

## **The influence of abacuses on children's mathematical ability**

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**Abstract:** *Abacus is a method of numerical calculation with abacus as a tool, which is known as the fifth invention. Abacus teaching is not only an exercise of computing skills, but also an all-round improvement of students' quality through the coordinated action of various organs to promote the healthy education of brain. This paper studies the curriculum standard of Korean primary school and the setting of abacus in primary school mathematics, and analyzes the important role of abacus in children's intelligence development and mathematics learning.*

**Keywords:** *abacus; interest; teaching aids.*

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### **I. Introduction**

Mathematics is a discipline of long standing. It is an indispensable tool for people to live, work, and study. Mathematics can help people process data, perform calculations, reason and prove, and mathematical models can effectively describe natural and social phenomena. Mathematics provided language, ideas, and methods for other science, which is the basis for the development of major technology, while it plays a unique role in improving human reasoning, abstractness, imagination, and creativity. Mathematics is a culture of humanity and the content, idea, method and language of mathematics are important part of modern civilization.

The basic starting point of mathematics course in compulsory education stage is to promote students to develop comprehensively, continuously and harmoniously. It should not only consider the characteristics of mathematics, but also follow the psychological rules of students learning mathematics. It emphasizes that teachers should start from students' existing life experience, and let students experience the process of abstracting practical problems into mathematical models, explaining and applying. In this way, students not only gain an understanding of mathematics, but also make progress and development in thinking ability, emotional attitude and values.

The children's rational judgment and decision-making ability are formed from early childhood through various mathematical activities, so mathematics education in early childhood is very important. In order to develop children's mathematical attitudes and abilities, teachers should use teaching aids in their teaching, which makes children understand mathematics more intuitively and easily. Abacus is the best teaching aid to cultivate children's mathematical attitude and abilities.

### **II. Abacus**

Abacus is a method of digital calculation using abacus. It is hailed as China's fifth largest invention and has been included in China's national intangible cultural heritage list. United Nations Education Scientific and Cultural Organization (UNESCO) believes that intangible cultural heritage brings a sense of identity and history to the owner community, which is the key to ensuring cultural diversity and human creativity. In October 2003, the 32nd Session of the UNESCO Conference adopted the Convention for the Safeguarding of the Intangible Cultural Heritage, which called for the protection of oral traditions and expressions, performing arts, social practices, ceremonies, festivals, traditional crafts as well as knowledge and practice of nature and the universe.

Through experiments, some scholars observed the characteristics of activation of brain functional areas after abacus training, and concluded that abacus training has an important impact on children's mental calculation<sup>[1,2]</sup>.

No matter in China or in South Korea, there is a broad mass base. Millions children and adolescents are learning abacus. Abacus teaching can not only improve the calculation skills but also promote the brain benign education to improve the overall quality of students through the coordination of students' various organs. Abacus computing is a special computing skill created by China. It is a kind of skill from the actual training to the simulation training, then to the image training, and finally to form the movement of bead image in the brain. Through months to years of repeated training, students can form a clear image of calculating beads in the brain,

and can operate this image of calculating beads, that is, "playing an abacus in the brain", thus greatly accelerating the speed of calculation.

In order to improve the effect, we should distribute the abacus course reasonably in the actual teaching.

**Korean Elementary School Curriculum Standards**

Course standard	Calculus			Abacus	
	2, 3 digit addition and subtraction	Multiplication table	Addition and subtraction of 4 digits or more	Addition and subtraction	Multiplication and division
First time (1955-1962)	2-1	2-2	4-1	4-1	6-1
Second time (1963-1972)	2-1	2-2	3-1	5-2	6-2
Third time (1973-1981)	2-2	3-1	4-1	5-2	6-1
Fourth time (1982-1988)	2-2	3-1	3-2	6-2	-
Fifth time (1989-1994)	1-2	2-1	3-1	-	-
Sixth time (1995-1999)	1-2	2-1	3-2	-	-
Seventh time (2000- )	2-①	2-②	3-②	-	-

### III. Abacus teaching in Korean primary school

From the chart of Korean elementary school curriculum standards on the next page, it can be seen that in the process of mathematics teaching in Korea, the calculations below three digits are now in second and third grades, while the abacus is arranged in students in the fourth to sixth grades. They have already learned how to add and subtract more than four digits, and then let them learn how to add and subtract less than three digits with abacus, which will not make them interested in abacus certainly. For students who have been assimilated by calculus, abacus has lost its meaning as a math teaching aid. According to the cognitive theory of Piaget<sup>[3]</sup> (the understanding of educational psychology), students who have been calculated as "assimilation" do not need to use abacus to "adjust", and they want to continue to use calculus to calculate problems.

Mathematics is a phased educational process. Only by understanding the contents of the next stage can we apply and expand to solve the problems of the previous stage. The abacus as a mathematics teaching aid is used flexibly in the addition and subtraction of two and three digits, which expand the mathematics and help to calculate larger numbers. However, if you have already learned the calculus, and then ask students to learn abacus, I am afraid it is difficult to achieve. Therefore, the abacus teaching must have the correct teaching order, which should be composed of "addition and subtraction calculus of two and three digits → addition and subtraction abacus of two and three digits → addition and subtraction of four digits or more → addition and subtraction abacus of four digits or more". Therefore, in the fourth curriculum standard, abacus appears in the second quarter of the second unit of the sixth semester of the sixth grade. That is to say, the abacus appeared in the sixth grade of elementary school, which did not help the students and did not attract their interest. Eventually, the abacus was cancelled in the fifth curriculum standard (1989). The abacus education at that time was in an inappropriate order, which led to the abacus gradually disappearing in the mathematics education process in primary schools.

### IV. The role of abacus

The psychological function of human intelligence can be divided into two systems, the system of intellectual and non-intellectual factors. The latter includes motivation, will, interest, emotion, and personality. It can power and regulate the function of intelligence, which is extremely important for the future learning and growth of students. In the abacus learning, the students' meticulous learning attitude and style, sense of responsibility, perseverance and diligence are cultivated. In addition, the calculation of abacus is in line with the age characteristics of the students, and the abacus makes the students feel new and interesting<sup>[4]</sup>.

Abacus significantly develops right brain function. The student's abacus learning process is an effective method to promote the development of thinking and strengthen their hand skills<sup>[5,6]</sup>. Human thinking behavior is the thinking consciousness activity that distinguishes the phenomenon from the surface. In the abacus teaching process, the teacher should focus on several influencing factors, which are the calculation rules of the counting beads, the rules of using the abacus and the image movement in the abacus.

The educational function of abacus teaching is mainly reflected in the integration of mathematics with

primary school. The abacus can quickly complete the number of enlightenment education and the recognition and calculation of the number within one hundred and one thousand. In addition, abacus can edify the good character of children<sup>[7]</sup>.

Abacus is not only a practice of computing skills, which significance lies not in the results, but in the overall improvement of students' quality by paying attention to the coordinated movements of students' various organs, promoting the benign education of the brain in the teaching process.

Abacus can change the attitude of learning and increase the concentration of children. When learning abacus, it is often necessary to focus on independent thinking, which invisibly cultivates the child's attention and memory.

Piaget, J. (1970). W.W. Norton & Company.

## V. Conclusion

Based on the above content, in the process of elementary school mathematics, the misallocation of abacus will lead to children who have formed mathematical concepts in the fourth to sixth grades who are disgusted with mathematics interests. If you want to use the teaching aids to successfully teach, you should choose the teaching aids that children can easily operate and can attract interest. The abacus education should be assigned to the first and second grades of elementary school that have not yet possessed the ability to judge and think logically.

We advocate the combination of abacus mental calculation and mathematics. The introduction of abacus into mathematics class can develop students' thinking, improve students' interest in learning, cultivate students' attention, memory, endurance and self-confidence, so as to facilitate the learning and mastering of other subjects. Abacus mental calculation teaching has such advantages, so we should add abacus mental calculation to characteristic teaching, improve students' computing ability, improve children's overall quality, and inspire national spirit.

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