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The studies on mathematics teaching in small classes in China

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Abstract
Many researchers in China have made theoretical and practical research on the effectiveness of small class teaching in mathematics. And these studies have promoted the development of small class teaching in mathematics in a more scientific and efficient direction. This paper sorted out the effectiveness research of mathematics teaching in small class in China since its inception. The author summarized the meaning of the effectiveness of small class teaching in China, the current shortcomings and its improvement measures in various aspects, and put forward the prospect of the effectiveness of small class's mathematics teaching.

Keywords: math education, small class teaching, effectiveness

1. Introduction
Small class teaching is represented in the form of educational organization as small-scale class teaching, but small class not only refers to the small class size, but its core concept is personalized education or adaptive education (Zhu, G. F. & Zhang, Q. H., 2014) [1]. The implementation of small class mathematics teaching is conducive to making full use of various educational resources. It is conducive to teachers teaching students in accordance with their aptitude and achieving differentiated mathematics teaching. It is conducive to the development of each student's mathematical thinking, improving students' mathematics achievements, and promoting students to grow up individually. However, in the practice of small class teaching in mathematics in recent years, there are still many teaching phenomena of "wearing new shoes and taking the old road", which is undoubtedly contrary to the original purpose of implementing small class teaching in mathematics. Therefore, the effectiveness of mathematics teaching in small class is studied has received much attention. The purpose of this paper is to review the effectiveness research of small class teaching in the country, to summarize the experience and deficiencies of predecessors' research, and to further improve the effectiveness of small class teaching.

2. The meaning of the effectiveness of mathematics small class teaching
There wasn't fixed statement about the meaning of the effectiveness of mathematics in small class teaching.
Fang Qiaoling, Zhang Yongpeng, Zhao Youjuan and others believed that the effectiveness of mathematics small class teaching model refers to the use of small class advantages, changing the teaching methods of mathematics teachers and the learning style of students, teaching students in accordance with their aptitude, providing students with personalized education, so that students can not only be able to learned the knowledge of mathematics, progressed in mathematics, and actively and purposefully learn other knowledge, thus promoting each student to develop actively, vividly and personally, and truly become the master of mathematics learning (Fang, Q. L., 2016; Zhang, Y. P. & Cai, X. L., 2018; Zhao, Y. J., 2013) [4- 6].

3. The current mathematics small class teaching effectiveness problems
Zhang Xiaojuan and Guo Hong believed that in the past mathematics class teaching, teachers were more difficult to prepare for classes, and there were few excellent teachers. This kind of teaching mode required teachers to completely change the old educational concepts and mindset, which undoubtedly increased the burden of teachers and students, coupled with the lack of excellent teachers, the teaching efficiency was difficult to improve (Guo, H., 2011; Zhang X. J., 2013) [7, 8].
Guo Hong believed through experimental research that the small class teaching had the problem of convergence between primary and secondary schools. Under the intensive teaching mode of large-scale class, if the problem of convergence between primary school and junior high school, such as psychological adaptation problem and convergence of learning content, is not handled, some students will not be able to adapt to the teaching mode based on small class immediately, thus affects normal learning and leads to a decline in the quality of education (Guo, H., 2011) [7].
Sun Lingzhi believed that the advantages brought by the small class size have not been effectively utilized, and mathematics small class teaching was difficult to get rid of the influence of traditional large class teaching. At present, the actual small class teaching still has a rigid spatial pattern, the interpersonal environment is good, the classroom atmosphere is dull, the actual teaching time is small, the teachers closely monitor the classroom, the discipline management difficulty is not reduced, the teaching method is single, the students' classroom participation is low, and the teacher-student interaction method is single, the scope is narrow, and the individualized teaching level is low (Sun, L. Z., 2012) [9].

Current problems that the teaching of junior high school mathematics are facing, Zhao Youjuan believes, are that how many students in the class is appropriate, whether it is beneficial enough for students to study in group corporation, and how to efficiently combine teachers' teaching with students' learning methods (Zhao, Y. J., 2013) [6].

4. Improvement measures for the effectiveness of mathematics small class teaching

4.1 About teaching objectives

Zhang Yongpeng and Cai Xueli believed that teachers should understand the intent of textbook writing, grasp the cognitive situation of students, and formulate long-term goals. Through interpreting the teaching materials, the teacher constantly infiltrates mathematics thoughts in the small class teaching, cultivates the students' mathematics learning ability, and makes the small class teaching realize the combination of long-term and short-acting effects (Zhang, Y. P. & Cai, X. L., 2018) [5].

Yan Zhehao and Wang Jinru believed that teachers should teach students in accordance with their aptitude and implement teaching objectives in layers. Yan Zhehao pointed out that in order to truly and effectively promote the growth of all students in the class, it is necessary to focus on the effective combination of each student's personality characteristics and actual conditions, and carry out differential teaching (Yan, Z. H., 2017) [2]. Wang Jinru believed that teachers could combine students into different levels, such as A, B, C, D, etc. according to the principle of comprehensive evaluation. Each level of students implements the corresponding target system and creates tailor-made mathematics teaching. In addition, the implementation of stratification goals should be implemented in every aspect of mathematics teaching, so that students can be better promoted in teaching students in accordance with their aptitude (Wang, J. R., 2015) [10].

Zhao Wanbing believed that teachers could use the preset and generation of multiple teaching objectives comprehensively. Teachers should pay attention to the essence of individual development in small class teaching and truly achieve people-oriented through the combination of various teaching objectives (Zhao, W. B., 2015) [11].

4.2 About the teaching process

In the relationship between teachers and students, Zhong Ruiyun and Ning Guohui believed that the teaching of the small class in mathematics should change the role of teachers and students and improve the participation of students in class. In traditional large-class teaching, students couldn't play their main role, and couldn't understand the fun of mathematics learning. Therefore, in the process of small class teaching, teachers and students should be transformed to make students become masters of the classroom, teachers are organizers, guides and the role of collaborators appears (Zhong, R. Y., 2013; Ning, G. H., 2015) [21, 22]. Xia Luojun believed that teachers and students should interact in an equal and antagonistic relationship. Teachers should treat each student equally and have sufficient communication with each student (Xia, L. J., 2013) [29].

In the teaching atmosphere, Wang Jinru and Ling Lin believed that it was necessary to create a harmonious teaching atmosphere to improve the effectiveness of mathematics classroom teaching (Wang, J. R., 2015; Ling, L., 2011) [10, 13]. Niu Xuecang believed that the teaching process should introduce a reward mechanism to form a competitive atmosphere (Niu, X. C., 2016) [14].

In the creation of teaching situations, Wang Yupeng believed that teachers should reform the teaching content boldly, be good at creating problem situations suitable for individual guidance, and maximize the development of students' mathematical thinking and innovative consciousness [12]. Zhao Wanbing believed that teachers should study the presentation forms of teaching scenarios according to the goals, principles and characteristics of the design of teaching situations, and attach importance to the strategy of adjusting teaching situations in the classroom teaching process (Zhao, W. B., 2015) [11].

In the exploration of new knowledge, Cao Zhengfa and Fan Jingui believed that teachers should group students scientifically, refine knowledge points into problems, and allow students to continually raise questions and discuss independently. Through the teaching of the plate problem group, experimental inquiry teaching, etc., students could walk on the stage and demonstrate experiments to realize the full-motion, interactivity, initiative and vividness of teaching (Sha, Q. Q., 2017; Cao, Z. F., 2011; Fan, J. G., 2016; Liu, X. M. & Huang, Y. L. & Lan, X. Y., 2013; Fei, S. M., 2014) [15-19]. Zhu Guangyong believed that the principle of suitability, inspiration and interactivity should be adhered to in class questions (Zhu, G. Y., 2015) [20].

In the assignment and correction of the work, Pan Wenyan believed that in the small class teaching mode, different mathematics assignments should be arranged according to the students' learning foundation and learning ability, and the training tasks should be tailored for the students [23]. Through the practice and exploration, Zhang Xiaojuan believed that teachers could divide homework into necessary and optional questions for the classroom teaching content [8]. Liu Wei believed that face-to-face corrections in the teaching of new courses and wrong questions could improve the teaching effect and prevent students from falling behind (Liu, W., 2011) [25].

In reviewing and consolidating, Fang Qiaoling and Wang Jinru believed that in small class teaching, teachers could take the test of the classroom to obtain feedback on the teaching effect of this class. In this way, teachers could keep abreast of the students' mastery and prepare for the next lesson. Students could also do their best to fill in the weak links after class (Fang, Q. L., 2016; Wang, J. R., 2015) [4, 10]. Ling Lin and Qin Xiaoqiao also suggested that students should be more "speak". At the end of the chapter, let the students review through "speaking", that is, let a student explain the knowledge points, other students evaluate, change the traditional teacher's "one-word" phenomenon, and improve the students' comprehensive ability (Ling, L., 2011; Qin, X. Q., 2013) [13, 28]. Chen Guoming believed that the counseling method should be flexible, and the close relationship between teachers and students was not as close as the relationship between students and students. Therefore, teachers and students could be combined with lifelong counseling. (Chen, G. M., 2016) [30].

4.3 About teaching evaluation

Zhao Wanbing believed that because of the special nature of small class teaching, it was necessary to strengthen the intensity and density of evaluation, attach importance to teaching evaluation, and increase the influence on students. Teachers should systematically study and adjust the content, methods, and angles of small class teaching evaluation, so that each student could establish good study habits, and harvest good learning methods and strategies to ensure that each student grows healthily and excellently (Zhao, W. B., 2015) [11].

In terms of evaluation methods, Wu Hualin and Chen Qibin proposed starting from the characteristics of small class teaching, using case evaluation method to develop individualized teaching plans for students, using the Promise Evaluation Method to provide students with multiple opportunities, and using feedback evaluation method for feedback (Wu, H. L. & Chen, Q. B.,2009) [3]. Ding Qiong believed that the role of formative evaluation in small class teaching was very important (Ding, Q., 2010) [26]. Huang Xiang believed that comprehensive evaluation, multiple evaluation, and stratified evaluation should be used comprehensively (Huang, X., 2015) [24].

In the evaluation content, Huang Xiang believed that the formative evaluation should be carried out according to the students' learning interests, academic performance, intellectual ability, learning methods, and mutual assistance and cooperation capabilities (Huang, X., 2015) [24]. Li Shaofang believed that while the content of small class teaching evaluation was pursuing diversification, it must pay attention to the reasonable sub-item in practical operation (Li, S. F., 2004) [27].

In the evaluation subject, Huang Xiang and Ding Qiong believed that the evaluation could be divided into student self-evaluation, student mutual evaluation, teacher evaluation, and parental participation evaluation (Huang, X., 2015; Ding, Q., 2010) [24, 26].

4.4 About teaching resources

Wang Yupeng, Wu Hualin, Chen Qibin and others believed that the use of modern teaching methods should promote the effective implementation of small class teaching. By deploying diverse classroom facilities and properly using network information technology, we would expand existing teaching spaces, broaden interpersonal relationships, and continuously develop student potential and improve teaching efficiency (Wu, H. L. & Chen, Q. B., 2009; Wang, Y. P., 2015) [3, 12].

Wu Hualin and Chen Qibin believed that in order to ensure the teaching effect and fully mobilize the resources of teachers, it was possible to establish two modern teaching systems: tutor system and shifting system. With the tutor system as the main means, each student was guaranteed to receive the guidance of teachers, and the shifting system was the main means to promote teaching according to their aptitude. By fully mobilizing various classrooms, teachers and other beneficial resources, the advantage of small class size could be maximized to help students effectively improve their math scores (Wu, H. L. & Chen, Q. B., 2009) [3].

Li Shaofang believed that teachers should make full use of the advantages of small class members, strengthen individualized teaching, and conduct effective individual counseling. In addition, teachers should be good at using time, grasp the best learning opportunities of students, and improve the efficiency of time use, which is one of the ways to optimize the teaching time of small classes (Li, S. F., 2004) [27].

4.5 About education management

Yan Zhehao believed that the advantages of small classes should be used to strengthen the management of students. Although the number of class members was reduced, it was still impossible to ignore discipline management. In the small class teaching of mathematics, it was necessary to maintain a good class order. In this way, students' learning efficiency was improved, and students were prevented from being distracted and distracted because the atmosphere was too active (Yan, Z. H., 2017) [2].

Li Shaofang believed that when managing small class teaching, the first was that we need to change management concepts and establish the concept of service management. Secondly, we must deal with the various relationships between teachers and students in the teaching process according to the particularity of internal contradictions in small class teaching, so as to optimize teaching activities. Third, we must take effective measures to strengthen the management of small class teaching according to the actual situation, and adopt a combination of standardized management and non-standard management (Li, S. F., 2004) [27].

5. Comment

In summary, it can be seen that in the research and practice of mathematics small class teaching in the past 30 years, domestic researchers have achieved rich research results. In the current situation and shortcomings of the effectiveness of small class teaching in mathematics, the researchers pointed out that there are many problems in the teaching efficiency of small classes in mathematics, such as high-quality teachers, the convergence of primary and secondary schools, the inability to make full use of the advantages of small classes, etc. In terms of effective measures, the researchers also gave many targeted suggestions, which is very instructive to improve the effectiveness of mathematics small class teaching.

However, when I have combed many research results in the past, I found that there are such problems in the past research: Firstly, the concept of the effectiveness of mathematics small class teaching has not been specifically stated yet, and the existing concept description is also simple. Second, the past research is often limited to a certain segment, and most of them are concentrated in the junior high school. This makes the research results have great limitations and cannot be implemented in a coherent and orderly manner in the actual teaching process. After entering the school, it may be difficult to adapt to the new small class teaching mode or some teaching methods under this mode. Therefore, it is felt that the learning pressure is increased, which leads to the decline of learning enthusiasm. Once again, some researchers only think and study based on past theories, and did not really test the effectiveness of its measures in teaching practice, so its research is not deep enough and complete, ignoring some

problems that may arise in actual teaching.

Therefore, future research needs to clarify the concept of the effectiveness of mathematics in small class teaching, increase the span and strive to achieve coherent research in primary, middle and high schools, enhance the scope of application of the research results, and conduct more research on the effectiveness of teaching in practice to make the research results more in-depth.

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