



# Constructing Strategies Mathematics Activities Based On Efficient Classroom

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**Abstract**—By creating mathematical activities based on mathematical situation, improve students' learning motivation, lead students to actively carry out independent inquiry learning, communication and cooperation, promote students' high-level thinking and effective mathematical understanding, generate effective activity experience, reproduce the generation process of mathematical knowledge, and lead students to put forward, analyze, solve and apply problems mathematically, Achieve efficient classroom and improve the core literacy of mathematics.

**Index Terms**—Efficient classroom, Mathematics activities, Experience, Generation, Core literacy.

## I. BASIS OF PROBLEM RESEARCH

Z. dienes, a famous educator, believes that students' understanding of mathematical meaning must be based on their familiar environment, be suitable for students' needs, interests, motives and emotions, and form their own personal experience in their familiar environment J.S. Bruner divides the development of children's understanding ability into three stages: action stage, representation stage and symbol stage P. Liebeck (England) accepted Bruner's thought that students' mathematics learning can be summarized into four basic links: experience, language, image and symbol James R. Davis and others believe that based on the construction of "doing mathematics", students attach importance to the purposeful and focused selection of teaching activities, so as to achieve an efficient and pleasant learning experience.

## II. MATHEMATICS ACTIVITY TEACHING STRATEGY UNDER THE CONCEPT OF EFFICIENT CLASSROOM

The core problem of efficient classroom is the efficiency of teaching. Paying attention to students' high-level mathematical thinking and students' "Recent Development Zone", highlighting the process of learning and highlighting the occurrence and development process of knowledge is to lead students to love learning, learn well and develop core literacy. Therefore, teachers should optimize teaching strategies according to their academic situation and leave sufficient space for students' thinking and development, Teachers' behavior is more about supplement and discussion, listening and communication, respect and trust, equality and cooperation. Efficient classroom makes teachers become

promoters, guides, helpers and admirers of students' learning.

Situational based mathematics activities are realized in the form of self-study and inquiry, desk cooperation and group learning. It is preset to consider the previous experience and knowledge base of students' learning, so that students can find problems in inquiry activities, put forward problems, find methods to analyze and solve problems according to the link degree of Mathematics activity experience, and make students feel knowledge, skills, emotional attitude Values are closely related to real life On the basis of their original social experience and life experience, students interact in multiple directions through consultation (cooperation) with others, harmony and interaction with the environment, and form mathematical activity experience through analyzing and comparing a large number of objective materials, refining and summarizing essential attributes, and summarizing abstract thinking activity processes, so as to effectively selectively absorb, To enrich their own life experience and social experience, realize meaning generation and construction, and form an efficient classroom.

### A. Effective activities and accumulated experience

Mathematical activities focus on changing students' learning methods. With the help of mathematical operations, activities and experiments, students can participate in teaching methods such as teacher-student interaction, discussion, activities, dialogue and exchange and discussion, use mathematical thinking to study practical problems in real life, and actively explore and study independently and in the process of group cooperative learning, Rationality obtains extensive experience in mathematical activities, experience and perception of mathematical inquiry, and experiences the process of rediscovery and re creation of mathematical knowledge, so as to promote students' cognitive emotion from latent state to positive state, from spontaneous curiosity to strong thirst for knowledge, produce eager active exploration consciousness, and realize positive and effective thinking in classroom teaching.

Carrying out interesting mathematical activities can situate knowledge, enable students to observe, analyze, refine and summarize, learn by doing and understand by doing. Students can discuss, debate and fully exchange their findings and



understand the development of problems. Teachers choose the way most conducive to students' learning to carry out mathematical activities, According to the students' thinking level, a learning platform is built for them and appropriate guidance is given, "so that they can become the objects of further thinking and processing, discussion and improvement, refinement and generalization, and promote the in-depth development of students' thinking" [1]. For example, "Zhiyuan middle school conducted campus greening and bought 100 Fatong saplings and cedar saplings. 3 yuan for each tree, 7 yuan for each cedar, and 460 yuan for saplings. How many did you buy for each of the two saplings?" By allowing students to communicate based on their cognition of binary first-order equations, understand the cognitive experience of equal quantity relationship, the basis of accepting mathematical application and emotional experience, so as to promote meaningful learning "This process is not only used to discuss topics, but also enables students to experience the methods hidden behind the establishment of definitions, the use of proofs, hypothetical questions, and the improvement of argumentation" [2]. In this way, the mathematical experience obtained by students through their own inquiry experience is a high-level mathematical thinking activity, which will be permanently preserved in memory and become the empirical basis of mathematical concepts.

#### *B. Representation, communication, thinking and understanding*

Through the actual operation, observation, thinking and comparison of specific things, the mathematical problems are extracted from the existing experience to make the knowledge problematic, "Gradually learn to raise and understand problems from the perspective of mathematics; develop the spirit of exploration and innovation in the process of solving problems and experience the diversity of problem-solving strategies; learn to cooperate with others and be able to clearly express and communicate the process and results of problem-solving; gradually form the consciousness of evaluation and reflection through problem-solving" [2], according to the facts, connection and imagination and beneficial mathematical experience obtained in mathematical activities, the abstract mathematical knowledge generates new mathematical meaning through fixed points, and closely connects the mathematical knowledge with the practical application of life. For example, on the issue of age, the teacher and students are talking about age during class. The teacher said: "when I am as old as you are now, you are only 2 years old." The student said: "If I were as old as you, you would be 44 years old." Ask what are the ages of teachers and students this year? Guide students to fill in forms and obtain beneficial experience in solving problems. After comparative analysis, from the table display, the age difference is the key to solving problems. In "doing mathematics" In the process of mathematical communication, students carry out activities

such as operation, discussion, communication and reflection. In the interaction between teachers and students, students and groups, students carry out high-level thinking, in-depth analysis of problems, effectively represent the generation process of mathematical knowledge, construct and improve their reasoning process in mathematical communication, learn the way of mathematician thinking activities and represent the process of mathematicization in practice Abstract generalization of mathematical concepts.

#### *C. Variant practice and perception process*

Mathematical activities are accompanied by positive emotional experience. Students have changed from "listening" mathematics to "thinking" mathematics. Students may have different ideas and strategies for the same mathematical problem. Through observation, thinking, association, imagination and questioning, they extract mathematical information and search for quantitative relations, spatial forms and internal relations between them, so as to make the problem develop hierarchically, Then the knowledge points are connected by meaning to form a knowledge chain Mathematics activities allow each student to explore and study in his own way. Through independent exploration and group discussion, he can improve his thinking and realize high-level mathematical thinking "Disputes and discussions can often lead to further and in-depth modifications, supplements and even corrections" [1]. For example, for the nature of isosceles triangle, teachers also let students take out their own paper pieces of isosceles triangle, carry out mathematical activities, explore how to prove that the two base angles of isosceles triangle are equal, and carry out characterization and communication. Some say I do high-line proof, others say I do middle line Teachers and students always explore, cooperate and communicate in a relaxed and harmonious learning atmosphere. Students show great interest and participation in each problem. The experience obtained according to the communication representation effectively promotes the development of the problem, generates their own mathematical cognitive foundation, constructs concepts or publishes research results, Such learning activities show that students' learning process is actively constructed and the level of deep learning.

#### *D. Mathematical practice and application expansion*

On the basis of group discussion and consultation, make choices through common recognition and establish mathematical concepts, so as to make problems collide with students' experience in the original cognitive structure, activate existing experience to "assimilate" or "adapt" new knowledge in learning activities, sort out the level of knowledge structure, and enable students to deepen their understanding of mathematical knowledge and form links "Pay attention to observing and summarizing the law of students' thinking activities in the process of mathematics learning, study the development process of thinking activities,



fully expose the occurrence and development process of mathematical knowledge to students, and try to show the original thinking process of mathematicians discovering mathematical knowledge to students" [3], "In the process of learning and thinking, students' attention needs to be constantly transformed between high-level strategic knowledge and low-level descriptive knowledge and procedural knowledge. They should not only be aware of their own processing materials, but also pay attention to their own processing process and methods, constantly reflect on whether their strategies are appropriate and optimize their own processing process" [2], let students realize that mathematics is everywhere in life and feel the application of mathematical knowledge in real life. For example, in "the positional relationship between circle and circle", students demonstrate the natural phenomenon of total solar eclipse by recalling the positional relationship between line and circle, think about the change process of total solar eclipse, and get the intersection (inclusion) and tangency (inscribed and circumscribed) of circle and circle With the help of the spatial form, morphological change and motion law of the total solar eclipse, understand the positional relationship between circles, describe graphics, explore the relationship between shapes and numbers, build an intuitive model of the distance and radius of the center of the circle, and explore ideas to solve problems.

#### E. Infiltrate ideas and improve literacy

Mathematics activities start from students' physical and psychological age and knowledge level. Teachers set up learning situations according to the characteristics of learning contents and learning objects. Students keep trying in the process of activities, constantly explore new learning fields and research contents, filter, analyze, process and study the obtained information, and truly gain an understanding of the meaning of knowledge. When students finish the "mathematics experiment", they combine their own inner feelings and experience, think and judge independently, and abstract the general laws and structures. In order to obtain the results of preliminary exploration, students learn to look at life problems from a mathematical perspective, accurately explain the facts in life with mathematical knowledge, and conduct exploratory questioning and empirical induction on the results, For example, after learning the problem of growth rate, study "for the same commodity, store A first increases the price by 10% and then reduces the price by 10%, store B first reduces the price by 10% and then increases the price by 10%, and ask whether the current price of the goods in store A and store B is the same? Why?" Based on Variant Teaching, the knowledge structure formed is characterized by mathematical language, the connotation of growth rate is clarified, and its nonessential attributes are eliminated. In this way, three-dimensional mathematical concepts are formed through the refinement of mathematical ideas and methods, learning

tasks are completed with high quality, positive emotional experience is obtained, and the power of mathematics is felt.

### III. SUGGESTIONS AND REFLECTION

Mathematical activities are full of exploration and creation. Students' non-intellectual factors affect the effect of mathematical activities. Efficient classroom pursues the emotional benefits of the learning process. "The diversified expression of mathematical knowledge can greatly expand the space of mathematical learning, support students' learning and teachers' teaching, and obtain favorable support for high-level and deep-seated thinking activities" [4]. Efficient classroom leads students to connect with the actual social life. It is the embodiment of effective inquiry learning process, the presentation of efficient thinking activities, the learning process of emotional experience, and contains the process of forming scientific values.

#### A. Strengthen problem awareness in mathematical activities

By carrying out "hands-on practice, design scheme, analysis and prediction, query expression, modeling application, evaluation and comparison" and other operation behaviors based on problem situation, students' learning presents a learning state of independent exploration and happy communication, which has fundamentally changed "teaching" and "learning". Such teaching activities have entered the depths of students' emotion and thinking, Touch the essence of problems and the core of knowledge, open the internal transformation process of students' "schema" development, promote students' independent discovery and real understanding, deeply understand the process of problem solving, and further develop high-level thinking ability. Students transform knowledge into the ability to analyze and solve practical problems and the concept of understanding the objective world. The knowledge obtained is structured and integrated, Flexible and networked, and also achieve efficient classroom.

#### B. Improve the will quality of mathematics learning

Mathematics activities are based on the generation process of knowledge, pay attention to students' emotional communication, enhance students' sense of social responsibility, and devote themselves to the cultivation of learning ability Starting from the whole of subject knowledge and learning part in the whole, rather than limited to specific knowledge details, make mathematical problem exploration, representation and communication, mathematical modeling and mathematical application become effective strategies for mathematical learning, and understand how students operate "in depth", process learning materials and transform subject knowledge into their own "schema" "Pay attention to observing and summarizing the law of students' thinking activities in the process of mathematics learning, study the development process of thinking activities, fully expose the



occurrence and development process of mathematical knowledge to students, and try to show the original thinking process of mathematicians discovering mathematical knowledge to students" [5].

#### C. Deep learning affects efficient mathematical activities

Mathematical activities can create personalized learning "space", move lively scenes into the classroom, simulate realistic mathematical activities, induce "deep learning" of high-level thinking, promote the effective operation of individual neural network's understanding of graphics and data analysis, pay attention to the critical understanding of knowledge learning, and emphasize the organic integration of learning content. The construction and reflection of intentional learning process is the transfer, application and problem solution of learning. Each student can experience the process of "schema", "assimilation", "adaptation" and "balance" according to his own experience, characterize the learning results and laws through symbols and the relationship between symbols, realize the effective development of mathematics learning, deeply excavate the methods, theories and values contained in his knowledge, and accumulate the core quality of mathematics.

#### D. Perfection in screening and reflection

Students collect the required knowledge and information and carry out classification and coding, data analysis and image processing. After comparative analysis, they study the differences between theory and practice, so as to make the static mathematical structure behave as a logical dynamic process, verify conjectures and theories, and understand the generation and development process of mathematical knowledge. Students can think like mathematicians and organize mathematics, summarize, analogy, association, guess and verify mathematical knowledge. According to the common problems exposed in the group communication, the teacher organizes the whole class to analyze, and the students conduct comparative analysis, reasoning and demonstration on the problems in the discussion, so as to form scientific mathematical concepts in the screening and reflection "Test their process of obtaining answers, share their own inquiry process with others, and further refine this process" [2].

#### E. Guide students to improve their mathematical concepts

"Project-based" mathematical activities highlight the way of thinking of problems, explore the differences between practice and theory, experience the process of algorithms, and understand the of knowledge generation and construction. Each student can participate in raising, analyzing and solving

problems mathematically, accumulate experience, verify assumptions, guess cognition, obtain development and innovation, so as to integrate mathematical knowledge with other knowledge. It enables students to move towards life, grow healthily, gain respect, understand competition and cooperation, improve their mathematical concepts, and obtain the core mathematical literacy necessary to adapt to modern life and future development.

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