

The Issues and Challenges of Professional Development of Mathematics Teachers — A group of Surveys from South China¹

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In this paper, the current problems and challenges of mathematics teachers practice and conditions are discussed with an oriental perspective. What are mathematics teachers' needs of their professional practice? What contradictions and difficulties do they meet in the condition of their professional development? The problems and challenges are described with the result of a group of surveys.

Keywords: professional development, contradiction, challenges.

ZDM Classification: B50, C79

MSC2000 Classification: 97B50, 97C50

1. INTRODUCTION: THE AIM OF STUDY

The Chinese National Curriculum Standards of Compulsory School Mathematics was implemented from 2002 (Chinese Ministry of Education, 2001), another “National Curriculum Standards of Senior High School Mathematics” was also implemented from in 2004 (Chinese Ministry of Education, 2003; 2007). Both of the new curriculum standards provide mathematics teachers for opportunities and also for challenges. Mathematics teachers have to overcome the difficulties and reply the challenges (Wang, 2004).

What issues or dilemmas of a controversial nature have happen in the process of implementing of new mathematics curriculums? How about the condition of their working and professional development? (Fung & Wang, 1998). What is the current situation of mathematics teachers' self learning and their ambition? (Sun, Wong & Lam,

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2005).

Teachers' preparation is one of most important factors of implementing the new standards of school mathematics, so that the mathematics teachers' educators need to know the current situation of mathematic teachers. Based on that consideration I made a group surveys from last term. The study was conducted using comprehensive methodology. The approach included questionnaire, data statistics and analyses, interview and seminar, etc.

The goal of this study is to find teachers' needs and learning styles in professional training. The survey is based on my professional training classes of in service mathematics teachers. 310 invitations were issued to 62 high schools, and 260 effective questionnaires were returned, follow-up clinical interviews conducted with the 10 groups. The testees were in-service mathematics teachers or teachers-students who came from high schools of Guangdong Province, China.

2. ALL TEACHERS NEED TO GET OPPORTUNITY OF FURTHER LEARNING, BUT THEIR OPPORTUNITIES ARE NOT BALANCED

Table 1. Opportunities of access to professional training

Type of training		1 st National		2 nd Provincial		3 rd Civic		4 th Local	
School or class	Number of testee	number of training days	Average days per one	number of training days	Average days per one	number of training days	Average day per one	number of training days	Average days per one
Key Teachers' Class	53	263	4.96	1147	21.6	94	1.77	143	2.70
7 th High School	14	0	0	12	0.86	8	0.57	10	0.71
Peiyong School	19	0	0	4	0.21	10	0.53	19	1
Luoding School	18	0	0	79	4.39	12	0.67	0	0
1 st Port School	24	0	0	21	0.88	281	11.71	99	4.13
Total number of testees from 4 schools	75	0	0	116	1.55	301	4.01	128	1.71

Teachers need the opportunity of professional development, but the opportunities are not balance from different teachers of different district.

The content and emphasis of school mathematics has been changed, they need much time for familiarizing themselves with the new standards. The department of educational administration tries to provide teachers with more chance of training, but the opportunities are not balance. The key teaches won much more than ordinary teachers. See in Table 1.

From Table 1 we can see that not only key teachers, but also ordinary math teachers have got opportunities of professional development, but key teachers won the opportunities much more than others in 3 types of training of mathematics education.

3. WHAT KIND OF KNOWLEDGE SHOULD BE EMPHASIZED? THE POINTS OF VIEW ARE QUITE DIFFERENT

How to choose the content of mathematics teachers' education? What direction of teachers' education should be emphasized? There are some contradictions in the choice of content. From the view of school administrator, a mathematics teacher at the first is an educator he or she should continue study the rule of education, and should master psychology of students. From the view of mathematician, a mathematics teacher should understand mathematics well, and have higher competence of problem solving.

From the view of experts of curriculum, mathematics teachers are implementing the new standards of school mathematics they should try to familiar the philosophy of new curriculums. Yes, all of those views are right, but mathematics teacher have only limited time for study. On the other hand, at the beginning of implement new mathematics curriculum, most of mathematics teachers did not familiar with some new topics of school mathematics, just as algorithm, probability and statistics, derivative and its application, modeling of function, after three years of teaching practice, their teaching experience was accumulated, they have more confidence with instruction in those topics.

4. SPECIAL CHALLENGES WHICH MATHEMATICS TEACHERS ENCO UNTERED IN THEIR PROFESSIONAL DEVELOPMENT

Textbook is one of most important materials of mathematics teaching, it is also main resource of knowledge. To help students study a new concept, to instruct them to solve a problem, mathematics teacher always help them to warming up the relative knowledge. Succession is an important principle of teaching and learning mathematics. There is a contradiction between succession of mathematics teaching and partition from modular to

modular in mathematics textbooks.

We need pay attention to synchronization of mathematics teaching but there is a large group of slow learner in the class, so that the teaching plan could not be completed on time. This is a serious challenge in mathematics teaching.

Table 2. What are the main challenges for mathematics teachers?

Number of testees	Content of math curriculum	Implement the new philosophy	Succession of Teaching material	Large group of slow learner
19 testees from Peiyang high school	0	1	10	8
15 testees from New Town High School	0	1	2	12
14 testees from Guangzhou 7 th High School	1	3	6	4
15 testees from Guangzhou 4 th High School	0	6	7	2
24 testees from Port High School	2	2	8	12
53 testees from key teachers' class, SCNU	0	19	20	14
37 testees from High Schools of Zhaoqing	2	6	11	18
39 testees from master degree class, SCNU	5	17	5	12
26 testees from Dalang High school	0	4	4	18
18 testees from Loding High school	4	4	7	3
Total	14	63	80	103

The number in the grid shows how many testees have the opinion of the main challenge for their professional development.

From Table 2, we can see how to keep the succession of mathematics teaching and how to help slow learner to catch up with average level of learning mathematics are the main challenges for mathematics teachers.

5. RESISTANCE OF FURTHER LEARNING OF MATHEMATICS TEACHERS

Based on the investigation, we can find that there are some resistances on the approach of teachers' professional development, for example, mathematics teachers are not easy to concentrate their spirit to their further learning because

- They could not correctly handle the contradiction between instruction of mathematics and their own professional development;
- Between the works that they are to be class sponsor and also mathematics teacher they need to spend the time for both sides;
- Could not easy to find the direction of professional development;
- Could not easy to save time from busy daily work. Some of testees described a daily works, they in average spend two hours for mathematics class teaching; two hours for checking and correcting students exercise books; two hours for preparing the subsequence lessons, etc. they also need to help slow learners in outside the class.
- Most of mathematics teachers are also in charge a class, they also need to organize various activities of the class, for example, to encourage students to attend intramural sports, to attend various competitions.

In the face of so much daily affair, how can they save the time for their further learning?

Table 3. What are the main resistances of mathematics teachers' further study?

What Kinds of resistances	Pressure from math teaching	Affairs of class sponsor are irritated	Responsibility of family is heavy	School works are always busy
The number of testee who agree with the above view	121	78	25	36
Percentage (%) from 260 testees	47	30	10	13

From Table 3, we can see the pressure of mathematics class teaching is the first resistance of further learning; it is also a strong motive of their professional development. They have to improve their own competence for improving the mathematics instruction; they also need to improve their competence during the process of their mathematics class.

6. PARTICULAR CHALLENGES FOR CHINESE MATHEMATICS TEACHERS FOR THEIR FURTHER LEARNING

Why the most testees think that Pressure of math teaching is the main resistance of their further learning? It is related with the tradition of Chinese culture. At the first, in mathematics class, we do not let students know the result but also let students to understand the reason, especially let them to experience the process of problem solving, so that to deduce each step, we need to spend some time. But on the other hand, the time of class is limited, mathematics teacher always find is not enough for the class. Sometime they delay the class teaching, they even have their class in the weekend or in holiday. They are reluctantly to do in this way, but they have to do. In fact, about 1/3 of mathematics teacher have their lesson in the week end, in holiday, or in vacation.

The second, It is related with the tradition of Chinese culture of examination.

Chinese people pay the most attention to common entry examination, it is an opportunity of further learning for the students, it is also the important element of evaluation. Mathematics is one of most key subjects in high school and problem solving is the main part in exam paper of mathematics. In this case, mathematics teachers and their students spend much time in the training of problem solving, then mathematics teachers could not easy to find enough time for their professional development.

Table 4. Teachers are supported from the school in their professional development?

Degree of support	Actively	Limited	Not enough	Very poor
The number of testees who agree with the above view	118	92	35	15
Percentage (%) from 260 testees	45	35	13	7

From Table 4, we can see, most of mathematics teachers are supported from their schools, but some time the support is limited, because the school is lacking in fund, in the other hand, each teacher has his (her) post. If many teachers leave for further learning, who can instead of him (her)?

7. THE AMBITION OF MATHEMATICS TEACHERS IN THEIR PROFESSIONAL DEVELOPMENT

Even the teachers are faced with challenges and contradictions in the approach of professional development, most of them are trying to overcome the difficulties and keep

to self further learning. From table 5, we can see, about 73% of testees keep to study more than half an hour every working day, they try to improve themselves with a great enthusiasm.

From the interview, most testee expressed the plans and various project for future 3 years:

- To improve their mathematics instruction, try to be excellent teachers;
- To do some research during the process of mathematics teaching;
- To deeply study the new standards of National Curriculum of mathematics, understand and implement their philosophy;
- To keep the further learning and get master degree as soon as possible;
- To sum up their teaching experience, try to write papers which can be published, etc.

Table 5. How much time for mathematics teaching out side the class from 76 testees

Range of time in hour	Not more than 0.5	0.5-1	1-2	More than 2
Prepare lesson for next days	2 (3%)	21 (28%)	49 (64%)	4 (5%)
Correct the exercise books	3 (4%)	24 (32%)	41 (53%)	8 (11%)
Self study for professional development	20 (27%)	34 (45%)	14 (19%)	7 (9%)

CONCLUSION

Chinese mathematics teachers are becoming busier during the process of implementing the new curriculum. They also are given both a great challenge and more opportunities. Most of the teachers are paying close attention for their professional development, some resistances they need to overcome. We would like that our experience will be shared with our foreign colleagues. We also hope to learn the new ideas from the overseas.

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中文摘要

本文指出了当前中国数学教师在职业发展中所面临的问题与挑战。作者通过系列调研与分析，从东方的视角，探索了数学教师当前工作的条件，他们在职业发展实践中的需要，他们所遇到的矛盾与困惑。调查研究的结论，是在对中国广东省62所普通中学，在华南师范大学学习的教育硕士学员，以及广东省中学数学科骨干教师培训班的学员进行多方调研的基础上获得的。

研究中综合使用了问卷法，谈话法，讨论研究法等多种方法。所提出的问题有：教师职业发展机会欠均衡，教师所需的知识各不相同，不同的培训人员强调不同的方面；数学教师在职业发展中遇到与其他科教师不同的特殊的挑战；数学教师在进一步的学习中遇到某些阻力；与其他国家相比，中国数学教师的职业发展遇到一些特别的阻力；中国数学教师对他们的职业发展有较高的抱负与雄心。