difficult exercises, wide knowledge needing a lot to be added. For these reasons the teaching time will be greatly increased and more burdens are placed on teachers and students. The current standard in *Curriculum Criterion* on the medium of instruction is provided for four hours per week, one semester to study two modules, a module of 36 hours. The truth is quite otherwise between the actual situation of our city and the standards in *Curriculum Criterion*. A teacher, teaching a key class in Zhongfang No. 2 Middle School, talked about the fact that it is right to complete a module during 36 hours and five required modules in two and half terms, but that is far away from the requirements of the examinations. If one module is for 36 hours, teachers can only scratch the surface of the teaching materials, and do not have enough time to do the exercises, let alone some extra-curricular exercises and examinations. In order to keep up with the examination, the teacher thinks that at least 50 hours are needed.

### Difficulties in Deciding What is Easy or Not (Figure 3)

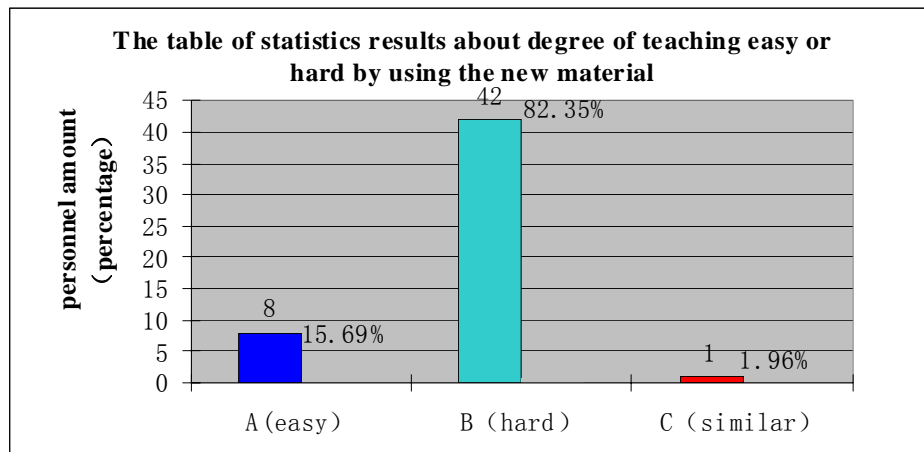


Figure 3. Hard or easy by materials.

The survey indicates that 82.35 percent of teachers think that it is more difficult to use the new teaching materials than to use the old. “In the process of using the new teaching materials, the most confusing part is that the more knowledge points involved, the broader range of knowledge, and the less teaching time. As a result, it is rather hard to decide what are the difficulties and the depth of teaching. Since the outline has not been out of college entrance examinations, I am not sure of my teaching, of what should be taught and what is the focus.” said a teacher in Zhongfang No. 1 High School in using the new teaching materials. A teacher from Huaihua No. 3 High School also talked about clutter and incoherent knowledge points, the large amount of knowledge, being superficial, the repetition of the elective content, and the uncertain yardstick of the teaching materials. A teacher from Zhongfang N0.2 High School still held to the same idea: students being unable to keep pace with the text, incoherent knowledge between junior and senior middle school, inadequate understanding of the purpose, and uncertain focus and content difficulty. Teachers from No. 2 High School told us that it’s very difficult to teach the curriculum due to the content in the textbooks and more of the examinations. The formal program of the College Entrance Examination has not yet been issued and the concerns over the examinations have great impact on teaching. Teachers asked a lot of questions like “Some examples, such as the Change of Base Formula on Page 72 of compulsory Book 1, the textbook, only give the conclusion without the process of deduction. Do we need to explain in detail?”; “Is the classroom instruction in strict accordance with the content of teaching materials, or do we need to add some points? If some addition is needed, what should be done?” and “The exercises in the new teaching materials keep a large portion of the old text and some formula from the old are used. Then, do the exercises reflect the spirit of the new curriculum or not?” The Change of Base Formula only needs understanding, but Exercise 11 of Group B on Page 83 is far over the level of understanding; Exercise 3 of Group A on Page 90 and Exercise 2 of Group A are actually a title of the college entrance examination in 1978. Those requirements on the Change of Base Formula necessitate not only knowing but understanding. This reflects the contradictions between the teaching materials and the standards. A series of problems occur when teachers prepare their teaching. Certainly, the college entrance examination is based on “standards”, but the program has not yet been finalized, so we are still struggling. In this way, affected by the traditional college entrance examination, there seems to be more uncertainty and randomness in our teachers’ classroom teaching.

### Poor Teaching Effect

Our investigation coincides with the monthly test in these two schools. Soon after the test, we had the honor of obtaining the test papers and the assessment results in two schools: one is from Zhongfang NO. 1 High School, the other Zhongfang NO. 2 High School. In Zhongfang NO. 2 High School, per capita scores of the total of the two classes in Grade 1 are 64.7 points and 61.76 points with passing rates 66% and 54%; per capita scores of the total of the two classes in Grade 2 are 59 points and 54.2 points with passing rates 40.5% and 50%.

Results of midterm examination in Zhongfang NO. 1 High School are listed in the following table:

Statistical table of the midterm examination results in Zhongfang NO. 1 High School (Note: full score of the papers is 150 points, then converted into 100-point scale)

*Table 1*  
**Zhongfang NO. 1 High School Midterm Examination**

Class	199	198	197	196	195	194	193	192	190	189	188	187
Average Scores												
150-point scale	83.7	75.8	80.9	76.9	46.9	63.6	57.2	60.1	71.5	57.5	75.6	76.5
100-point scale	55.8	50.5	53.9	51.3	31.3	42.4	38.1	40.1	47.7	38.3	50.4	51
passing rates	344 %	153 %	279 %	226 %	7.4%	1.8%	1.8%	3.5%	8.6%	0%	14.1 %	22.4 %
Total average scores in 100-point system = 45.9 points												
Variance in 100-point scale = 1082.6												

Perhaps, we would doubt the validity, reliability and comprehensiveness of the conclusions of this sample survey. Therefore from the Huaihua Research Institute of Educational Science, we obtained statistical tables of results of students who received more than 600 points (nine subjects out of 900 points, hundred-point system) in a unified test in the second term of the academic year 2008. Owing to the fact that no students with scores more than 600 were investigated at Zhongfang NO. 2 High School and Xupu NO. 2 High School, they are not included in this table. The statistical results show

that the passing rates is 77.7%, with per capita scores 69 and the highest score 99 in math of students whose total scores were more than 600 in Huaihua NO. 3 High School; The passing rate is 57.4%, with per capita scores 62.2 and the highest score 88 in math of students whose total scores were more than 600 in Zhongfang NO. 1 High School. If we take into account the math results of students whose total scores were under 600, the average scores would decline. It is a regret for this result in the schools which have the best students as well as the best hardware facilities.

### **The Similarities and Differences in Teachers' Implementation of Teaching in Urban and Rural Schools**

#### **Basically Same Teaching Methods**

By sitting in on the lectures as well as viewing and emulating teaching, it is found that the teaching methods of teachers in urban and rural schools demonstrate little difference. The majority of teachers employ the traditional teaching model and the research learning and cooperative learning advocated by the new curriculum are demonstrated in the open class and competition class.

In interviews, many teachers mentioned that the concepts of the new curriculum demand that students promote self-study, and explore mathematical knowledge on their own, but the actual situation does not permit this. Firstly, lack of teaching time does not allow students to spend too much time to explore. Secondly, students had a poor basis in math when they were in junior school, and knowledge in math is not well linked, resulting in the inability of students to explore, and finally having to be taught by teachers.

#### **Serious Splitting of Courseware Teaching**

Little use and excessive use of multimedia courseware are the issues of two extremes in teaching mathematics in high school in Huaihua. The mathematics teachers in Zhongfang NO. 1 High School adopts multimedia courseware for almost all classes, the classrooms are equipped with multimedia equipment and every teacher in this school is equipped with laptops. Schools in other cities and counties such as Huaihua NO. 3 High school, Xupu NO. 2 High School also use multimedia courseware several times each semester. However, schools in rural areas, such as Zhongfang NO.



2 High School is not equipped accordingly with hardware facilities, so multimedia courseware cannot be adopted. Both of these two extremes are not desirable.

Multimedia teaching is a significant sign in the educational modernization of mathematics. The use of modern teaching means is the requirement of the times, what is more, it is the historic responsibility that new curriculum entrusts to the teachers. Multi-media teaching not only shape the sound simultaneously, with the aid of diagrams, vivid and life-like, but also speed up the rhythm of the class to enhance classroom capacity and shorten the time for teachers to write and so on. Therefore, for some teaching contents, this teaching method presents great advantages, for example, in the Preliminary teaching of compulsory algorithm, we can show its infinite power. Due to the lack of hardware equipment, the teachers in the rural schools still teach compulsory algorithm with the traditional teaching method, namely, with pieces of chalk and blackboard to explain the knowledge. Board writing to explain the English procedures is so boring that the students may think math is so abstract, too difficult to understand (English version), that they then gradually lost their interest in mathematics, and will even display emotional weariness. When teaching the content of the (triangular) function image transform, we can show the advantages of using multimedia teaching better. Through using multimedia, we can make a static image, which can be dynamic with the teaching rhythm and content, and it becomes vivid and easier for students to understand and master.

However, multimedia has such features as speeding up the teaching tempo, increasing the classroom capacity and shortening the time of writing, so it also brings some problems. The multimedia-based teaching method is used in all kinds of courses so that there are many problems such as duplicating teaching materials with multimedia courseware; using multimedia courseware instead of teachers' writing; using it too often and teaching shoddy contents which do not meet with the students' demands, and presenting knowledge improperly. Multimedia teaching has been carried to the extreme of vulgarizing, overrunning, and using it so casually so that the teaching goals have been weakened and the effects of classroom teaching have been reduced. The content of multimedia courseware is generated automatically and would not replace the role of teachers such as the function of teachers' board writing and imparting a knowledge focus. Although it does bring the realization of the "no-pen" teaching, it also brings hidden dangers for students to sort out knowledge, to construct knowledge and to deepen their capacity of understanding. If we

use multimedia courseware too often, the students will lose their freshness, enthusiasm and interest for learning mathematics. In the process of our investigation, we found that a vast majority of students in Zhongfang No. 1 High School do not like or even are sick of the frequent use of courseware. Their knowledge of high school mathematics is slim. They have no clear idea about the most basic conceptual knowledge. It is not unusual for them to have bad scores in examinations. As a result, their learning motivation and enthusiasm are low.

#### *Dealing with the Breadth and Depth of Teaching Materials Differently*

The result of the questionnaire presents that in the process of teaching, 86.27 percent of teachers explain the sample questions in the teaching materials, teach supplementary examples; 68.63 percent of teachers ask the students to do all exercises in Group B and in addition, 96.08% of teachers request the students to do a certain number of exercises outside the teaching materials. It means that teachers generally felt that the breadth and depth of the teaching materials are not enough and need to be strengthened. However, after further investigations, we found that in rural schools and urban high school, teachers deal with the breadth and depth of teaching materials differently. Teachers in Zhongfang No.2 High School do not require students to subscribe to extra-curricular materials. In the interview, a teacher said that the students are so poor in their knowledge, so it is good if they can finish all the exercises in the teaching materials on their own and grasp the knowledge. They rarely spend their time in thinking about knowledge outside the materials and they have no high demand for more difficult content in the materials. In contrast, teachers in such schools as Huaihua No. 3 High School and other country or city schools, require the students not only to complete exercises in the materials, but also require them to subscribe to extra-curricular materials and finish the exercises in them after classes. These materials include *Secondary School Mathematics*, *Optimal Design*, etc., in which the content of the teaching materials is usually treated deeply and comprehensively.

#### *Big Difference in Participation in Training Courses*

Through the survey, we found that 80.40 percent of high school teachers participated in the training courses of the new curriculum before becoming the high school teachers, but 19.6% of teachers were not trained. We also found

that the teachers without training are basically rural secondary school teachers. Through the survey, we are deeply impressed by the fact that the application of the New Curriculum of high school mathematics is unsatisfactory. There are many reasons that lead to such a situation, and it needs more study, but in any case, it's very urgent to improve the professional development of mathematics teachers.

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### References

- An, S., Kulm, G., & Wu, Z. (2004). The pedagogical content knowledge of middle school, mathematics teachers in China and the U.S. *Journal of Mathematics Teacher Education* 7, 145–172.
- Liu, S. (2004). *Mathematics textbook of high school (in Chinese)*. Beijing, China: People Education Press.

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