APPLICATION OF THE PATTERN METHOD TO FORM THE NEURAL STRUCTURES IN THE LEARNING PROCESS AS A WAY OF SOLVING MODERN PROBLEMS IN EDUCATION

Abstract. The problems of modern education are large-scale and diverse. The aspirations of parents, teachers, and experts converge - everyone interested to grow up the generation of a whole, well-educated persons. Both the family and society are expected in the future generation being self-sufficient, desirable in the labor market, capable of lifelong learning.

Today's children have a powerful potential that is difficult to realize in the conditions of traditional school approaches.

Solving the problems of modern education largely depends on teachers - innovators, teachers - practitioners who develop and implement effective educational methods and programs.

Effective education consider the creation of stable neural structures during the learning process, which allow to preserve and increase knowledge throughout life.

To achieve this purpose the author proposed a method of integrated lessons – cases based on the maths patterns. This method and programme are scientifically substantiated and has more than 15 years of practical application experience in school and student classrooms.

The author also admits that a similar method can be successfully applied to the training of artificial intelligence neural networks. However, this assumption requires forward research and verification.

The educational method and program proposed by the author meets the modern requirements for education, which involves mastering various areas of knowledge, starting from an early age. This approach makes it possible to involve the student's cognitive potential as much as possible and direct it to the preservation and development of individual talents.

Keywords: life long learning, education’s innovations, creativity development, AI, science education, prevention of senile brain diseases.
Formulation of the problem. Modern children are ahead of the wildest expectations in their development. The international expert community has recognised that one of the main tasks of the nowadays educational process is the preservation and development of the child's individual talents. This requires innovative methods and educational programs that meet modern requirements and expectations for education.

Analysis of recent research and publications. Scientists, International organizations, national governments, educational experts, teachers, administrators, parents - everyone is involved in solving the problems of modern education.

The purpose of the article: 1) to substantiate of using mathematical models on STEM education; 2) to present innovative educational technology for creativity development, its main principles, tasks and methodology.

An overview of the main material. In the 21st century, the focus of educational priorities has shifted from the acquisition of all basic education (reading, writing, arithmetic) to forming a comprehensively developed individual, personality, person [1, 19].

The international scientific community recognizes that the modern education system is imperfect and does not allow students to fully discover their talents [2, 4, 8, 17].

It seems that today's children exceed the wildest expectations of adults. The fact that a modern child can justify his actions, provide explanations that exceed the vocabulary and cognitive reserve of an adult, does not affect the upbringing process in any way. This drives me into a corner even more. Humanity loses its enormous potential due to the fact that students do not have the opportunity to realize themselves.

How to calculate how much the lost potential of childhood will cost in terms of all the lost benefits of the inhabitants of the global village - all of humanity? How many brilliant minds have been driven into the framework of "traditional education" since childhood? In the screens of smartphones and TVs? How many of them got lost in the labyrinths of computer games? Can these losses be equated with medieval epidemics or a threat to pristine nature?

Understanding the scale of the problem acts as an accelerator for educational experts - it forces them to persistently knock on the doors of the bureaucracy and private homes, accusing the state and families of insufficient attention to the upbringing and education of children [2, 4].

But, unfortunately, neither the obviousness of the problems nor their recognition provide sufficient momentum for their solution.

The educational Titanic is constantly sounding the alarm at the last minute. There are shouts on the surface: "Iceberg on course". Passengers are urgently seated in reform boats. But how many will be saved? We will now dive into the icy water to explore what is hidden under the tip of the iceberg.
Discussion

Among the recognized problems of modern education are the following [2, 3, 8]:

1. Experts emphasize to pay more attention to the education and development of preschoolers. Experts urge parents to create a base for lifelong learning and emotional comfort. But what % of parents have enough knowledge and skills to ensure this level of preparation? This is not an easy job even for very well skilled specialists. Below we will consider the neurophysiological prerequisites for creating a foundation for building knowledge system throughout life.

2. When making demands to decision-makers, we must also align them with the expert environment itself. We must eliminate the threat of verbal jugglers influencing to the decision-making process. The future of societies cannot depend on the one-sided position of an official, politician, expert or corporate lobby. How many of them rely on their own practical experience or, at least, on the opinion of specialists — scientists, those who work in the mines of scientific laboratories? Maybe we should listen to the opinions of different Neuroscience experts before offering to teach 2-3 year old children using a learning system with AI, ChatGPT, MOOCs and online tutoring? [2, 18, 20]. «Consider the possibility of increasing a student’s intelligence based on understanding the cascade of neurobiological events that contribute to brain characteristics necessary for good reasoning and problem-solving ability. » [21].

3. The next recognized problem is the lack of teaching staff. Especially in the field of science, technology, engineering and mathematics (STEM). And closely related to it is the problem of recognizing the teacher's authority [19] and monetarization of their work [22]. The focus on scientific education was the result of the determined intention of the world scientific community declared in international documents: "Need to improve, strengthen and diversify science education, formal and non-formal, at all levels and for all sectors, and to integrate science into the general culture, emphasizing its contribution to the formation of open and critical thinking as well as to the improvement of people's ability to meet the challenges of modern society." [22].

Let's look around - what exactly have done governments of countries, even developed and not poor ones, to solve this problem? Who shows us realy creative teachers, inspired and tireless? A creative teacher always expands the narrow framework of ministerial recommendations, looks for relevant, new, something that develops. We should pay attention to the experience of such teachers. We have to understand where the real educational gold exist - inside of creative teachers – practitioners. Now they are miners of education. They are beyond the soffits and majestic signs. They simply don’t have enough time and energy to promote their effective methods. We have to take them out of the school bureaucracy to the world of scientific conferences. Extracting and washing gold sand in the mines of classrooms is the real work of educational experts. In those mines we will find the
solution to the problem of effective teachers and effective education. In fact, there are many of them. We just don't notice them. It is the same with effective teaching methods. Every talented creative teacher has his own methodical case. The mission of states is not only to find them and pay attention to them. But also guarantee copyright protection and monetized their work.

Therefore, the visible problem of the shortage of pedagogical personnel hides its foundation under water - the mass dismissal of practicing teachers and the political conjuncture [2, 3]. And even deeper - the lack of recognition of truly worthy pedagogical personnel [3]. There is only one solution and it is obvious - successful practices must be found, protected and spread. Reforms will follow them.

All of the above applies to both education in general and mathematical or scientific education in particular. Starting with the Pythagorean maths school, science was not separated from life [11, 12]. Mathematical skills have been a necessary component of living beings' since the beginning. If this is not the case, then how can we explain the precision of jump calculations in the brains of predators or the ability of birds to build nests or make long flights? In the human’s brain, mathematical abilities are genetically embedded [9, 14], as deeply as the ability to speak and walk straight. But over time, maths became more abstract, complex and difficult to understand. Its utilitarianism has become the prerogative of individuals. But even for now there is no better tool to develop the brain than mathematical exercises. Somewhere along the way of phylogeny, humanity reduced this natural talent to mathematics. And there are only talented teachers who be able to restore it at the level of ontogenesis.

Understanding the importance of maths education, educational institutions try to gradually introduce a mathematical component into the composition of compulsory subjects, without dividing education into "humanitarian" and "scientific". But these changes are so careful that they do not keep up with the development of the students themselves and the demands of life: « Over the last two decades, mathematics support has, increasingly, been seen by higher education institutions as a vital mechanism for helping students enhance their mathematical and statistical skills, particularly as they make the transition to university study. ….. Significantly, the analysis shows that mathematics support offers good potential for sustainability such that the legacy of national endeavours to establish it more widely will continue to exist into the future. »[17].

The importance of growing interface between disciplines is declared in issues of World Conference on Science for the Twenty-first Century [22].

Sciences are difficult to teach in principle. It is even more difficult to teach them in an interesting and exciting way. And this is not about the «wow effect», of course.

What does it mean to develop intelligence? Neurobiologists studies [5, 6, 9, 10, 16] prove that it is the development of neural structures through the involvement
of long-term memory in the learning process and builds the foundation for forming up the knowledge system throughout life.

Richard J. Haier, professor emeritus in the School of Medicine at the University of California, Irvine, talks about the relationship between intelligence development and quality of life [21]. Urging to consider the possibilities of intelligence development through the prism of neurobiology, Dr. Richard J. Haier emphasizes that "lower reasoning ability is a profound limitation that most of us can scarcely imagine." The scientist also suggests a high probability of a relationship between a low IQ level and "underlying chronic underemployment, education achievement gaps and even poor health."

The human brain contains approximately 100 billion neurons. But this is not the main thing. The key is how these neurons are interconnected. Chaotic filling of the brain with any data will not form a developed structure of neural connections. Training by the type "click-click and done" or by the type "WOW! How interesting" will not make an educated person either. Watching experiments, pressing keys or buttons on the screen does not teach by itself. It can either supplement learning or add disparate data to an unstructured system. That is, if you focus only on video lessons, if you make students scanning how someone does something, you will get them only an idea of what you are looking at. But no one guarantees that they will be able to apply it into real life. It's like learning how to play soccer by watching TV matches. Scanning matches excites, gives adrenaline to run through the body, but nothing more. In the same way, you cannot learn any skill - hairdressing, airplane construction, architecture, ballet only through watching. If you are already a football player, ballerina, aircraft designer, architect, you can look at someone's game or process and find something new there. You can watch the video tutorial and get an understanding of how to make cake frosting. But you will never be able to do it immediately after watching. It takes practice and experimentation.

"A developed brain is not a brain that works more, but one that works less. This is called neuroefficiency. To be smart is to solve a problem with a minimum of effort. » [21].

Today's curriculum teaching in classrooms are, in fact, not much different from those taught 15 years ago. Yes, we use podcasts, computers and the Internet during the lessons. But are we teaching students or just spending time with them? Or are we entertaining?

In terms of neurophysiology, impressions in themselves involve short-term memory [6, 15]. This is important for short-term adaptation to sensory information. Constant unsystematic exploitation of children's attention (use of gadgets, bright images, etc.) especially at an early age, poses a danger to children's psyche. After all, at an early age, a child should gain experience for the future life. A child may lose the meaning of gaining life experience and replace it with the need for impressions. This is how any addiction is formed.
In contrast to short-term plasticity, "long-term synaptic plasticity is associated with gene expression and synthesis of new proteins, which is important in the development of new neuronal pathways."[16]. The elements of entertainment are also an important in educational programs, but not as the leading element of the educational process. In my lessons, for example, I use entertainment elements to consolidate the material that have learned, for relax, and for inspiration as well.

Forming professional knowledge system and practical skills takes many years of practice and learning to [15]. But who said we cannot start from the 1st grade of school? [13]. This is only a matter of methodology and content.

Recently, a lot of attention has been paid to the issues of effective teaching of sciences, in particular mathematics. Articles by scientists and key figures in education, teachers' opinions, numerous and diverse surveys of parents - everything that revolves around the issue of effective learning is focused on the development of a comprehensively developed personality. An individual who is able to surf information, quickly make the right decisions, a person who is well educated and able to apply his knowledge in professional activities, socialized and at the same time self confident; a person empathetic to humanity's humanitarian problems as well as to global environmental problems. But where to start this journey? Who has already proposed a solution to the problem of effective learning?

Having worked for a long time on the educational methods and program for teaching scients and humanitarian subjects the author proposed educational method of maths patterns to form integrated case studies.. This method based on the inextricable connection between memory and learning and allows to master academic knowledge at any age. By successfully combining theoretical knowledge with the practical application of science in the learning process, it engages both short-term and long-term memory. It suggested reproducing previously learned material according to certain patterns. The pattern method creates stable neural structures during the learning process. Each pattern acts as a magnet for the information of the next module, both subject (horizontal level) and evolutionary (vertical level). Author beleive that the same principle can be proposed for training AI's neural networks and will be happy to join such studies.

This approach meets modern requirements for education, which involves mastering various areas of knowledge, starting from an early age. It makes possible to use the student's cognitive potential as much as possible and direct it to the preservation and development of individual natural abilities.

Thus, we came to the next important issue of effective education - lesson's content structure formation, its fulfil and concentration.

The Internet data is a huge, not organized and dirty. And I'm not talking about the fact that ads of computer games with sexual or aggressive connotations constantly appears on reputable educational sites. I'm talking that users being offered a lot of interpretations and insinuations upon a search query of any serious topic.
You will be confused and led to many paths with many possible answers. - Maybe this is not too bad, - a concerned mom or dad will ask? Perhaps, just how can a child find his way in this information jungle? How not to go astray? We throw children into self-learning, like some other neural network algorithm, hoping that somehow it will learn something there.

No, the content needs to be organized for educational purposes. Carefully select, arrange, synchronize to serve for education’s users.

**Conclusion.**

For 20 years of research and practical work, I can state that the positive effect of education can be achieved through:

- a fundamentally new teaching methodology based on neuroscience data (not to be confused with neural network sciences for AI. The former can be successfully applied to the latter, but not vice versa).
- carefully selected educational programs content
- state investments in teachers.

Working for a long time on improving the teaching methods of sciences and humanitarian subjects, the author developed approach that allows students to learn not only school subjects from the first grades, but also to acquire academic knowledge[23].

Using the "pattern" method to form the integrated lessons - cases allows to involve both long-term and short-term memory into the learning process. Undoubtedly, a great role is given to the content of the lessons, which is thematically selected and synchronized with the school program. Education is focused on the practical skills development and applying of scientific laws to creativity and professional activity.

The educational method and program proposed by the author meets the modern requirements for education, which involves mastering various areas of knowledge, starting from an early age. This approach makes it possible to evolve the child's cognitive potential as much as possible and direct it to the preservation and development of individual talents.

**References:**


23. Video presentation of the education program "Mathematics for Creativity"