

# The Role and Significance of Mental Arithmetic in the Intellectual Development of Preschoolers

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**Abstract:** *The article illustrates the theoretical aspects of the intellectual development of preschool children through an unconventional method for teaching them oral calculation using the Japanese horizontal arithmetic Abacus, called “mental arithmetic”.*

**Keywords:** Intellect, Abacus, mental arithmetic, teaching methods, oral counting, UCMAS program, preschool children.

## I. INTRODUCTION

In these days, the development of post-industrial society defines the tasks of improving sensory, academic-cognitive and intellectual-innovative abilities of a child as one of the priority areas of work.

The success of the state in the world stage largely depends on the creation of innovative technologies, the rational development of resources, the ability to build a long-term strategy of economic development. In particular, the achievement of such characteristics is directly related to the level of mathematics and the scientific literacy of society. The most effective mechanism of developing intelligence is teaching mathematics.

## II. METHODS

In scientific research, intelligence frequently defined as a complex integral formation that carries various cognitive processes and functions (thinking, memory, attention, imagination) in their interconnection, and intellectual advancement which depicts the development of basic logical processes that form the integral quality of the personality [1] ...

For the time being, the question of the intellectual development of preschool children determined by the existing contradictions, firstly, between the content of the remaining informational programs of preschool education, which does not consistently contribute to the disclosure of the child’s intellectual potential and the demand for their cognitive enrichment within the framework of additional education, and secondly, between the pedagogical ability of teaching mental arithmetic to expand logic processes and actions in preschool children and the insufficient development of its methods and didactic techniques.

## III. RESULTS

For this reason, it is really essential to develop an effective educational methods and programs aimed at the intellectual, innovative and personal improvement of children with the maximum use of potential of their age capabilities. One of these programs is the UCMAS (Universal Concept of Mental Arithmetic System) method of teaching preschool children using the ancient horizontal arithmetic Abacus.

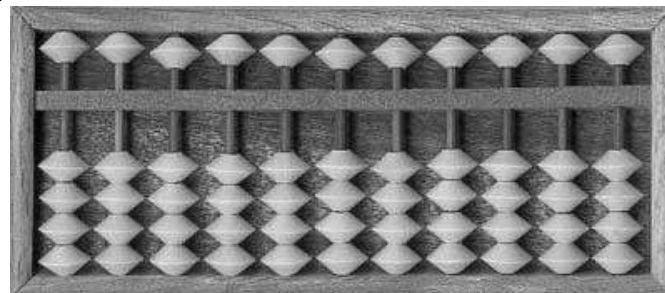


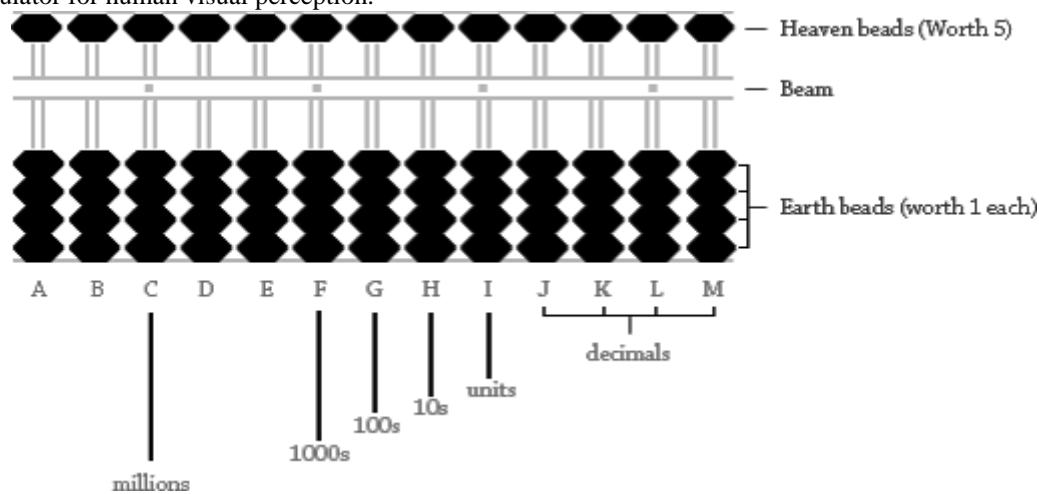
Figure 1 - Wooden horizontal calculator Abacus (Soroban)

The UCMAS program is a product of UC International Corp, headquartered in Kuala Lumpur, Malaysia. The founder of this technique is Dino Wong. The history of UCMAS (translated as Universal Concept of Mental Arithmetic System) began in October 1993. The program is designed for children from 4 to 12 years old, but can be mastered at an older age.

## IV. DISCUSSION

For more than 20 years, mental arithmetic has been successfully used in teaching children in 56 countries of the world, most actively in Malaysia, Thailand, China, Canada, USA, Great Britain, Austria, Spain, Australia and the Middle East. Among the CIS countries, the method of teaching mental arithmetic has reached particular popularity in Kazakhstan.

The UCMAS program is described as an ancient Chinese technique for brain coordination and body development using the Abacus calculations. This program is called “mental arithmetic”. Sometimes you can hear other names, for example, mental mathematics or Menard. Abacus eliminates mistake in calculations, as it provides an obvious interpretation of the numbers. Not a single digit could be postponed in the accounts in two ways, which makes arithmetic operations understandable. Abacus is the most accessible calculator for human visual perception.



*The location of the digits of the decimal system on the Abacus*

The child will be able to carry out mental arithmetic actions only when he learns to replace the physical Abacus with his image in his own consciousness, i.e. use in the mind (mentally) the “virtual” Abacus. The required numbers are visualized as pits and images on the Abacus.

Scientists and practitioners see a crucial factor in the effectiveness of the UCMAS program in the evidence that in the learning process a child almost always experiences a situation of success, which is a positive reinforcement, a kind of bio-feedback. The child quickly receives an answer, sees an immediate result, all this creates a feeling of wide possibilities and self-confidence. The preschooler becomes less dependent on the teacher, thus establishing a series of trust and motivation. This psychological aspect of teaching mental arithmetic cannot be overestimated, since the psychological characteristics of preschool children include a high self-esteem of their capabilities, which allows the child not to be afraid to explore reality, to engage in activities in which they are not yet competent, and, thus, actively master the social and objective world [5, p. 53].

In Uzbekistan, there is relatively no serious scientific research in the influence's field of mental arithmetic on the intellectual or personal development of a person, but there are many foreign studies in this field in the world.

Michael Frank, a professor at Stanford University, after conducting a large-scale study in India, came to the conclusion that mental calculations do not operate on a linguistic, linguistic system, but are more based on visual experience, in particular, on the ability to represent several groupings of objects in parallel to create visual representations ... This allows for fast coding of objects in the visual working memory [7].

Professor from Jordan Sue Rotenberg convincingly makes an argument about the effectiveness of the UCMAS program, referring at the same time to the results of experimental studies and measurements obtained in the process of neurological testing [8].

An identical investigation of the impact of learning to count based on the Abacus development of the intelligence of Sudanese children (from 7 to 11 years old) was carried out by Omar Khaleefa, Paul Irwing and Alya Hamaza, PhDs in 2008 [9]. The results of the study have reliably confirmed that there is a significant improvement in the general indicators of intellectual abilities (thinking, memory, attention).

## V. CONCLUSION

Thus, the effectiveness of the program for teaching mental arithmetic according to the UCMAS program, based on the oral counting system using mathematical calculations on the Abacus, is explained by scientists by the following factors:

1. Development of the ability to visualize - learning the ability to build a mental picture, thereby raising the amount of memory. In foreign psychology, this process is called the creation of a flash card (mental map) - this is the development of the skill of creating a virtual image of the location of the bones on the Abacus. By the end of the UCMAS program, the child has over half a million images stored in his memory;

2. Development of concentration of attention and speed of response to a task, as well as the ability to include in the work several mental processes and resources in the construction of sign systems;

3. The program for teaching mental arithmetic according to the UCMAS program, based on the oral counting system using arithmetic calculations on the Abacus, can become an effective instrument of developing the intellectual abilities of older preschool children in the framework of additional education.

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