MATHEMATICS LEARNING AND MATHEMATICS GAMES

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Short description of the Workshop Groups: organizers, aims and underlying ideas

Type a short description of the organizers, aims and underlying ideas characterising your thematic afternoon activity here.

The organizers in the workshop are math teachers instructing students aged 12-18. Many of the teachers are members of a program named Mathematics Learning and Mathematics Games.
Professor Shi is the leader of the organizers. He is the deputy director of Basic Education and Lifelong Education Development Department of East China Normal University, the vice principal of No.2 High School of East China Normal University, the host of the Mathematics Base of the Fourth Phase of Shanghai Famous Principals and Educators Project and the council member of Shanghai Mathematics Society. He has devoted to gifted students education for many years. Some of the students he tutored have won the gold medal of the International Mathematical Olympiad (IMO), the national outstanding of High School Mathematical Contest in Modeling, and the Mathematics Prize of S.-T. Yau High School Science Award. He has written some books on math learning and teaching, such as "Practice and Thinking on the Cultivation of Mathematical Innovation Quality of High School Students", "Walking Mathematics Around Games", "Introduction to Risk Decision and Game Theory", "Inquiry into Mathematics Based on Graphing Calculators" .

There are widespread demands that mathematics instructions should be dramatically reformed so that students will be enabled to learn mathematics with understanding by actively participating in tasks that incorporate important mathematics. Games can play such a role. It is generally believed that Games is a broad concept, which includes any kind of activities that aim at recreation or entertainment. And mathematics is intellectual work with artistic demeanor, and at the same time it is a science of great practical value. Mathematics is always together with logic. Mathematicians are generally not joking when they are engaged in research, because rigor and seriousness are people's pursuit of mathematics, and the role of games in mathematics can at most stimulate interest and regulate emotions. Investigating the relationship between mathematics learning and games, we find that games and mathematics are very closely related. The factors of games can be found in terms of mathematical knowledge itself or the process of mathematical activities, such as the motivation and methods of people engaged in mathematical activities.

There are many deficiencies in the current situation of game teaching in middle schools and high schools. First, the teaching goal is not clear. Second, the game design fails to present the nature of mathematics. Third, the teaching material is insufficient and the teaching form is monotonous.

The program mainly develops math games suitable for middle school and high school students. It focuses on the combination of games and mathematics, integrates classroom practice, collects and organizes relevant data for a long time. We have set up elective courses about math games since 2015, both in middle schools and high schools; in the summer of 2017, we started to cooperate and study with Julia Robinson Mathematics Festival, since then we organized Mathematics Festival in No. 2 High School of East China Normal University every year; in 2018, we compiled a book about math games containing 20 puzzles and solutions for teachers, and it's quite popular among math teachers; in 2020, due to the influence of covid-19, we launched a series of online activities about math games. Throughout the process, first-hand information about students' feedback on math games was obtained through videos, questionnaires and interviews.

As a matter of fact, we still have many questions to think about. How to better combine games with math learning? What other games can be used to understand the nature of mathematics? What role should we teachers play in the math games learning?

In the workshop, we will share the detail of our practice, give a brief review of the results to the questionnaires and interviews, and share our experiences about the series of activities. What's more, we will hold a mathematics festival, which includes 15 games. Every participant in our workshop can choose the games they are interested in and can switch to another game as they wish. Participants will play different games at different tables at the same time and discuss the answers with table leaders. In particular, we will display several traditional Chinese games such as Chinese Rings, Tangram, Magic Square and so on. Welcome game lovers and math fans from all over the world to join us.

Planned structure:

Insert the planned structure of the workshop in the table below. You can insert rows if needed.

Planned timeline	Planned activity	Working format /Responsible person
10 minutes	Aims and Meanings	Lecture / Hongliang Shi
20 minutes	What have we done?	Lecture / Fanglin Tian
50 minutes	Mathematics Festival	Games / Hongliang Shi, Fanglin Tian, Zhiyu He
10 minutes	Conclusions	Lecture / Zhiyu He