Kassen G.A., Dautova Z.R.

**Mental arithmetic in the development of intellectual abilities: searches and results**

The authors justify the necessity of development of intelligence in primary school children with the help of mental arithmetic. Noting that the complex development of children's intelligence in the early school age goes in several different directions (absorption and active use of speech as a tool thinking, connection and impact of each other all kinds of thinking, etc.), the authors refer to the possibility of mental arithmetic to complex function used two hemispheres of the brain.

In the main part of the article the authors present the results of the mini-study conducted among primary school children visiting the center of intellectual development "Advanced." The essence of the mini-study was to identify how do intellectual and creative abilities develop in children during the lessons of mental arithmetic.

Rising interest rates intellect, photographic memory and fine motor skills, as well as the decline in creative thinking and focus of this group of students, say on the effectiveness of training of mental arithmetic to form the intellectual development and the need for further study of the problem, as well as the development of methodological basis for its application.

**Key words:** mental arithmetic, the development of intelligence, creativity abilities, intellectual abilities.

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Қасен Г.А., Даутова Ж.

**Интеллектуалды қабілеттіліктерді дамытудағы ментальды арифметика: ізденістер мен нәтижелер**

Мақалада авторлар кіші мектеп оқушыларының интеллектін менталды арифметика арқылы дамыту қажеттілігін негіздейді. Авторлар балалардың интеллектісінің кешенді дамуы кіші мектеп жасында бірнеше әртүрлі бағытта (сөзді ойлау құралы ретінде игеру және белсенді қолдану; ойлаудың барлық түрлерінің бір-біріне ықпалы және бірігуі және т.б.) жүретінін айта отырып, мидың екі жарты шарының да қызметтерін кешенді іске қосудағы менталдық арифметиканың мүмкіндіктеріне сілтеме жасайды.

Мақаланың негізгі бөлімінде авторлар «Адванс» интеллектуалды даму орталығындағы кіші мектеп жасындағы балалар арасында жүргізілген мини-зерттеу нәтижелерін көрсетеді. Мини-зерттеудің мәні балалардың интеллектуалдық және шығармашылық қабілеттері менталды арифметика сабақтары барысында қалай дамитынын анықтауда.

Қол моторикасының, фотографиялық жадының және интеллектінің пайыздық көрсеткіштерінің арттырылуы, сол сияқты берілген оқушылар тобындағы креативті ойлау және зейіннің концентрациясы көрсеткіштерінің азаюы және менталды арифметика сабақтарын интеллектуалдық дамуды қалыптастыру үшін тиімді екенін және мәселені ары қарай зерттеу мен оны қолдану үшін әдіснамалық база жасау қажеттілігін көрсетеді.

**Түйін сөздер:** ментальды арифметика, интеллектіні дамыту, шығармашылық қабілеттіліктер, интеллектуалдық қабілеттіліктер.

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Қасен Г.А., Даутова Ж.

**Ментальная арифметика в развитии интеллектуальных способностей: поиски и результаты**

В статье авторы обосновывают необходимость развития интеллекта у младших школьников с помощью ментальной арифметики. Отмечая, что комплексное развитие детского интеллекта в младшем школьном возрасте идет в нескольких различных направлениях (усвоение и активное использование речи как средства мышления; соединение и влияние друг на друга всех видов мышления и т.д.), авторы ссылаются на возможности ментальной арифметики в комплексном задействовании функций обоих полушарий мозга.

В основной части статьи авторы представляют результаты мини-исследования, проведенного среди детей младшего школьного возраста, посещающих Центр интеллектуального развития «Адванс». Суть мини-исследования заключалась в том, чтобы выявить как развиваются интеллектуальные и творческие способности у детей в ходе уроков ментальной арифметики.

Повышение процентных показателей интеллекта, фотографической памяти и мелкой моторики, а также снижение показателей креативного мышления и концентрация внимания данной группы учащихся говорит об эффективности применения занятий ментальной арифметики для формирования интеллектуального развития и необходимости дальнейшего изучения проблемы, а также разработки методической базы для ее применения.

**Ключевые слова:** ментальная арифметика, развитие интеллекта, творческие способности, интеллектуальные способности.

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# MENTAL ARITHMETIC IN THE DEVELOPMENT OF INTELLECTUAL ABILITIES: SEARCHES AND RESULTS

**Introduction**

With the arrival of the child in the school under the influence of training begins restructuring of all its cognitive processes, the acquisition of qualities peculiar to adults. This is due to the fact that children are included in the new for their activities and the system of interpersonal relations that require them for new psychological qualities. Common characteristics of all the cognitive processes of the child should be their arbitrariness, productivity and sustainability. During the lessons, for example, a child from the first day of training is necessary for a long time to maintain attention, be diligent enough to perceive and remember all the good what the teacher says [1, p. 66].

Psychologists proved that ordinary children in junior high school are quite capable, if properly educate, assimilate and more complex material than that which is given on the current training program. However, in order to skillfully use the available reserves of the child, it is necessary to solve two important tasks beforehand. The first of these is that, as soon as possible to adapt the children to work in school and at home, to teach them to learn without wasting physical effort, be careful, plodding. In this regard, the curriculum should be designed in such a way as to cause and maintain an ongoing interest among the students [2, p. 104].

The second problem arises from the fact that in the context of adaptation processes develop thought processes, and there is a need to form them without losing the chain: interest – Motivation – Training – intelligence [3, p. 178].

Integrated development of children's intelligence in the early school age is in several different ways: absorption and active use of speech as a means of thinking; Connect and mutually influence each other all kinds of thinking: visual-motor, visual-figurative and verbal-logical [1]; selection, isolation and relatively independent development in the intellectual process of two phases: a preparatory and executive. In the preparatory phase of the solution of the problem is carried out an analysis of its conditions and produced a plan, and in the executive phase the plan is implemented in practice. The result is then correlated with the conditions and problems. To all It should be added the ability to think logically and use the concepts [4, p. 26].

The first of these areas is associated with formation of speech in children with active its use in a wide variety of tasks. The development in this direction is successful, if the child is taught to conduct reasoning aloud, words play train of thought and call the result.

The second direction of development is successfully implemented, if the children are given tasks that require solutions for both developed and practical action, and the ability to handle images, and the ability to use concepts argument lead to the level of logical abstraction.

In accordance with this, in our view, we need a program that combines these two areas. Studying mental arithmetic program meets all the above requirements, mental arithmetic – is a highly efficient system of mental abilities with the help of arithmetic in the accounts. The essence of this system is that in the process of learning mental arithmetic stimulated by the work of both hemispheres of the brain. In a simple memorization is only logic – the left hemisphere. The program includes the study of mental arithmetic, the individual working with imaginary accounts and start using right hemisphere is responsible for imagination, intuition, creativity, i.e. He begins to solve a math problem, seeing as a number of pictures. Thus it is realized the second direction of development of intelligence [5, p.101].

In the first stage of studying mental arithmetic, children learn to read using special accounts, which contributes to the development of fine motor skills of hands and simple arithmetic. There is an intensive use of child accounts Abacus (Soroban). First, children are using the instrument of interest – to solve arithmetic problems by moving bones on the spokes abacus is simple and fun.

The next step – learning to count on Abacus in mind and perform calculations on an imaginary abacus – developing «mental account». Classes on mental arithmetic are widely used games, music, singing, exercise to improve the perception of the material and motivation to learn.

At all stages of training the child uses both hands for operations with accounts bones, stimulating the work of both hemispheres of the brain. Children perceive all four types of mathematical operations of addition, subtraction, multiplication and division. With an equal participation of both hemispheres of the brain process of learning and reflection, it becomes much more efficient. Each workout gradually weakened binding the child to the accounts and is stimulated by his own imagination, so after a few sessions, he will be able to make simple calculations in your mind, just imagining Abacus (Soroban) in front of you and mentally making a movement bones (called working with imaginary accounts ) [6, p. 48].

The "mental arithmetic" is working in Kazakhstan for the third year. It is believed that the founders of this trend are several mathematical guru. One of them is Melik Duyar, known for his performances on the show memory on different TV channels, and as one of the champions in the world of photographic memory. He also holds the post of chairperson of the international organization «MEMORIAD ™ – Memory of the World Olympics, the account in the mind and a quick read." Today Melik Duyar is among the ten people in the world with the strongest memory. Moreover, that it is cultivated today, placing Duyar's photo on billboards and brochures on mental arithmetic.

The training program focused on the development of mathematical thinking in children aged 5 to 12 years. That is, in this age range the child has a chance to become Archimedes, Descartes, Newton and Lobachevsky. That's only if the great scientists and mathematicians of the past centuries with the skill of a jeweler years perfecting his gift, trained brain multistage formulas in the mental arithmetic is much simpler. According to this method, all you need – its special accounts and to direct the child [7, p. 13].

A distinctive feature of mental arithmetic – that are forced to work just two hemispheres of the brain learning. By the way, fans and supporters of the mental effects of repeatedly cited this argument in support of its educational child – examining any other science in the traditional way; it is possible to use only 10% of the brain, whereas in mental arithmetic, this percentage is higher at times. Accordingly, the child's talents are no longer count.

«Our main task – not just to teach the child to put up big numbers, multiply, divide, extract out of the root, although this is done in the mind faster than a calculator, the main goal – to develop the child's photographic, visual, auditory memory, develop leadership quality, logical thinking. That is, human brain cells, like a sponge to absorb all of 12 years, on, of course, also is the development of brain cells, but it is much more difficult. Regular brain grinding method of mental arithmetic subsequently necessarily give absolutely incredible results promised training followers – in a child school performance increases, it becomes more assiduous, attentive, well absorbed material from the teacher, increases concentration.

Meanwhile, referring to the attitude of some teachers for mental arithmetic zealous, director of the school «Mega-arithmetic» clearly underestimates the scale. As a rule, teachers in math, practicing the traditional ways of learning, mental novelty categorically do not accept all as one called its main drawback – mental arithmetic makes child's calcu-

lating machine, depriving him of the opportunity to improve the usual ways for all of humanity.

«The baby is developing in one direction only. Specifically, I do not like when a student load your brain too big numbers, big calculations. The child, when small, it can not give a clear message to its parent – whether he has a penchant for math or any other subject, but he was forcibly given to the mental arithmetic and he was forced there, figuratively speaking, to force your brain at the same time losing the connection with other objects, to which he may be, he has a talent from God. The child becomes a computer, which carries a certain program. No internal sense, there is no complete assessment of the situation. I still support the education to which all of us were trained. The mental arithmetic is nothing good «, – commented Serik Sarsen, math teacher, now a practicing math tutor.

«As for the technique, maybe some elements of the traditional mental arithmetic teacher usually use, just do not know about it. Typically, there are many different techniques. For example, I use a few. Any teacher for himself chooses the members of a scheme of work. Somewhere there is integration of didactic units – for this technique to work hard, you can take some of the techniques, such as when we acquaint children with the multiplication of numbers simultaneously take the next big topic at a two-digit, three-digit numbers, and explain. Everyone has their own perception of someone like, some do not. But I'm more of a traditional education, for what is already there, already tested and works «, – said Svetlana Chernorai Math teacher.

On the dispute between the parents on the background of mental arithmetic utility Nurbeke Zarubekova knows that any criticism of this teaching method as jealousy of others' success on the part of teachers who, in fact, most often discourage mothers and fathers to send their children to study mental arithmetic. On the allegation that the child is overloaded and becomes a robot, the followers of Malik Duyar answer: the child is no longer loaded, than if he had visited the chess section or learned to play the piano [8, p. 65].

«This is deeply misleading or just jealous attitude. The man who created the mental arithmetic, he did a research, scientist who has devoted much time to the study of human brain cells. This is true in the world today, it is proved by scientists, that's the potential – akin to when children are given to chess. Then for some reason it did not criticize, children were without exaggeration geeks who have started to work and also the left and right hemispheres of the brain. Same thing here. There you have such a comparison. We are ordinary people, and we have basically worked the left hemisphere of the brain, at 8-15%, this is equivalent to what we have, when to move, we skip on one foot. Here, due to the development of both hemispheres man, figuratively speaking, he stands on both legs. As we will reach the goal – on one or two legs? The answer is clear, «– convinced Nurbeke Zarubekova.

Solomonic solution, as often happens in cases where there is no precise answer – that the child needs and what is not, as a rule, a child psychologist. Oksana Chulak, psychology professor at the correction center and the development of «Logos», learned to objectively evaluate any know-how offered by parents and promising outrageous possibility of their child. Mental arithmetic is not an unambiguous assessment, says psychologist. Having studied the method more carefully, Oksana Danilovna came to the conclusion that despite the very intrusive marketing, this is just one of many options for brain training. Just like learning a language or crossword puzzles. For the child's psyche mental arithmetic has the same effect as memorizing poems, formulas, or multiplication tables. Psychologist agrees that the numbers and mathematical symbols is best recognized by the left hemisphere of the brain, so this method is affected by it in the left hemisphere [9, p. 99].

"Of course, the brain – is a very complex and interconnected system. Its functions include the processing of all incoming information. Therefore, in teaching new skills and have new emotions and feelings he works a few percent more than in the rest. In general, any training creates new neural connections and nourishes the cerebral cortex. Advantages of this method lies in the fact that the child is learning mental arithmetic. Disadvantages also abound: Mechanical (oral) account does not generate the correct mathematical representations of children. Methods of formation of mathematical concepts in classical pedagogy formed over the centuries. "Order, the countdown", "part number", "comparison of numbers" form a spatial visualization ability, and more – verbal and logical. In addition, it offers us a mental arithmetic. "Mechanical" recount ", – says Oksana Chulak.

The presence of these same cons – only half the problem, says the psychologist. The saddest thing is that parents often refuse to recognize their already drawing yourself and your baby his great mathematical future. Any attempt to make adjustments to the image created by angrily swept aside, and the child has to attend school, to which he has in fact no interest.

This technique helps to balance the brain and develop opportunities of school-age children: the

functions of both hemispheres; ability to count orally, quickly and accurately; analytical thinking; concentration, attention stability; the ability of the natural sciences; visual differentiation, perception, photographic memory; intelligence, logic, spatial imagination [10, p. 38].

As you can see, mental arithmetic course aims to develop intellectual abilities, provides a solid foundation for future academic success and personal development. But there are still few evidence about this in Kazakhstan [11, p. 65].

**The organization and methods of studying the mental abilities in terms of developing the center**

To study the abilities that arise in the process of learning mental arithmetic primary school children on the basis of the center of intellectual development "Advanced" in Almaty was held a mini-study, consisting of three stages:

– stage – the initial diagnosis of psychometric characteristics and abilities of children in the two groups (groups are – relevant training classes).

– stage – control diagnostics psychometric characteristics and abilities of children in the two groups and to compare the results of the initial and control sections.

– stage – a survey among parents, children and instructors.

Mini-survey was conducted on a sample of 16 people (students CIR "Advance Mamyr") of them girls – 9, boys – 9 person respondents age – from 6 to 12 years.

To study the abilities that arise in the process of learning mental arithmetic, children used the following diagnostic tools:

Stage 1 mini-study – a test of Eysenck on IQ, test Bourdon "proofreading test" on concentration and stability of attention, creative thinking on Torrance test, the test of fine motor skills, a photographic memory test.

Stage 2 – the same tests.

Stage 3 mini-study – oral survey among parents, children and instructors.

In order to identify the severity of certain ability there were used psychometric tests such as: Eysenck IQ test, Bourdon test "proofreading test" on concentration and stability of attention, Torrance test for creative thinking, fine motor skills test, a photographic memory test.

These psychometric tests will determine how well affect the mental arithmetic exercises on the formation of intellectual and creative development of younger school-age children. Mini-study was conducted in two stages, in order to compare these results to the mental arithmetic training (initial cut) and after 3 months of training (control section).

Testing for the above procedures were performed separately for each group as well as individually (compliance by tests: group or individual). It should be noted that the subjects were extremely interested in the mini-study, and its results, so try to do everything as much as possible correctly. The first group was the Kazakh, Russian second. The studies were conducted in parallel in both groups. Prior to the test group respondents wound up one by one to carry out individual tests such as a test for a photographic memory and fine motor skills.

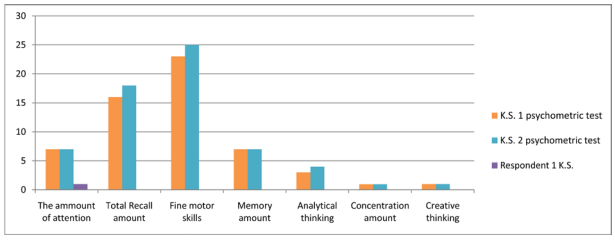
**The results of the mini-study**

Respondent № 1 K.S. Age 12 years old.

The time required for the training of mental arithmetic: 2 months

Level: 2

As we can see on the diagram below, K.S. has developed only total recall and fine motor skills, but other indicators remained the same, except the analytical thinking – it has decreased.

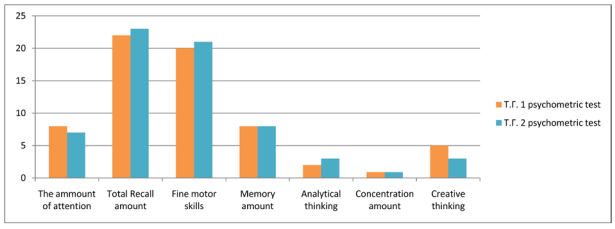



Respondent № 2. T.G. Age 11 years old.

Term passing classes on mental arithmetic: 3 months

Level: 2

As we can see on the diagram below, T.G. has developed only total recall, fine motor skills and analytical thinking, but other indicators decreased, except concentration of attention – it remained the same.

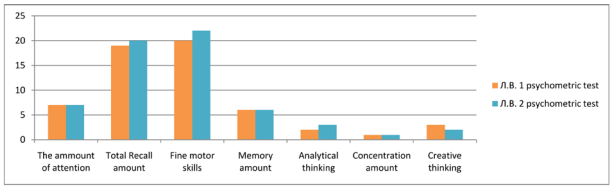



Respondent № 3. L.V. Age 10 years old.

Term passing classes on mental arithmetic: 2 months

Level: 2

As we can see on the diagram below, L.V. had progress in total recall, fine motor skills, analytical thinking, but other indicators were stable, except concentration creative thinking – it had a small drop.

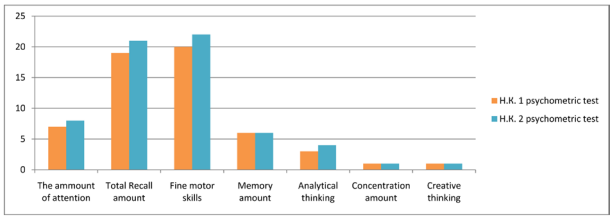



Respondent № 4. N.K. Age 7 years old.

Term passing classes on mental arithmetic: 4 months

Level: 4

As we can see on the diagram below, N.K. had progress in almost all indicators, only concentration of attention, memory and creative thinking were stable.

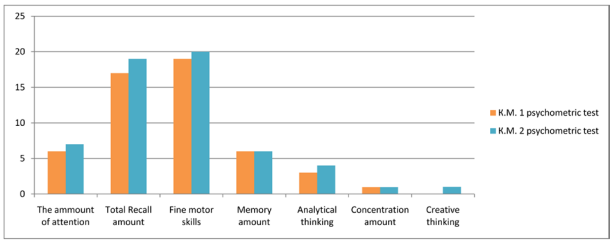



Repondent № 5. K.M. Age 12 years old.

Term passing classes on mental arithmetic: 3 months

Level: 2

As we can see on the diagram below, K.M. had progress in almost all indicators, only concentration of attention, memory remained the same.

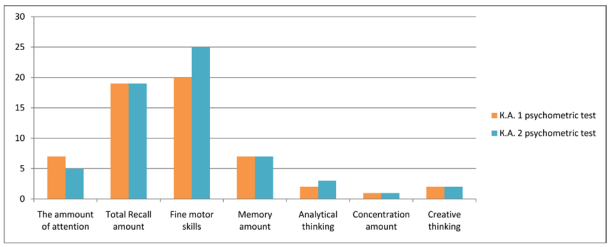



Respondent № 6. K.A. Age 13 years old.

Term passing classes on mental arithmetic: 2 months

Level: 3

As we can see on the diagram below, K.A. had progress in only two indicators, such as, fine motor skills and analytical thinking, but other indicators remained the same, except the amount of attention.

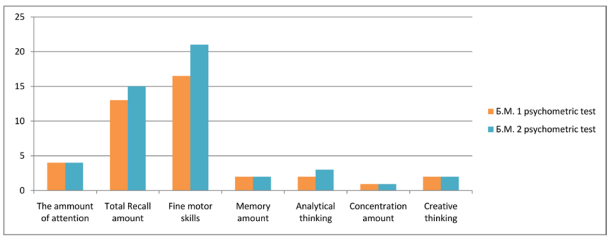



Respondent № 7. B.M. Age 9 years.

Term passing classes on mental arithmetic: 5 months, there was a break for 2 months

Level: 3 level

On the diagram below, B.M. had progress in three indicators, such as, fine motor skills, total recall and analytical thinking, other indicators just remained the same.

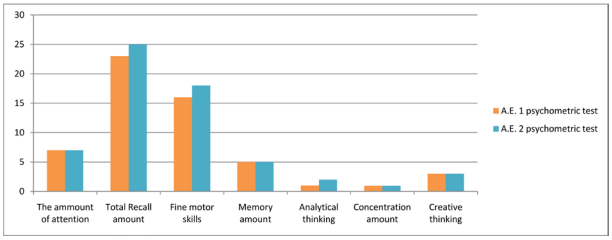



Respondent № 8. A.E. Age 9 years old.

Term passing classes on mental arithmetic: 3 months

Level: 2

On the diagram below, A.E. had progress in only three indicators, such as, fine motor skills, total recall and analytical thinking, other indicators remained the same.

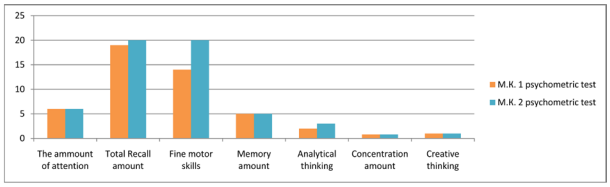



Respondent № 9. M.K. Age 9 years old.

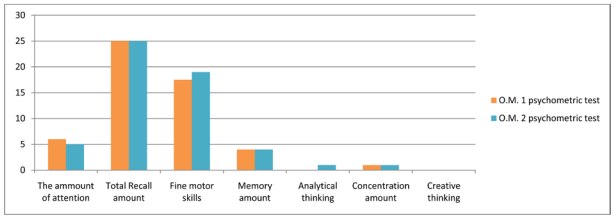
Term passing classes on mental arithmetic: 4 months

Level: 3

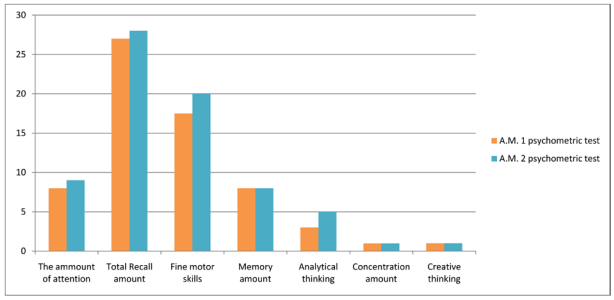
On the diagram below, M.K. had progress in only three indicators, such as, fine motor skills, total recall and analytical thinking, other indicators remained the same.



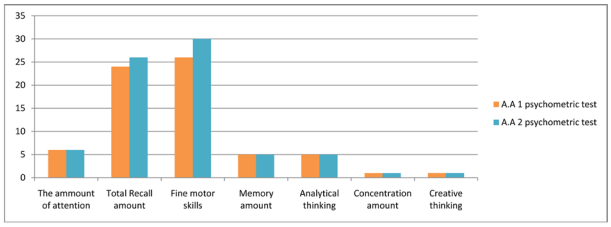
Respondent № 10. O.M. Age 8 years old.
Term passing classes on mental arithmetic: 4 months
Level: 2
On the diagram below, O.M. had progress in only in fine motor skills, then there was a slice decrease in the amount of attention, other indicators remained the same.



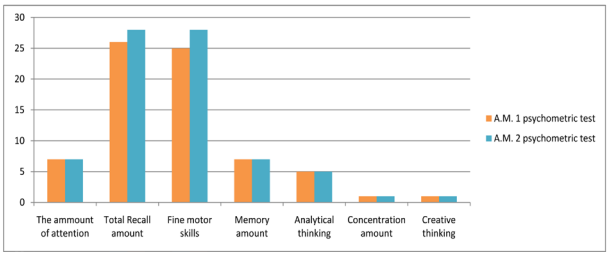

Respondent № 11. A.M. Age 10 years old.
Term passing classes on mental arithmetic: 4 months
Level: 5
On the diagram below, A.M. had progress in four indicators, such as, fine motor skills, total recall, analytical thinking and other indicators remained the same.



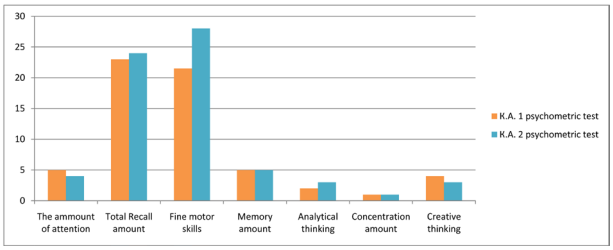

Respondent № 12. A.A. Age 10 years old.
Term passing classes on mental arithmetic: 5 months
Level: 4
On the diagram below, A.A. had progress in only two indicators, such as, fine motor skills, total recall, other indicators remained the same.



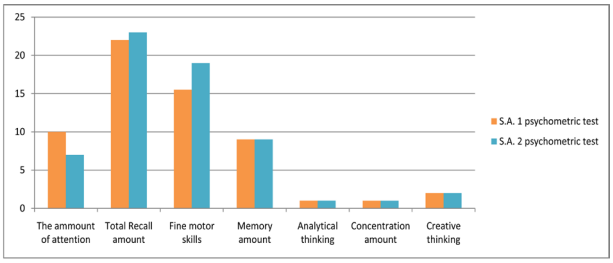

Respondent № 13. A.M.. Age 12 лет.
Term passing classes on mental arithmetic: 5 months
Level: 6
On the diagram below, A.M. had progress in only two indicators, such as, fine motor skills, total recall, other indicators remained the same.



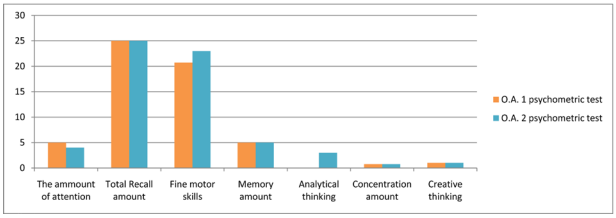

Respondent № 14. K.A. Age 10 years old.
Term passing classes on mental arithmetic: 3 месяца
Level: 4
On the diagram below, K.A. had progress in three indicators, such as, fine motor skills, total recall and analytical thinking, other indicators remained the same, except the creative thinking and amount of attention.




Respondent № 15. S.A.. Age 8 years old.
Term passing classes on mental arithmetic: 3 months
Level: 2
On the diagram below, S.A. had progress in three indicators, such as, fine motor skills, total recall and amount of attention, other indicators remained the same.




Respondent № 16. O.A. Age 9 years old.
Term passing classes on mental arithmetic: 2 months
Level: 3
On the diagram below, O.A. had progress in only one indicator, such as, fine motor skills, other indicators remained the same, except the amount of attraction.




## Conclusion

Comparing the percentages of primary and control sections performed in the experimental group, the authors observed that the percentage of the level of intelligence of the experimental group students (CIR "Advance Mamyr") for controlling the cutoff results increased from 100% of pupils in the 1-2 points as compared with the original cut; photographic memory index by 12%, and fine motor skills improved in 100% of the students by a few centimeters each. In turn, the percentage of creative thinking and concentration decreased by 11%.

After the second psychometric diagnosis, we can clearly see the changes that vary considerably in every student. For example, there are only 18% of students that had an improvement in the indicator showing the amount of attention, however, there is 32% of students which had a decline and 50% of students which had the same amount of attention after the second diagnosis. In the indicator which shows fine motor skills 100% of students had a rise in their points, when the indicators which show total recall and analytical thinking increased in 81% of students. Other 19% of students had the same indicators after second diagnosis. There is no difference in other indicators, which can show progress, in contrast, we can see an 18% decrease in creative thinking among the students. According to this, we can bravely say that mental arithmetic does not give any guarantee of developing creative thinking.

The analysis makes it clear that the mental arithmetic classes generally only affect the intellectual development rather than creative. It does not even depend on the period of their learning the mental arithmetic or other circumstances.

Oral survey of parents, instructors and children showed that all directly related to the child being interested in this course. That is, children with good results and progress are interested to learn the program better and faster. From this, it follows that children with a negative or zero result was seen on these courses where they were unconsciously counting, or at the insistence of parents.

Prospects for research: In accordance with the results of the survey there will be developed special note or recommendation to all centers where mental arithmetic is taught, so they could change their methods that could truly develop both hemispheres of a child's brain. As long as the survey can be made longitudinally, there are still some factors that could be included in this survey in order to improve it.

### References

1 Istratov, O.N. Directory of elementary school psychologist / Istratov, O.N., Eksakusto T.V. – Ed. 7th. – Rostov n / D: Phoenix, 2011 S. 443.

2 Mental arithmetic: the mind or thinking of the XXI century? // Rezhim dostupa: https://kapital.kz/gosudarstvo/48161/mentalnaya-arifmetika-um-za-razum-ili-myshlenie-xxi-veka.html Date: 15.05.2016

3 Donaldson M. Intellectual activity of children. – M., 1985.

4 Niskanen L.G. Intelegent development and education ofprimary school. – 2002. – Pp. 639.

5 Romanov I.I., Kalinin T. The role of literature in the intellectual development of the younger schoolboy // Young scientist. – 2015. – №22.1. – S. 154-156.

6 Agafonov I.N. et al. Methods of studying intelligence / Agafonov I.N., Kolechenko A.K., Pogorelov G.A., Shekhovtsov L.F. – Part 1. – SPb., 1991.

7 Donaldson M. Intellectual activity of children. – M., 1985.

8 Methods of studying intelligence / I.N.Agafonova etc. – SPb., 1991. – 221 p.

9 Holodnaya M.A. Psychology of intelligence. Paradoxes Research. 2nd ed, Pererab.i additional. – SPb.: Peter, 2002. – 264 p.

10 Epiphany D.B. Intellectual activity as a problem of creativity. – Rostov n / D, 1983.

11 Methods of studying the structure of intelligence / Comp. M.K. Tutushkin, G.M. Tovbin. – SPb., 1994.