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Research on application of micro class in middle school mathematics teaching in China

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Abstract
Since the micro class was introduced in China in 2011, it has shown explosive growth. Micro class has been rapidly applied to middle school mathematics teaching, which not only reforms the way of classroom learning, but also improves the interest of learning and promotes the development of students. Meanwhile, there are more and more research results on micro class mathematics teaching, and but most of them are about the meaning, characteristics, problems, strategies, values and application status of micro class teaching. There are few researches on problems in practice and teaching evaluation research. Therefore, the author summarizes the current situation of the application of micro class in mathematics teaching in middle schools, puts forward own ideas and indicates the next research direction.

Keywords: micro class, micro class teaching, middle school mathematics, information technology

1. Introduction
Micro class refers to the structured digital resources that use information technology to present fragmented learning content, process and expanded materials according to the cognitive law. The micro class originated from the 30 second course proposed by Professor LeRoy of University of Iowa in North America (Deng, J.L. & Chen, G.R., 2014) [1]. The earliest application was the Khan college in the United States, at that time, some schools in the United States had replaced classes with videos of students going home to study in Khan College (Liao, X.H., 2014) [2]. Hu Tiesheng of Foshan, Guangdong first proposed the concept of "micro class" in China. Since then, micro class teaching had swept across the country rapidly. At the same time, there were endless stream of research on micro class teaching, which not only promoted the reform of middle school mathematics curriculum and the development of students, but also stimulated interest in learning and improved academic record. Among them, there were many opinions on the advantages and measures of micro class teaching, but public opinions were divergent and no unified results. Therefore, the author reviews the application of micro class in middle school mathematics in recent two years, and analyses the characteristics and aspects of micro class research in China, thereby, puts own view and points out the next research direction.

2. The Meaning of Micro Class Teaching Mode
Deng Juli and Chen Guorong believed that the micro class teaching mode is a new teaching mode guided by the syllabus, with "micro-teaching" as the main driving force, with curriculum emphasis and difficulty as the center, and with the characteristics of highly interactive teaching between teachers and students (Deng, J.L. & Chen, G.R., 2014) [1]. Cao Liping believed that the micro class teaching mode is to record the whole process of excellent educational activities that teachers open around a certain knowledge point or teaching link in the course of classroom teaching with video as the main carrier (Cao, L.P., 2017) [3]. Chen Jianli believed that micro class teaching mode refers to the way in which students are taught in class through a short and concise teaching video file with words, films and sounds, combined with specific teaching objectives and requirements (Chen, J.L., 2018) [4]. Ao Lili believed that the micro class teaching mode is based on video clips, and its main contents include textbook knowledge points, experimental operations, life case analysis, teaching summary, feedback of students, etc. and it forms a relatively complete and systematic teaching method (Ao, L.L., 2016) [5]. Yang Jie believed micro class teaching is a kind of network course mode that uses information technology to record courses into satellite videos for watching and learning on the Internet (Yang, J., 2017) [6]. Yang Ying believed that micro class teaching refers to online teaching of knowledge points, test points and corresponding simulation questions in each course in the shortest time under the provisions of curriculum teaching standards (Yang, Y., 2018) [7]. Sun Baole believed that micro class teaching is a kind of teaching in which teachers make their own instructional videos according to the important and difficult points in teaching content and apply them in class (Sun, B.L., 2017) [18].

3. The Characteristics of Micro Class Teaching Mode
Yan Wenjuan, Xie Jinghui, Cao Liping and others believed that the micro class teaching mode has two characteristics: terse and forceful, easy to use and not limited by time and place (Cao, L.P., 2017; Ao, L.L., 2016; Yan, W.J., 2017; Xie, J.H., 2017; Cheng, S.R., 2018; Wei, C.D. & Liu, G.H. & Li, J.L. & Wang, Y.R. & Luo, X.H., 2015) [3, 5, 8-11]. Yan Wenjuan and Cheng Shiran believed that micro class teaching has the characteristics of clear objectives and prominent themes (Yan, W.J., 2017 & Cheng, S.R., 2018) [8, 10]. Xie Jinghui believed that micro class teaching is in line with students' cognitive characteristics and promotes the communication between

teachers and students (Xie, J.H., 2017) [9]. Cao Liping, Cheng Shiran and Ao Lili believed that micro class teaching has strong pertinence and timely feedback, which is conducive to improving the effectiveness of teaching (Cao, L.P., 2017; Ao, L.L., 2016; Cheng, S.R., 2018) [3, 5, 10]. Yang Dehui and Ao Lili believed that micro class teaching has the characteristics of strong variability, wide coverage and strong interest (Ao, L.L., 2016; Yang, D.H., 2018) [5, 12].

4. The value of micro class in middle school mathematics teaching

Liao Xiaohong concluded that the value of micro class teaching lies in having more time to discuss and learn the knowledge points learned in the classroom, and satisfying the needs of students' preview, review and self-learning through the study of foreign micro class teaching (Liao, X.H., 2014) [2]. Yang Ying put forward "four abilities". She believed that the application of micro class in middle school mathematics teaching could decompose the knowledge points of middle school mathematics, to concretize abstract theoretical knowledge, sort out the teaching framework of the course, improve learning enthusiasm, upgrade educational resources, enhance students' learning enthusiasm, improve teaching level and teaching quality (Yang, Y., 2018) [7]. Yan Wenjuan believed that micro class has the value of mastering knowledge, breaking through difficulties and increasing fun, and narrates it in middle school mathematics teaching from three parts: pre-class preparation, classroom introduction and explanation of key and difficult points (Yan, W.J., 2017) [8]. Xie Jinghui, Huang Bin, Yu Haifeng, Yang Dehui and Liu Haitao believed that the advantages of micro class in middle school mathematics teaching are to stimulate interest in learning, mobilize enthusiasm for learning and break through key and difficult points (Xie, J.H., 2017; Yang, D.H., 2018; Huang, B., 2016; Yu, H.F., 2017; Liu, H.T., 2017) [9, 12-15]. Zhou Peihua started from the application of micro class in mathematics preview in junior high school, he believed that micro class played an important role in highlighting the key points of preview, grasping the key points of preview and breaking through the difficult points of preview (Zhou, P.H., 2017) [16]. Du Shuang believed that the value of micro class in mathematics teaching is to improve students' comprehensive quality, implement the new curriculum reform concept, stimulate students' enthusiasm to participate in the classroom, reduce students' blindness in learning, help students develop good habits of mathematics learning, and enhance students' ability to explore mathematical knowledge (Du, S., 2016) [17]. Liao Xiaohong and Sun Baole believed that the value of micro class in mathematics teaching in middle schools is that teachers share resources, which is conducive to improving the teaching level (Liao, X.H., 2014; Sun, B.L., 2017) [2, 18]. Deng Xiaorong, Yang Dehui and Sun Baole believed that micro class plays an important role in creating teaching environment and improving comprehensive ability of students in middle school mathematics teaching (Yang, D.H., 2018; Sun, B.L., 2017; Deng, X.R., 2017) [12, 18, 19]. Zhang Ping believed that micro class mathematics teaching can satisfy the need to diversify learning methods and play a role in making up for lack of class hours (Zhang, P., 2017) [20]. Liu Haitao and Ao Lili believed that micro class mathematics teaching can carry out after-class review, improve teaching level and promote teachers' professional development (Ao, L.L., 2016; Liu, H.T., 2016) [5, 15]. Fan Changzheng believed that micro class teaching is conducive to enhancing the attraction of the classroom, improving the quality of the classroom and content structure (Fan, C.Z., 2016) [21]. He Chunjuan and Zhong Zhirong believed that micro class mathematics classroom can make mathematics classroom lively, arouse students' curiosity to explore, and meet students' needs of personalized learning (He, C.J. & Zhong, Z.R. & Li, G.L., 2016) [22]. Wang Yujuan believed that micro class plays an important role in mathematics preview courses (Wang, Y.J., 2017) [23]. Yang Jie, Yu Haifeng and Qi Jingbi believed that micro class teaching can enhance students' autonomous learning ability (Yang, J., 2017; Yu, H.F., 2017; Qi, J.B., 2016) [6, 14, 30]. Yang Jie and Yu Haifeng believed that micro class in mathematics teaching are conducive to highlighting the focus, satisfying the learning needs of students at different levels, and reflecting personalized learning (Yang, J., 2017; Yu, H.F., 2017) [6, 14]. Wu Wei studied the role of micro-class in mathematics preview. He believed that micro class teaching could improve classroom learning efficiency and knowledge capacity, and deepen ability of students to understand and apply knowledge (Wu, W., 2017) [24].

5. The strategy of micro class in middle school mathematics teaching

Ao Lili believed that micro class teaching should have three strategies: defining the purpose and direction of teaching, combining the actual situation of students, and choosing appropriate teaching resources. She also believed that we should pay attention to the practicality of micro class teaching, there must be some difficulty, and appropriate curriculum content in order to ensure the improvement of students' learning level in the use of micro class in mathematics teaching (Ao, L.L., 2016) [5]. Yang Ying believed that the application strategy was to construct mathematical activities by using micro class in middle school mathematics teaching and to make use of micro class to check and fill gaps in mathematical knowledge (Yang, Y., 2018) [7]. Yu Haifeng believed that the application strategy of micro class in middle school was to grasp three principles: precise positioning, featured content and flexible way (Yu, H.F., 2017) [14]. Du Shuang analyzed the application strategies of micro class from four aspects: application in the preview stage, application in the introduction stage, application only in the professor stage, application in the test question explanation. In a word, micro class should run through the whole teaching process (Du, S., 2016) [17]. Tang Daoxi believed that the strategies of applying micro class in middle school mathematics teaching include defining teaching themes, controlling teaching practice, choosing resources reasonably and paying attention to students' differences. Meanwhile, he put forward the application requirements of taking pertinence and concentration as the principle, diversity as the characteristic and sharing as the spirit (Tang, D.X., 2017) [25]. Xu Yuexiu analyzed the application strategy of micro class in middle school mathematics teaching from three aspects: one-

dimensional mathematics knowledge points, multiple mathematics knowledge points and inquiry mathematics problems (Xu, Y.X., 2017) [26]. Xu Mao sheng and Huang Zhidong put forward the application strategy of combining micro class with flip-over class, which makes the classroom a place for teachers and students to explore, solve problems and collaborate and innovate (Xu, M.S., 2017; Huang, Z.D., 2016) [28, 31].

6. The shortcomings of micro class in middle school mathematics teaching

Deng Juli believed that the shortcoming of micro class teaching is that it did not follow the requirements of the syllabus and failed to pay attention to timely assessment (Deng, J.L. & Chen, G.R., 2014) [1]. Cao Liping believed that the application of micro class in teaching has the following shortcomings: Firstly, the school hardware is insufficient. Secondly, teachers lack experience in making micro class. Finally, the teachers did not blindly use micro class according to the actual situation (Cao, L.P., 2017) [3]. Chen Jianli drew the conclusion that many schools lack the corresponding equipment and unable make micro class by studying the teaching mode of high school mathematics micro class. Teachers also lack sufficiently understanding of micro class teaching (Chen, J.L., 2018) [4]. Liu Haitao analyzed the application of micro class teaching in high school mathematics and he believed that the thought of examination-oriented education is prevalent in schools, which hinders the application of micro class teaching in high school mathematics classroom (Liu, H.T., 2016) [15]. Deng Xiaorong believed that the shortcomings of micro class teaching lie in the content and the way of explanation. We should pay attention to improving the content of micro class teaching and adopting more effective ways of explanation (Deng, X.R., 2017) [19]. Tang Daoxi believed that the current problems of micro class teaching include uniform teaching design, too much content and too wide scope, unreasonable time allocation, etc (Tang, D.X., 2017) [25]. Xu Yuexiu believed that the application of micro class in junior high school mathematics teaching has low frequency, the way is limited to the classroom, lack of systematic micro class teaching design and other issues, she believed that the reason may be related to the attitude of teachers (Xu, Y.X., 2017) [26]. Ji Lixia and Kang Shuhuan believed that the current application of micro class in teaching has the shortcomings of low enthusiasm of students to participate, and propose to improve teachers' information literacy to adapt to micro class teaching (Ji, L.X. & Kang, S.H., 2017) [27]. Yan Guixiang and Yu Haifeng believed that the problem of micro class in middle school mathematics teaching is that it is difficult to make micro class in mathematics subject, and the production and application of micro class are merely modal (Yu, H.F., 2017; Yan, G.X., 2018) [14, 29].

7. Comment on Current Studies

The author thinks that the research on micro class in middle school mathematics teaching in our country mainly focuses on its characteristics, value, teaching strategies and problems. There are few studies on specific application steps, shortcomings of micro class teaching and evaluation of micro class teaching. Therefore, we should start with the following aspects in the future research:

1. The theoretical study of micro class in middle school mathematics teaching. The author searched literature relevant literature on CNKI and found that most of the authors of literature are on-the-job teachers. This shows that the current research results on micro class in mathematics teaching in middle schools are basically the results of front-line teachers based on their daily experience. This is the conclusion drawn by the observation and thinking in the daily teaching of front-line teachers. This makes these research results more practical and less theoretical, and lacks the necessary knowledge of pedagogy and psychology. Therefore, we should combine theoretical knowledge with micro class teaching, and explore what teaching principles are used in micro class teaching Why do we need to use these principles? What are the functions of these teaching principles? How video content can be present in a way that is more consistent with students' cognitive level and cognitive structure? We can combine learning theory with micro teaching, such as the combination of constructivism and micro teaching. Combining theory with practice, enriching practice with theory and verifying theory with practice will greatly promote the development of micro class mathematics teaching in China and ultimately promote the development of students.
2. The empirical research of micro class in middle school mathematics teaching. Just said, we had mentioned a point: more research results are drawn by front-line teachers based on their own personal experience, without the necessary experiments, which may lead to a conclusion of great contingency. So, we should tightly adhere to the experimental operation norms in the following research. There are control group, experimental group, pre-test, post-test, strictly in accordance with the requirements of the experiment so that our conclusions can be more convincing.
3. The specific application steps of micro class in middle school mathematics teaching. Although there are many studies on the application process, most of them only give a general process, that is talk in generalities. For example, according to the four processes of setting goals, teaching design, implementation of teaching and classroom summary, micro class application is carried out. These are four larger steps, and there should be many small steps in each step. For example, how to establish goals? What basis do we need to establish? What are the issues to be noted in the establishment of goals? How should I relate the relationship between my micro class video and teacher's instruction in the implementation of teaching? How can the combination be better? Is the form of classroom summaries summarized by students or by micro class? These questions should be a direction for us to study next.
4. The shortcomings in mathematics teaching. Everything is a double-edged sword. No matter what, it has both good and bad sides. However, there is no general description of the shortcomings of the application of micro class in middle

school mathematics in the current research. Most researchers studied the shortcomings of micro class mathematics teaching in the current application situation, such as lack of hardware facilities, lack of understanding of teachers and so on. It is not the adverse effects of micro class mathematics teaching on students and teachers. Is there no shortcoming? Obviously not. The reason is why our research on micro class mathematics teaching is not comprehensive enough. The author believes that micro class mathematics teaching has an obvious shortcoming, that is can't teach students in accordance with their aptitude. Micro class teaching has a great role in breaking through the difficult points, which may not be difficult for good students. In this case, good students have no effect in watching micro class and they also waste time. So, micro class teaching can't be taught in accordance with their aptitude. Is there any other shortcoming? This requires us to explore in the next study.

5. The evaluation of mathematics teaching in micro class. Teaching evaluation plays an extremely important role in understanding whether micro class teaching is effective, whether interest in learning has been strengthened, whether academic performance has been improved, teaching level of teachers, and comprehensive quality of students and so on. At present, we have studied a lot about the evaluation of general teaching mode, and there are also many research results. However, there are few researches on the evaluation of micro class mathematics teaching mode. Can the general teaching mode and the micro class teaching mode share a set of evaluation indexes? In other words, can we apply the research results of the general teaching mode to the micro class teaching mode? This is a good research direction. If not, what are the changes in the evaluation index and evaluation level of the micro class teaching mode? This should be a key direction for our next research.

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