# “Out School” Mathematics Learning

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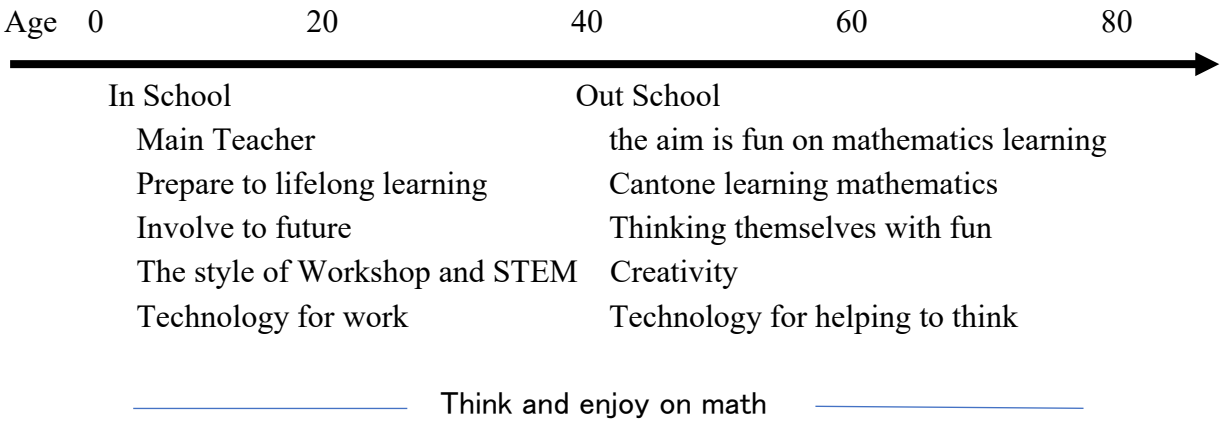


What is “In School” and “Out School”? A suggestion for lifelong learning of mathematics. We think that lifelong learning of mathematics is saying “Out School” learning. Learning styles, are broadly divided into two, one is “In School” and the othe is “Out School”. What is meant by “In School” and “Out School”? “In School” is same as the school education system. In this system there are students and teachers and the lead is given by the teachers. In this style, the teacher is in a position of authority and the student is in a subordinate position; learning mathematics is a top down process in which the students are given the theorem and problems by the teacher. A diagram of “In School” and “Out School” Learning Structures. (Fig.1)

| **“In School” Learning Structure** | **“Out School” Learning Structure** |
|---|---|
| Mathematics<br>↓<br>Teacher/ Specialized Book<br>↓<br>Student | Mathematics ⇔ Student with Technology and Books |

Fig. 1 “In School” and “Out School” Learning Structures

We want to think about lifelong learning as “Out School”. It is said that lifelong learning can be divided into four fields.
(1) Adult class (back to “In School” learning)
(2) In-house training (in a business, government service or other organization)
(3) Preparing for a new profession
(4) Personal joy/fun
In these fields, we think that (1), (2) and (3) are “In School” education, only (4) is “Out School”. In this field, the aim of mathematics education is to enjoy mathematics learning. So, the next table is the differences between “In School” and “Out School”.

Table 1: Comparison of “In School” and “Out School”

| | “In School” | “Out School” |
|---|---|---|
| Investment | Education as investment<br>Preparation for occupation<br>Expectation for the future | No investment |
| Place | School / cram school<br>Vocational training<br>Company training<br>On Line | Home<br>Library / Museum<br>Public place<br>Community center |
| Method of thinking | Deductive thinking<br>Proof<br>Critical | Inductive thinking<br>Mathematical experiment<br>Creative |
| Technology | On Line<br>Assistance<br>Help | Assistance for technical skills<br>Not only to get answers but aid to think |
| Aims | Getting knowledge<br>Be useful math | Personal joy/fun |
| Motivation | Passive motive<br>Learning is an obligation<br>Right to learn | Proactive motive<br>Active motive<br>Personal joy/fun |
| Concept | Systematic teaching materials<br>Course of Study<br>Syllabus | Personal Choice (Freedom) |
| Material | Textbooks / reference books<br>Given teaching materials<br>Exercise books | Books/Informants/Newspapers/Magazines<br>/Radio/Television/Films/Plays<br>Technology<br>Thought<br>Enlightenment Paper/Book |
| Assessment | Examination /<br>Dissertation<br>Evaluation is given | No evaluation<br>Verification<br>Emphasis on self-evaluation |

We think the most important element of mathematics is “to think”. For learners who are taught “In School” mathematics in the past (past learning experience), their next stage of mathematics learning (lifelong learning) will most likely be “Out School” learning. The method of “Out

School" mathematics learning is the inductive thinking, whereas "In School" is logical thinking, that is deductive (Fig 2.).

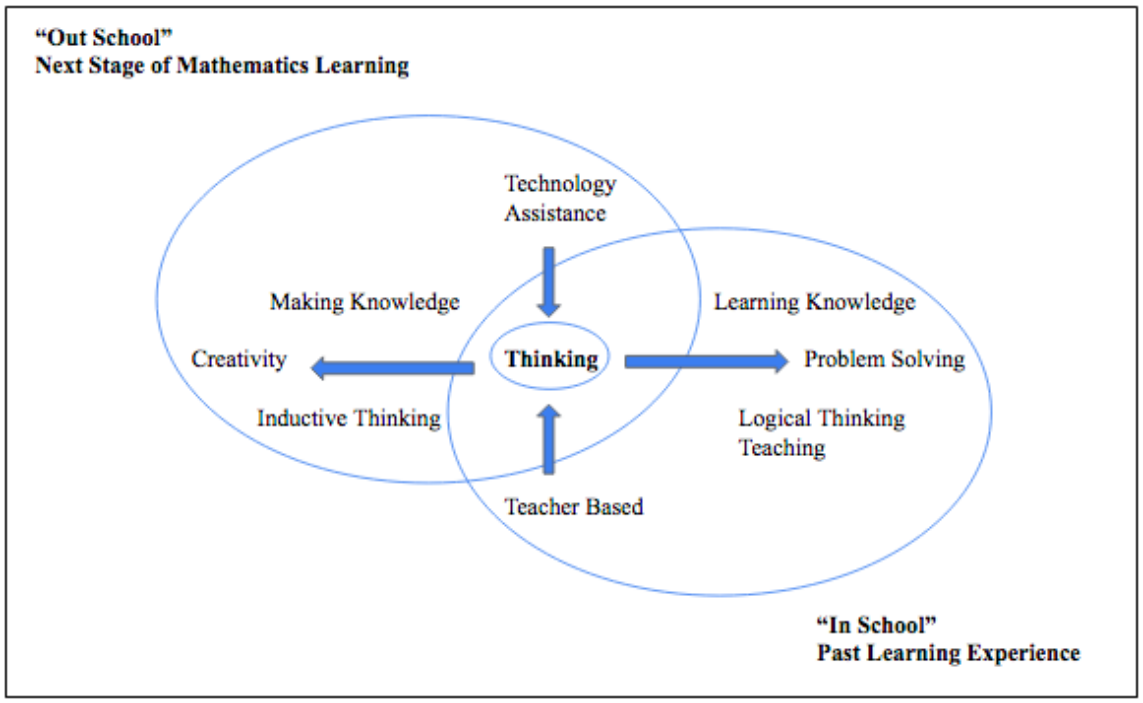


**Fig 2. A relation between "In School" and "Out School"**

## Expected discussion

We introduce an approach to the lifelong learning of mathematics and consider how lifelong learning of mathematics may develop in Japan.

### References

S.Watanabe The aim of mathematical education at next society. International conference on mathematics and mathematical education at Laos 2018

S.Watanabe Creativity, Technology and "Out School"-Interesting at Mathematics with Technology during Out School. The 11th International Conference on Mathematical Creativity and Giftedness 2019(accepted)

S.Watanabe Utilization of Technology for Mathematics Education "To Know" and "to Feel". The Japan Society for Science Education 2019