# Characteristics and Historical Stages for the Development of Secondary School Mathematics Classroom Teaching in China during 20th Century

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During the 20th century, the secondary school mathematics teaching in China had  been developing from the an old-style private school form with individual instruction to class-room teaching with Chinese characteristics, which experienced three stages of develop-ment; the stage for the formation of modern teaching system (1902–1949), the stage for development (1950–1976), and the stage for innovation (1977–2000). The characteristics and journey for the transformation will exert great for reference and effects for the reform of secondary school mathematics teaching nowadays.

## 0. INTRODUCTION

The classroom teaching came into existence earlier in Guozijian (the ancient Nanjing University) in the Ming Dynasty (1368–1644). But the setup of classroom teaching system for primary and secondary schools in latter-day China is later than the Western over 300 years. The earliest secondary school in hinterland China which adopted the

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classroom teaching of western countries was Ningbo School for Girls[1].

Over 100 years in 20th century, the secondary school mathematics teaching in China experienced three stages for the formation, development and innovation of latter-day teaching system.

## I.  THE STAGE FOR THE FORMATION OF MODERN SECONDARY SCHOOL MATHEMATICS TEACHING SYSTEM (1902–1949)

This is the stage for the introduction of western mathematics education and initial formation for the modern secondary school mathematics teaching system in China. And two educational salient events which happened during this stage exerted important influence to secondary school mathematics teaching. One is the promulgation of "Authorized School Regulation" in 1902 and "Presented School Regulation" in 1904; the academy changed into school, and the secondary school mathematics teaching as the division of class, and the mathematics classroom teaching general became the organized form of teaching all over the nation. Another is the promulgation of "Ren-xu Educational System" in 1922 and "Act for the Reform of School System" at the end of the year, the change of study into school and the general formation of modern secondary school mathematics. Therefore, the first stage can be divided into two periods: the period for the initial setup of secondary school mathematics classroom teaching from 1902 to 1922, during which the education system of the Imperial Examination (Keju) in China was transformed into western educational system in modern times.

At the initial period of setup, length of schooling was four year, and the nation-wide systematic mathematics teaching had not been set up yet. For each school decided their own principles for teaching and the requirements for teaching were not unified. Although teachers could compile teaching materials, the general textbooks were directly translated from textbooks abroad.

In 1909, the synopsis which the Ministry of Education examined and approved was nominated for 9 kinds of textbooks, among which 6 kinds were from Japanese and Euramerican textbooks (see Table 1).

In 1913, the Ministry of Education (1913) promulgated "Curriculum Standards for Middle Schools" for the mathematics teaching contents, which were as follows (The list refers to regular curriculum, and Table 2 refers to the selective subjects.):

Arithmetic and Algebra for the first year,

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[1]  Mary Ann Aldersey (1797–1868), a British woman, founded a school for girls in Ningbo, Zhejiang.

Algebra and Plane Geometry for the second year,

Algebra and Plane Geometry for the third year, and

Geometry and Trigonometry for the fourth year. (In 1913-1922, the length of schooling was four years for junior middle schools. After 1922, it became three years.)

**Table 1.** Examined and approved textbooks by the Ministry of Education in 1909 (Ministry of Education, 1909)

| Textbooks | Authors | Publishers |
|---|---|---|
| Arithmetic Self-study | Ting Shenyu | Book Company of China |
| Secondary Arithmetic Textbook (Book Two) | Chen Zhi | Textbooks Translating and Compiling House |
| Up-to-Date Algebra Textbook | Genyan Gongtian (Japan) | Middle Oriental Publishing House |
| Algebra Textbook | Gaomu Zhenzhi (Japan) | Science publishing House |
| Algebra Textbook (Book 1) | Charles (Britain) | Science Association |
| Plane Geometry (Book 2) Solid Geometry | Research Association for Calculations | Changming Company |
| Geometry Textbook (Book 2) | Hua Zhengdong (Japan) | Book Company of China |
| Geometry (Plane Parts) Textbook of Secondary School (Book 1), Solid Geometry | Mill (America) | Commercial Publishing House |
| Up-to-Date Textbook of Triangle Methodology (Book 1) | Fellie, Boshidelan (America) | Commercial Publishing House |

**Table 2.** Selective Subjects of Mathematics and Credits of the Senior High School

| Years and Semesters | | Algebra Exercises | Modern Geometry | Trigonometry | Introduction to Calculus |
|---|---|---|---|---|---|
| **Year 1** credit / hours a week | Semester 1 | 1/1 | | | |
| | Semester 2 | 1/1 | | | |
| **Year 2** credit / hours a week | Semester 1 | | 2/2 | 1/1 | |
| | Semester 2 | | 2/2 | 1/1 | |
| **Year 3** credit / hours a week | Semester 1 | | | | 3/3 |
| | Semester 2 | | | | 3/3 |

In spite of the initial setup of secondary school mathematics teaching through the transplantation of mathematics curriculum and teaching contents of the west, the older style of put-in teaching method to which teacher were accustomed was hard to be changed at once. In order to help teachers master the methods of classroom teaching as soon as possible, the Ministry of Education put forward the items to the headmaster

conference to discuss and make a decision in 1919, and the suggestions for the teaching method for mathematics subject were as follows:

(1) Reviewing before the class, while teaching with the guide of enlightening;
(2) Learning theorem and definitions by heart to prepare for the calculation;
(3) Solving all kinds of problems by taking more practices, then to reach smartness and perfect;
(4) Taking more temporal experiments, and marks by examining the process of calculating;
(5) In order to be practical, reading more materials related;
(6) Creating more chances to help students apply equipments and appliances and experience.

The older ways of teaching although had been eradicated, the up-to-date methods for the classroom teaching has not fully setup yet, and the typical characteristics for this period are the combination of new and old classroom teaching, during periods of educational transformation which is a normal phenomenon (Zhu, 1980, p. 366).

During the period for formation, length of schooling for secondary was changed into two sequences of junior middle school for three years and senior for three years. "Curriculum Standard for the New Length of Schooling" regulated the subjects for the junior middle school as follows:

Arithmetic, Geometry, Algebra, and Trigonometry

and the compulsory subject for the senior middle school:

Trigonometry Geometry (Plane, Solid Conics), Algebra, and
General Course for Analytic Geometry.

The establishment of the frame for the mathematics classroom teaching was the typical features for the reform of mathematics. As for the definite mathematics teaching contents, the systematic feature of the mathematics knowledge would be taken great notice, and it shows as follows: First, the textbook compiled as the system of mathematics knowledge. Second, mathematics contents would be taught by the teaching of disciplines. The feature for this period of mathematics teaching and reform was generally focused on the selectivity. Table 2 is the mathematics selective subjects and credits for the state-run the Attached Middle School of the National Beijing Normal University (1923, pp. 10–19).

Although the flexibility of teaching requirements was not at all the general cases of secondary school mathematics teaching, to some extent it reflected the facts that the mathematics teaching should be adapted to students' needs initiatively, and served for the tendency of reform. Nevertheless, paying more attention to the students' selectivity, the flexibility to the teaching requirements, was ignored in the 1950's and in the earlier

1980's, and till the middle of 1980's; it came back to people's attention.

## II. THE DEVELOPMENTAL STAGE FOR MATHEMATICS CLASSROOM TEACHING OF MIDDLE SCHOOL IN CHINA (1950–1976)

On 1949, the founding of the People's Republic of China, China came into a new era, and mathematics also entered new stage for development. From the founding of new China to the end of the Cultural Revolution, mathematics education experienced the process of learning from the former Soviet Union to the gradual formation of own characteristics. Three important incidences which happened in this stage exerted great influence on mathematics teaching of middle school:

- The first was the whole unification of mathematics classroom teaching for middle school by learning from the Soviet Union in 1951 (cf. Wein & Zhang, 1996, p. 210);
- The second was the promulgation of the Teaching Syllabus of Middle School Mathematics Teaching which clearly put forward mathematics basic knowledge and Three Abilities as the goals of mathematics teaching;
- The third was the chaos state of mathematics teaching during the Cultural Revolution. This stage could be divided into three periods:

  - 1950–1957, as for the mathematics education, the whole country had the tendency of all learning mathematics classroom teaching from the former Soviet Union;
  - 1958–1965, the periods for the exploring and the putting forward the teaching goals of Two Bases, which were taken Two Bases and Three Abilities as mathematics teaching goals, and mathematics teaching for middle school appeared Chinese characteristics;
  - 1966–1976, the chaos state of mathematics classroom teaching, during which the carrying out the Cultural Revolution broke the normal state of classroom teaching, and thus result to the serious damages to the mathematics classroom teaching.

## III. THE INNOVATION STAGE FOR THE MATHEMATICS CLASSROOM TEACHING OF MIDDLE SCHOOL (1977–2000)

At the end of 1976, the Cultural Revolution which brought about damages to our society, economy, culture and education came to an end. In December 1978, the Third Plenary Session of the 11th Communist Party of China (CPC) Central Committee convened and the nation-wide discussion about the standards of truth, China began to emancipate the mind, the development of reform and opening-up period. China's devel-

opment of mathematics teaching in secondary schools went into the right track, and has entered a stage of continuous reform and innovation. At this stage there are two important events in the secondary school mathematics classroom teaching which had a significant impact, one is the restoration of institutions of higher learning in 1977 entrance examination, and the other is to begin to enact in 1985 a series of educational and legal system and education development plan . This phase can be divided into two periods, a period from 1977 to 1985, the revival of mathematics teaching adjustment period, during this period the secondary school mathematics classroom teaching comes back to the right track, and rapid development in the basis of 1963; another period is from 1986 to 2000, the period of reform and innovation of mathematics teaching. In this period, for all students, reducing students' burden, and improving the quality of teaching have become the subject of reform of secondary education.

During the rehabilitation and adjustment period, because of the Cultural Revolution, the original order of education has been seriously damaged. In urgent need of China's education back to normal state, mathematics teaching developed on the basis of the 60's became the inevitable choice. The distinctive feature for this period is to adjust the teaching content and requirements on the basis of 60's continuously. Promulgated in 1978, the basic content of the Syllabus for Middle schools was basically the same with that in 1963, and only in part is to be streamlined and increased the knowledge of modern mathematics. In 1982, secondary schools implemented the "three-three" system, and the established key middle schools. Syllabus for key middle school was paid much attention to the selectivity of the teaching and the difference of the requirements. There are four characteristics for the revision of the teaching contents and requirements in this phase: First, to streamline the content of traditional teaching; Second, to increase the preliminary knowledge of modern mathematics; Third, to infiltrate ideas of concourse and parallelism; Fourth, to pay attention to the selectivity of the teaching contents and the difference of the requirements. Another feature for this period was that the college entrance examination has become one of the objectives of classroom instruction. Since the resumption of college entrance examination in 1977, the community and schools paid close attention to it, and the place of mathematics subject in the entrance examination appeared more prominent. Mathematics teaching in secondary schools regarded the entrance examination requirements as the objectives and the pursuit of the teaching.

In the period of reform and innovation, to meet the needs of the implementation of the Compulsory Education Law, by reducing the difficulty of teaching content, junior high school mathematics teaching further defined teaching requirements in order to reduce the burden on students and reflect the philosophy of mathematics teaching for all students. One notable feature for this period was to reduce the difficulty of teaching contents in junior high school and put forward specific requirements of the teaching. Syllabus in

1988 clearly defined the four levels of teaching requirements of "learn, understand, master, flexibility," and for the first time, brought to the ideas that mathematics teaching must be in accordance with the law of the students' cognition. Another feature of this period is that the connotation of mathematical "double base" increasingly became clear and "double-base" teaching took shape. Syllabus in 1988 and 1996, respectively, defined the specific contents of basic knowledge, basic skills and mathematics competence for the elementary and advanced mathematics. The connotation of mathematics "double-base" became clearer and clearer, thus the requirements for the syllabus of "double-base" teaching became more and more specific. That also enhanced the "double-based" mathematics teaching operable. Teachers of secondary school mathematics explored methods for strengthening the "double-based" teaching in practice, such as variant teaching, problem-solving teaching etc. This period, another distinguishing feature was the reform of mathematics teaching in the ascendant, and a variety of new mathematical methods and styles, such as trying approach, situational approach, goal approach, guided learning, and guided reading etc. These teaching methods emphasize students "trying" and "discovering," highlight students' initiality and offer time and space for students' activities.

## IV.  THE IMPLICATIONS FOR THE JOURNEY OF MATHEMATICS TEACHING DEVELOPMENT IN SECONDARY SCHOOLS IN CHINA IN THE 20TH CENTURY

Secondary school mathematics teaching for today is a continuation and development of yesterday. All the historical research when backing to the scene and restoring to the truth of the history, we should rely on the reality and prospect the future. The present paper, sorting the transformation of the mathematics teaching for secondary schools in 20th century, hope not only to objectively reflect the history of mathematics teaching in secondary schools, but also to seek the connection between the history and reality and to draw lessons from history and the past serve the present. Historical experience of the transformation for mathematics teaching to our ongoing classroom teaching has a profound implication.

First, the transformation is always on the go. Each transformation is closely related to the changes of the times, the emergence of the educational concept and the development of mathematical discipline, which will reflect the times mightily. At the beginning of the last century, the educational transformation make the comprehensive reform of the classroom teaching , and such reform is not only a new way as a substitute for the original, but also to retain the history and continue to be strengthened and updated in the future. It is gradually becoming clear of the objective and requirement of the teaching for taking

basic knowledge of the systematical mathematics as the classroom teaching content. The stage alternative teaching methods of Herbart[2] which substitute the traditional individual teaching approach in China, and in the 1950's, connected with N. A. Kaiipob's teaching process (*cf.* Xie, 2009, p. 121) and a new approach called five-stage teaching approach is formed, which become the basic teaching approach for teachers of secondary school. The general trend of the mathematics teaching reform with the times is as follows:

(1) Teaching contents are more and more close to students' actuality in life;

(2) Teachers are more and more concerned about students when teaching; and

(3) Students have more and more initiatives when studying.

Second, those transformations which are closely connected with the tradition and avoid the backward can easily be acceptable for teachers and may become a universal teaching behavior. For instance, after the founding of new China, secondary school mathematics teaching gradually is strengthened the systemic knowledge learning and to cultivate mathematical "three capacity", which are in line with China's traditional concept of education, and also adapted to the realities of the country's need of talents, which is naturally accepted by teachers and consciously become the goal of classroom teaching. The teaching methods that teachers take are paid more attention to the students' initiatives in study, which not only retain these traditional Chinese teaching methods in the teaching practice, but also is a further development of heuristic teaching, at the same time the results of the new concept of the teaching. Improving the efficiency of classroom teaching is the key point for reform in our country. It is also the reason why people paid so much attention to the tradition of actual usage and effect. It is also the direction of education reform and development. Connection with the tradition is not meant to wholly accept all the tradition, but to take those which will benefit us and abandon that dross. China's transformation of mathematics classroom teaching in secondary schools have been taking efforts to eliminate the phenomenon of teacher-centeredness and all-gave teaching method, and to oppose corporal punishment of students and look down upon students' personality. These changes mean to abandon all the tradition.

Third, any complete transformation, which is trying to fully abandon the tradition, against the inherent tradition of education, and contrary to the laws and specific characteristics of mathematics teaching, are hard to act as a universal teaching behavior. After May the Fourth Movements, affected by Dewey's the mathematical design of teaching experiments, although for getting rid of the defects of teachers' all-given teaching method,

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[2]  Johann Friedrich Herbart (1776–1841) was a German philosopher-psychologist and educator, noted for his contributions in laying the foundations of scientific study of education.
Read more: http://www.answers.com/topic/johann-friedrich-herbart#ixzz1MrEUsDeC
and http://www.archive.org/stream/herbartherbartia00degarich#page/n7/mode/2up

concerning about the students' active learning, and establishing the democratic relation-ship between teacher and students, exert very important and positive significance. Be-cause of the original "total revolution" for educational tradition, it is difficult to be coincidence with the reality of the education, so it can not become a widespread teaching behavior of teachers. After the founding of new China, it comes to the age of comprehen-sively learning mathematics education from the Soviet Union. During the Great Leap Forward in 1958, education serve for the politic of proletariat combined with production and labor, and the start of educational revolution in 1966, which took place from top to bottom violently storm-like changes in classroom teaching, are all to come to an end in failure. On account of education is a cultural phenomenon, and can not be abolished, it only can be reformed gradually.

Fourth, there lies the difference between internal and external facts for the dynamic transformations in mathematics teaching. Transformation which arouse from intrinsic motivation, is based on the objective of the commitment to devoting to reform the disadvantages of actual teaching, and achieve its self-improvement. Even if subjected to the failure of the changes, the positive factors will be gradually accepted by the teaching transformation. For example, although child-centered teaching reform comes to a failure, that reasonable factors of concerning about students' active learning become an important aspect of teaching reform. Transformation caused by external pressure did not focus on the problems of teaching, rather than the behavior of self-improvement of education, and thus lack guide of educational theory of science. Secondary school mathematics teaching in our country's historical process of change, as the country's political system changes, there has been some history of the phenomenon of reproduction.

- One phenomenon is the selection of high school mathematics curriculum. The ma-thematics curriculum for students in the 20th century era of 20s' to 30s' are concerned about the different needs of development, and courses compulsory and elective courses was set up in high school mathematics. There is no selection for the high school mathematics curriculum after 1949. The syllabus in 1986, as for the mathemat-ics teaching contents for senior high school, regulated the basic and higher require-ments, which reflect a certain degree of selectivity. The syllabus in 1990 makes the different requirements of the teaching contents for senior high school in accordance with the compulsory course (the scope of literature and history category for the col-lege entrance examination) and the elective course (the scope of science and engineer-ing for the college entrance examination).

- The second phenomenon is about the teaching content of the plane geometry. The curriculum standards in 1936 regulate the flat geometry as the mathematics teaching content of senior high school. In 1952 after the abolition of plane analytic geometry course, and in 1963 the syllabus for senior middle school restored plane analytic geo-

metry in the college entrance examination. Since then plane geometry course has been the teaching contents for the senior high school mathematics.

- The third phenomenon is the experimental study of mathematics teaching. In the 1920's to 30's, there had research on the design of mathematics experiment, which concerned the essence for students' activities. After 1950, the experimental study was stagnated and until 1963 it began to appear study on mathematics teaching experiment. And in 1966 experimental study was stagnated again. Until the early times of 1980's, experimental study began to be carried out. Of course these historical moments can not return back to the original state, and there are the transformations in combination with the need of reality after self-examination for the history. But they also explain to some extent, caused by external factors in mathematics teaching, were not a positive role in promoting mathematics teaching, but can be an obstacle to normal development or damage.

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