

MATHEMATICS EXPERIMENT: A TRANSFORMATION OF MATHEMATICS LEARNING IN CHINESE PRIMARY AND MIDDLE SCHOOLS

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Short description of the Thematic Afternoon: organizers, aims and underlying ideas

This thematic afternoon is organized by Prof. Linwei Dong, the Vice Chairman of the Teaching and Learning Speciality Committee of Middle School Mathematics, the Chinese Society of Education. Prof. Dong was a high school mathematics teacher for nearly 20 years and, after that, a teaching and research advisor for 15 years. He is now the Editor-in-Chief of Junior High School Mathematics Textbook (Jiangsu Edition) and the Director of the Education Science Planning Office of Jiangsu province. During his career, he has won the title of special-class mathematics teacher, the first prize of the National Su Buqing Mathematics Education Award, and the second prize of National Teaching Achievement Award.

As early as the 1990s, Prof. Dong began to pay attention to middle school students' interest in and ways of learning mathematics. He designed some mathematical activities to involve students in productive learning, for example, *using dominoes to learn mathematical induction* and *using a circle game to discover the sum of inner angles of a triangle and the sum of outer angles of polygons*. These activities sparked series of studies on mathematics experiments.

In 2001, China launched a new round of curriculum reform of basic education. Based on the revised national curriculum, Prof. Dong and his team designed a series of mathematics experiments and included them in the junior high school mathematics textbooks, such as *Try it, Do and Think*, and *Mathematics Labs*, which inspired teachers and students to change their traditional ways of mathematics teaching and learning.

Since 2007, the team started to systematically explore the theories and applications of mathematics experiment. They proposed the basic theoretical framework, wrote operation manuals, designed various patterns for teaching mathematics experiment, and developed series of experimental tools. They also conducted empirical studies to investigate the effectiveness of mathematics experiment.

Mathematics experiment has proved to be a learning strategy matching the cognitive traits and levels of primary and middle school students. By doing mathematics experiments, whether with physical models or technical software, students are involved in mathematical activities such as hands-on, experimental exploration, and practical applications. Such activities provide them the opportunities to understand mathematical concepts, explore mathematical rules, and solve practical problems.

Studies have shown that mathematics experiment helps make abstract mathematical knowledge more vivid and, thus, enables students to learn abstract concepts and generalize

rules through direct experience. Besides, in the process of learning mathematics concepts and rules, students gain methodological insights into how to learn and how to think mathematically.

Mathematics experiment greatly protects students' curiosity, imagination, and thirst for knowledge. It, at the same time, arouses students' interest and enthusiasm for learning. Therefore, it enables students to positively engage in activities of experimental inquiry. Such a positive attitude would stimulate their inspiration and promote the generation of their creative thinking.

The thematic afternoon will show in details the background, significance, development, and achievements of mathematics experiments, and it will also demonstrate the research results of mathematics experiments through specific cases.

References

- Dong, L. (2020). Mathematics experiment: A reform of junior school students' mathematics learning. *Global Education Outlook*, 49(9), 103-115.
- Yu, P., & Dong, L. (2016). Analysis of nature of mathematics experiment in junior middle school. *Curriculum, Teaching Material and Method*, 36(8), 89-95.
- Zhao, W., & Zhang, J. (2016). Teaching design of mathematics experiment in junior middle school. *Curriculum, Teaching Material and Method*, 36(8), 102-107.

Planned structure:

Planned timeline	Planned activity	Working format /Responsible person
14:00-14:30	Mathematics experiment: a transformation of mathematics learning in Chinese primary and middle schools	Keynote speech /Prof. Linwei DONG
14:30-15:00	A case study of mathematics experiment: Understanding mathematical concepts	Presentation /Qingsong GUO et al.
15:00-15:30	A case study of mathematics experiment: Exploring mathematical rules	Presentation /Aiping ZHANG et al.
15:30-16:00	A case study of mathematics experiment: Application of mathematics knowledge	Presentation /Weikun ZHAO et al.
16:00-16:10	Research on the educational effects of mathematical experiments	Presentation /Prof. Ping YU
16:10-16:20	Research on the psychological effects of mathematical experiments	Presentation /Prof. Dingliang TAN
16:20-16:30	Prospects for research on mathematical experiments	Presentation /Detong XU