

Mathematics Curriculum Reform and Power: A Case Study

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Mathematics curriculum reform is very important, and it can be understood well by power. This paper uses the extended Foucault's power theory as foundations to view mathematics curriculum reform. The research's case is China's ongoing mathematics curriculum reform. Through analyzing the power relationships in China's ongoing mathematics curriculum reform, the paper thinks that power's balance is very important in mathematics curriculum design, because it will affect the designed curriculum.

Keywords: mathematics curriculum, reform, power, power relationship.

ZDM Classification: C60, C90, D20

MSC2000 Classification: 97C60, 97C90

INTRODUCTION

Mathematics curriculum reforms are very important, because they promote the development of the mathematics education. Mathematics education reforms, at some extent, mean mathematics curriculum reforms. Going with a mathematics curriculum reforms, mathematics instructional thoughts, methods, even technologies also are changed, they are not sole to change the instructional contents. Ostensibly, mathematics curriculum reform is academic. But, in fact, in a mathematics curriculum reform, power is a key factor. It maybe cannot be seen externally, but many phenomena in the mathematics curriculum reform can be understood from the power. If the power is neglected, then it is difficult to understand the reform perfectly.

In this paper, I want to focus on the following questions:

- What decide the power in a mathematics curriculum reform?
- Does the power in a mathematics curriculum reform affect the mathematics contents?

- And, how to deal with power in a mathematics curriculum reform to build ideal mathematical curriculum?

THEORY FRAMEWORK

Michel Foucault is an important postmodern sociologist; his power theory can be used to analyze many social phenomena. His theory seems abstruse from the exterior but its core is decided by power relationships.

Foucault's power theory is very rich. In this paper, two points of the theory are very important; they are this paper's important theoretic foundations.

The first point of Foucault's power theory is that power is a relationship and exists anywhere. Foucault thinks that power is not a commodity and can be possessed by someone. This power perspective differs significantly to the common understanding about the power.

"Power is not something that is acquired, seized or shared, [it is] something one holds on to or allows to slip away." (Foucault 1978, p. 93)

Foucault also thinks that the power exists anywhere. *It exists in every social corner.*

"Power is exercised from innumerable points, in the interplay of no egalitarian and mobile rations." (*ibid*)

If there are social relationships, then there are power relationships (X. Zhang 2005). Power can be found just when it can be exercised. So, power is embodied as power relationships.

The second point of Foucault's power theory is that knowledge and power are integrated and reciprocal.

The operation of power will create the knowledge, and if someone has knowledge, then he will possess the power. Knowledge and power are inseparable.

"The exercise of power itself creates and causes to emerge new objects of knowledge and accumulates new bodies of information ... the exercise of power perpetually creates knowledge and, conversely, knowledge constantly induces effects of power. ... It is not possible for power to be exercised without knowledge. It is impossible for knowledge not to engender power." (Foucault 1980, p. 93)¹

Foucault's power theory can explain many phenomena, but in this paper, I want to extend the power theory. Firstly, I want to extend the power's resources. In many situations, the society's views also are the power's resource. In some society, when public views think some one or some group is powerful in do something, then this one or

¹ See <http://www.comm.umn.edu/Foucault/pk.html>

this group may be powerful. Whereas, when public views think some one or some group is powerless in do something, then this one or this group may be powerless. I call the power that is gained because of knowledge as knowledge power, and the power that is gained because of the views of the society as societal power. Sometimes, knowledge power and societal power are same; sometimes they are not same. Secondly, I put the powerful and powerless on the two poles of power continuum. In many cases, some one or some groups may have some power, and not be powerless completely.

RESEARCH METHOD

The research method of this paper is case analytical method. In this paper, I will give a case, which is about ongoing Chinese middle school mathematics curriculum reform. Though analyzing the curriculum reform, I will try to answer the questions put forward above. In analyzing, Foucault's power theory and my extending to Foucault's power theory are the theoretic foundations.

A CASE

In China, people have paid important attention to mathematics education especially for many years. Comparing to the other subject's teachers, mathematics teachers are respected more. They think that mathematics teachers are more sapient than other subjects' teachers, and they also think that mathematics is very important to a person and the society. Some years ago, there was such a sentence "if you learn mathematics, physics, and chemistry well, you will go around the world without fear". It embodies mathematics' importance in Chinese minds.

From the end of the Qing Dynasty (清朝: 1644–1911) to now, Chinese modern mathematics education has gone through about one hundred years (but Chinese mathematics education may ascend to Zhou Dynasty (周: BC 1111–BC 222), about three thousand years ago). During the history of one hundred years, in despite of instructional contents, teachers' level, and instructional technologies changing largely, but the thoughts of mathematics education, instructional methods, and teachers' mathematics instructional beliefs keep changeless. For example, in Chinese mathematics classrooms, "chalk and talk" now still is dominant instructional ways. So, Chinese mathematics education must be reformed. From 1999, a mathematics curriculum reform began to operate.

In 1999, the development group for the *National Mathematics Curriculum Standards* was constituted. In 2000, the group completed the experiment draft of the *National Mathematics Curriculum Standards* to request some advises. In 2001, the *Mathematics*

Curriculum Standards for Full Compulsory Education (Experimental Draft) was published (cf. Ministry of Education of Peoples' Republic of China 2001), it was also called the *New Curriculum Standards* or NCS, and the new mathematics textbooks based on NCS for middle school students were used in some testing zones distributed in China. In 2004, except some regions, the new mathematics textbooks had been used in almost whole China.

Is the current mathematics curriculum reform successful? The answer is ambiguous: Maybe yes, maybe no. In fact, in the process of the reform, many questions appeared. Behind the questions, power can be seen and pays an important role.

The members of the development group of the *National Mathematics Curriculum Standards* included mathematics education researchers, mathematicians, and high school mathematics teachers. The group leader was a mathematics education researcher. In the group, the numbers of mathematics education researchers are more than mathematicians and mathematics teachers. Mathematics education researchers thought that they should have more power, because they possess of rich knowledge of mathematics education. So, they should decide mathematics curriculum reform. Because of having less power, when drafting out the NCS, mathematicians and mathematics teachers cannot insist on themselves views. Then, the NCS mainly embodies the mathematics education researchers' thoughts. Affected by NCTM (2000), the NCS emphasized more some modern mathematics instructional thoughts than mathematics contents. So, in the NCS, there are many new mathematics education concepts, for example, group learning, interactions, technologies, etc.

Many mathematicians in China have been concerned about school mathematics curriculum reforms for many years, especially in recent years. About school mathematics curriculum reforms, many mathematicians think that they should be powerful, because of their profound mathematics knowledge and their insights to mathematics natures. To mathematics knowledge and natures, they think either mathematics education researchers or mathematics teachers cannot compare with them. So, they think they should be more powerful than mathematics education researchers and mathematics teachers in current school mathematics curriculum reform. When having less power, they were disappointed and wanted to re-obtain the power by some ways.

In 2000, the Educational Committee of National Mathematical Committee convened a symposium to discuss the NCS suggesting draft. In this symposium, many attending mathematicians criticized rigorously the NCS. They argued that the reform's thoughts are mistake. In November of 2003, the National Mathematical Committee convened to investigate and research the national mathematics reform practice. Though investigating new mathematics textbooks using status in Changsha Zone, Hunan, many mathematicians claimed that some heavy mistakes must be corrected. In January of 2005, the National

Mathematical Committee convened the Spring Tea and Talk. In this meeting, criticizing the mathematics curriculum reform's thoughts became the mathematicians' common topics. In these meetings above, the mathematicians' criticizing to the mathematics curriculum reform had been passed to the Department of Education. Under making great efforts, the Department of Education finally was convinced of the problems existing in the mathematics curriculum reform and recognized that the roles of the mathematicians should be stressed. Now, the Department of Education has set up a new development of group for NCS, the leader of the group is a famous mathematician, and more mathematicians entered the group. The aim of the group is to change NCS' shortcoming and complete a sound new NCS. Now the new group is working.

Mathematics teachers think that school mathematics curriculum reform must focus on students, students' mathematics learning, and mathematics teaching. To these, they believe that they are really experts. The mathematicians think that both mathematicians and mathematics researchers just are theoreticians; it is they that really and truly know and understand school mathematics, mathematics teaching, and mathematics learning. So, in the school mathematics curriculum reform, they should be powerful. Like mathematicians, in first NCS' designing, mathematics teachers had less power. This made them indignant. Also like mathematicians, they give voice to express their dissatisfaction. For example, in colloquia for some middle school mathematics teachers, many teachers criticized sharply the new mathematics textbooks they were using, these new mathematics textbooks are written based on the NCS. Below are some teachers' talks (Wang 2005).²

It seems that we always follow the U. S. Assessment system is disordered. If the students are active ceaselessly, they are thought well. This will ruin a whole generation.

The textbooks are bad, they must be re-written. They just increase the difficulty to the teachers. The teachers must supply much knowledge to students. It is no way to teach. I began to teach grade 7's experimental textbook and have taught it for a semester. It was a difficult time.

The textbook is not systemic, and it seems that the contents are made up of sections that are separate. Some contents are too simple, and some contents are too complex. In grade 8, the transfer of plane figure is introduced, the students feel difficult to understand, and the number of exercises is too deficient.

In 2005, the Educational Committee of National Mathematical Committee convened an extended meeting, some mathematicians, mathematics teachers, and publishers were invited. In this meeting, some mathematicians and mathematics teachers criticized the NCS again. Below are two people's talks, first is a mathematics teacher, and second is a

² <http://sx.zsedu.net/sxdjt/UploadFiles/2005518153836819.pdf>

mathematician (Y. Zhang 2005)³, their talks represent the mathematicians and mathematics teachers' opinions.

Many problems have appeared. I think the reason is the textbook's disturbing the mathematical understanding of teachers.... but this textbook itself don't increased the teachers' mathematical level, instead, it gives the teachers many non-mathematical tasks. So, the teachers are at loose ends. Consequentially, the teachers do this at some times, and do that at other times. After the teacher's on way, the students are confused, of course. Then, the whole level of teaching and learning drops inevitably. When using the new textbook, many teachers are back to the mathematical teaching tradition in spite of themselves, because they cannot understand the new textbook. So, to those mathematical teachers, their burden is heavier rather then lighter. I read a new textbook just some time ago and found easily a serious mistake. ... It sees that the author's thinking is disordered. ... I think that whole basal mathematical education is very important. Mathematicians, mathematics education researchers should be with mathematics teachers to draw on the wisdom of the masses and find a good way practically and realistically. ... I think the NCS must stop immediately. Now we need not to investigate any more, because its bad result has been seen obviously. ... To the NCS, my inclusion is that the writers are disordered in their thinking. So, the NCS must be censored drastically, and a new development group should be constituted, its aim is to re-design NCS.

POWER ANALYZING IN THE CASE

In the above case, in spite of complexity of the mathematics curriculum reform currently; but from the view of Power, it is simple.

In the beginning of the reform, the mathematics education researchers had more power. Correspondingly, the mathematicians and the mathematics teachers had less power. The power the mathematics education researchers have in this stage mainly is endued by the society rather than their knowledge, that is to say the power of the mathematics education researchers mainly is societal power. In China, many people, especially many intellectuals, think that the mathematics education researchers are really experts, because their works are to study the school mathematics teaching and learning, and they are accomplished in both mathematics and mathematics pedagogy. So, in the mathematics curriculum reform, they should be powerful, and decide the reform. Therefore, the knowledge power and the societal power together decide the mathematics education researchers' power in the reform.

The mathematicians and the mathematics teachers had less power, but they were not

³ *ibid.*

ready. They themselves thought that they should have more power. The mathematicians thought that it is they that know the nature of mathematics really, and the mathematics teachers thought that it is they that know very well the mathematics' teaching and learning. So, the mathematicians and the mathematics teachers use many opportunities to express their dissatisfaction. Because the new mathematics textbooks exist some questions in using (in fact, any new textbooks have some questions when they are using firstly), their appealing was recognized by the Department of Education.

Under the direction of the Department of Education, the new development group of NCS has been constituted. The leader of the group is a famous mathematician, and more mathematicians and mathematics teachers have entered the group. Comparing with the old group, the power relationships have changed in the new group. Now, the mathematicians have more power, but up to now we have not knew if the mathematics education researcher and mathematics teachers have the same power as the mathematicians or have less power.

POWER AND MATHEMATICS CURRICULUM REFORMS

In mathematics curriculum reform, who have more power to design the school mathematics curriculum? The internal question is school mathematics curriculum embody whose benefit or views? Is it mathematicians, mathematics education researchers, mathematics teachers, or others? Apparently, every kind of people will design school mathematics curriculum from the group' benefits themselves. For example, the mathematicians will design curriculum from the view of culturing mathematicians consciously or unconsciously. The mathematics education researchers may address pedagogy. If the nature scientists participant in design, they will emphasize mathematics used in science actives. Of course, if mathematics teachers or parents participant in design, they also put forward the schema themselves. In one community, the members' views to a certain question are similar. But people coming from different communities see a certain question differently.

Mathematicians, mathematics education researchers, or mathematics teachers belong to different communities; so, their school mathematics curriculum designs must obey the benefits of certain community. Their perspectives to school mathematics curriculum are different with each other; of course, some perspectives may be same or similar. At some aspects, their perspectives may be very different. For example, in some curriculum design, the mathematics education researchers design a scheme, but to the mathematicians, this scheme is thought as wrong completely.

Generally, the people who participant in a mathematics curriculum's design include

mathematics education researchers, mathematicians, mathematics teachers and some others (for example, some professional technicians and some parents, etc.), of them mainly are mathematics education researchers and mathematicians, and mathematics teachers, parents and others occupy a small part. Even if mathematics teachers, parents and others participant in a mathematics curriculum's design, they are minority and cannot express their voices very well. From the view of power, in a mathematics curriculum design, the mathematics education researchers and the mathematicians have more power, and the others, especially the mathematics teachers have little power.

The theory framework above can explain this phenomenon well. It is a common cognition that the mathematics education and mathematicians possess richer knowledge in mathematics curriculum's design; so, they should be powerful to design mathematics curriculum. By contrary, mathematics teachers and parents are thought knowledge scanty in design, thereby, they should not have power to design curriculum.

Current condition is that there are a certain proportional mathematics teachers participating in some mathematics curriculum design. It is to say, mathematics teachers have some power in these mathematics curriculum design. I believe that the reason of the phenomenon is mathematics teachers' concerned knowledge about mathematics and mathematics curriculum improvement and this knowledge being recognition. Obviously, if mathematics teachers hope they can possess more power than now they do in mathematics curriculum design, they must make great efforts to improve own mathematics and mathematics education level. Otherwise, they will be excluded from the community of mathematics curriculum design or just wander the brim of the community, and are difficult to enter the core of the community and gain status and possess power enough.

In school mathematics curriculum design, power's contesting is a foreseeable phenomenon. This kind of power's contesting manifests between mathematicians and mathematics education researchers in many cases.

From themselves benefit, both the mathematicians and the mathematics education researchers all think that they should possess more power in the school mathematics curriculum design. If they cannot acquire expectant power or are powerless, they often use kinds of occasions to criticize the design that mainly embody the opponent's thought. They not only point the wrong in the design, but also forecast turgidly the serious or catastrophic outcome. From the view of power, these behaviors' aim just is to win the power in the curriculum design, so, it can be understood. Of course, such behaviors sometimes are unnecessarily self-conscious.

SOUND MATHEMATICS CURRICULUM AND POWER BALANCE

Do the power relationships in the school mathematics curriculum design community affect the designed mathematics curriculum? The answer to this question is yes. In China's ongoing mathematics curriculum reform, because the mathematics education researchers' have more power, so, the designed mathematics curriculum stresses the teaching and learning of mathematics. To a great extent, the power relationships in the school mathematics curriculum design community decide the designed mathematics curriculum.

Mathematicians, mathematics education researchers and mathematics teachers belong to special community.

The members in same community share common perspectives about the world. The members in different communities often have different perspectives about the world. For example, mathematicians think that school mathematics curriculum must focus on the mathematics knowledge; and mathematics education researchers accent the thoughts of teaching and learning implement in mathematics curriculum. Obviously, if the mathematicians possess more power than others in the design community, the designed mathematics curriculum will embody more characteristics of mathematics; and if the mathematics education researchers possess more power than others in the design community, the designed curriculum will embody characteristics of teaching and learning.

A good school mathematics curriculum must be balanceable; the balanceable school mathematics curriculum should balance mathematics, teaching, learning, and others. If mathematics is emphasized excessively, students maybe face many difficulties when learning. If teaching and learning are emphasized excessively, students maybe cannot learn high quality mathematics knowledge.

From above analysis, balanceable mathematics curriculum need the balanceable power relationships in curriculum design community, so, it is very important to balance the power relationships in the curriculum design community. Then, how to balance the power relationships in the curriculum design community? I think that two points must be addressed.

Firstly, every designer must understand that the mathematics knowledge, the thought of the mathematics teaching and learning, and the consideration of practical mathematics teaching and learning are all important to the designed mathematics curriculum. So, the mathematicians, the mathematics education researchers, and inservice mathematics teachers are equally important. Every designer cannot consider he/she views more important than others in design. In design, every member has power to put forward himself/herself opinions, and has not power to reject others opinion. When the

divarications appear, the members of the community must negotiate.

Secondly, the personal composing and status must be balanced. The mathematicians, the mathematics education researchers, and the inservice mathematics teachers ought to have almost same number, and they have almost as like status. Briefly, power should be distributed soundly among the participants. Otherwise, sound mathematics curriculum will be difficult to achieve.

CONCLUSION

Power relationships are very important relationships among participants in a mathematics curriculum reform.

Participants, which include mathematics education researchers, mathematicians, and mathematics teachers, maybe some others, all think that they should have more power than others, and the society often think some community should have more power to decide the curriculum. When some group don't get their anticipant power, they often express their dissatisfaction, and wish to get more power.

Power relationships decide the curriculum designed, that is to say, the curriculum designed embodies the power relationships among participants. If some group has more power, then the curriculum designed will embodies this group's perspectives. So, in order to get a balance mathematics curriculum (*i.e.*, balance among mathematics contents, teaching, learning, and others), the power in curriculum design community must be balanced.

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