CURRENT RESEARCH JOURNAL OF PEDAGOGICS
(ISSN –2767-3278)
VOLUME 04 ISSUE 02 Pages: 01-06
SJIF IMPACT FACTOR (2021: 5. 714) (2022: 6. 013) (2023: 7. 266)
OCLC – 1242041055
Publisher: Master Journals

Journal Website: https://masterjournals.com/index.php/crjp

Research Article

METHODOLOGICAL PRINCIPLES OF DEVELOPMENT OF CALCULATION THINKING IN THE EDUCATIONAL PROCESS

Submission Date: February 04, 2023, **Accepted Date:** February 09, 2023,
Published Date: February 14, 2023
Crossref doi: https://doi.org/10.37547/pedagogics-crjp-04-02-01

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ABSTRACT

This article describes the emergence of the concepts of thinking, computational thinking, knowledge expression and uncovering hidden knowledge, its development prospects and features in science, in the educational process. Also, computational thinking as a bridge between science and technology, methods of thinking applicable to different disciplines are presented.

KEYWORDS

Calculation, thinking, reasoning, algorithmic thinking, compositional thinking, task bowl, procedural thinking, recursive thinking, automating intellectual processes.

INTRODUCTION

The emergence and development of computer technology gave a strong impetus to the use of computing technology in almost all scientific fields. In the modern world, it is practically standard practice to include the analysis of experimental data and the analysis of computational experiments along with theoretical research in scientific work. Entire scientific directions aimed at the professional use of computing techniques in scientific research have appeared: computational chemistry, computational physics, computational biology, neuroinformatics, bioinformatics, and others.

Computational thinking is the mental processes involved in formulating a problem and presenting solutions in a form that can be effectively implemented using information processing tools.

This is not to say that "Computational Skills" is an entirely new idea, but various aspects of the concept

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have been considered by scientists since the advent of computers. Like any kind of thinking, computational thinking is a cognitive activity of a person, the result of which is an idea (concept, meaning, idea), which in the process of human activity is the acquisition of thinking methods, transition to new situations, their formed through independent application and reflection.

Thinking is the highest level of human consciousness, which allows a person to act in the surrounding world, gain experience, and create an idea about objects and events. This is an internal system capable of modeling the laws of the surrounding human world, predicting the course of events, analyzing what is happening, and gathering unique truths.

Computational thinking is a problem-solving process that includes (but is not limited to):

- formulation of problems in a way that allows the use of computers and other tools;

- logical organization and analysis of information;

- representation of information through abstractions such as models and simulations;

- automation of the solution through algorithmic thinking (a series of orderly steps);

- identify, analyze and implement possible solutions to achieve the most effective and efficient combination of steps and resources;

- to generalize and transfer the process of solving this problem to the process of solving a wide range of problems;

There is no definition of what computational thinking is in the quote above. Later, Jeannette Wing formulated the following version of the definition: "Computational thinking is the thought processes involved in posing and solving problems so that the solutions are presented in a form that can be effectively implemented using information processing tools". [7].

A comprehensive academic discussion of the concept of "computational thinking" is given in the report of the Task Force on the Capabilities and Nature of Computer Thinking prepared by the USA National Academy of Sciences (a private non-governmental organization) [5]. The members of the working group made a number of conclusions about the nature of computer thinking. Below are abbreviated versions of some of these points.

Computational thinking is closely related to process thinking, whose definition was developed by Seymour Papert in 1981. Process thinking involves designing, presenting, testing, and correcting processes that are step-by-step sets of instructions, each of which can be formally interpreted and executed by a specific agent, such as a computer or automatic equipment. can be performed [6, 4].

Computational thinking is concerned with the study of the mechanisms of intelligence and is expressed in the enhancement of human intelligence with the help of tools that help to automate the solving of complex problems along with practical applications.

Computational thinking must connect thought processes with technological support.

Computational thinking is the bridge between science and engineering, a metaphor for the study of thinking techniques or methods applicable to different disciplines. Computational thinking is an open and growing list of concepts that reflect the dynamic nature of technology and human learning, incorporating the elements described above, as well as "intellectual process automation" and "information process learning".

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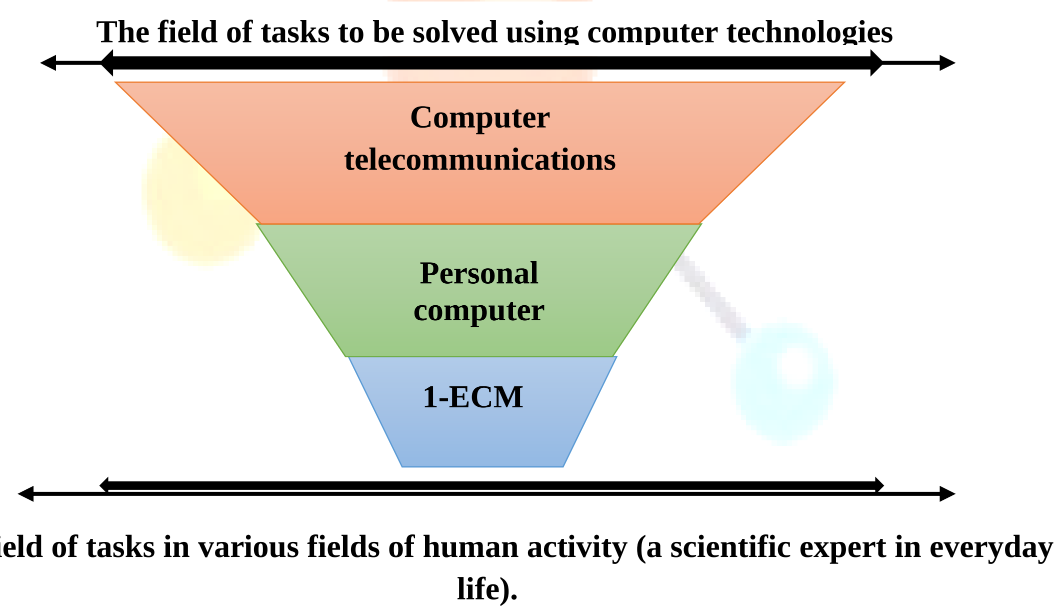
What makes computational thinking particularly relevant is that computers can implement our "computational thinking" and that computers have become "partners and collaborators" in research.

From the above judgments, it becomes clear how wide the range of ideas about computational thinking is.

A computationally intelligent person understands that solutions to complex problems can be found through algorithms and automation. A "computational" thinker understands that numerical simulations can help solve complex problems in fields as diverse as climate change, economic policy, education decision-making — these and other examples were cited by panelists.

There are several references to computational thinking in Russian scientific literature. A very clear idea about this was formed by V. E. Wolfenhagen: Computational thinking plays the role of a tool that allows the analysis of ongoing information processes, whether these processes have occurred or not, whether they are in the development stage or not. or only assumed to be still possible. Computational laws are defined and understood as a short and economical way of expressing what is common in various properties for concrete information processes [2].

Picture 1 shows a "bowl of tasks" solved with the help of computer information technologies. The conventional timeline shows three bifurcation points: the creation of the first computers, personal computers, and modern computer networks and telecommunications. Each of them was characterized by a sharp increase in the number of tasks that can be solved with the help of computers.



Picture 1. The "bowl of tasks" solved using information and computer technologies

Both problem areas are symbolically depicted in Fig. New tasks arising from human activity are constantly emerging, and computer technologies are invented (or recreated) to solve some of them.

At the computer software development level, this evolution is reflected in a shift in programming paradigms and a shift to the now dominant object paradigm, which includes object-oriented analysis and design phases. "Object-oriented technology is based on what is called an object model. Its main principles are: abstraction, encapsulation, modularity, hierarchy, typing, parallelism and persistence. Object-oriented design methods are designed to help developers use the powerful expressive tools of object-oriented and object-oriented programming using classes and objects as building blocks" [1].

It should be noted that along with the improvement of technical tools and programming methods, the number of tasks solved using information and communication technologies, the development of software systems for solving problems, play a large role in the rapid growth.

many areas of professional activity; these systems, direct access to open information technologies do not require users to have programming skills in its classical sense. A.P. Ershov's wonderful metaphor "programming - second literacy" (the metaphor of this phrase was named by academician Ershov himself), which played an important role in the initial stage of school informatics, turned out to be a metaphor "Programming - second literacy". More than expected 30 years ago [3]. The collapse of the programming barrier has enabled millions of professionals in not only the natural sciences and engineering, but also the humanities and social sciences to use computers in their daily work, and hundreds of millions in their daily lives.

We would like to emphasize that there is another thing that is called "second literacy" today: the ability to use modern information and communication technologies to solve problems that arise before a person. Formation of skills such as components of information and communication competence is an important task of education starting from the school course; these skills are also an important part of professional training.

The remarkable success of computer technology shows that compensators, conceptual tools developed by computer scientists, are widely used beyond simple computation. In fact, ongoing general informatization promotes a new indicator of professional competence. This indicator can be formulated as the ability to understand and apply fundamental computing principles to a wide range of human activities [2].

However, experience shows that such skills are not enough - they only need to add some quality that may seem temporary at first glance - focus on the above program, a certain way of thinking. Such a quality is calculating thinking. Just because this concept was formalized only 10 years ago doesn't mean that matching quality isn't important - this way of thinking, which has been lurking for a very long time, was implemented when the first computers were created. means to implement it; At the same time, the appearance of computer thinking has changed in parallel with the evolution of hardware and software and the rapid expansion of the field of tasks to be solved.

Computational thinking is a problem-solving process that includes (but is not limited to):

- formulation of problems in a way that allows the use of computers and other tools;
- logical organization and analysis of data;
- presenting information through abstractions such as models and simulations;
- automation of the solution through algorithmic thinking (series of orderly steps);

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- identify, analyze and implement possible solutions to achieve the most effective combination of steps and resources;
- generalize and transfer this problem-solving process to a broader problem-solving process.
- Computational thinking is related to a number of personal qualities of students: The above-mentioned skills should be supported and strengthened by a number of qualities that are necessary characteristics of computational thinking. These qualities include:
- confidence in the existence of difficulties;
- perseverance in solving difficult problems;
- tolerance in conditions of uncertainty;
- ability to solve unfinished problems;
- ability to communicate and work with others to achieve

a common goal or decision.

To conclude from the above, computational thinking is a non-scientific concept, and if we talk about education, it is formed in the process of studying various subjects - mathematics, natural sciences, technology, etc. Using modern terminology, computational thinking is essential.

Everyone encounters feeling thinking throughout their lives. Most of the time, the necessary answers in the processes of tarakkur are found by discussing and thinking, hypothesizing, using logical methods of thinking. For example, math problems are solved in this way. In the process of solving problems and tasks, in the process of searching for an answer to a given question, we sometimes make mistakes, get lost from the right path leading to the solution of this problem. Such cases come at another time in the process of thinking - to critically check the result of this process. Sometimes this critical check happens at the same time as the process of solving the problem, the task. This is the process of thinking. During the controller, logical processes, the processes of conclusion, proof, refutation, take an especially large place.The last and main criterion of action is human life experience.

REFERENCES

1. Butch G., Maksimchuk R. A. et al. Object-oriented analysis and design with application examples: translation from English. Moscow: Williams, 2010. 720 p.;
2. Wolfenhagen V. E. The area between practical skills and fundamental principles of computing [Electron. resource] // Applicative Computing Systems: Proceedings of the III International Conference ABC 2012. Moscow, November 26–28, 2012, pp. 1–7. Access mode: http:// jurinfor. exponenta.ru/ACS2012/ACS-12_Proceedings-All.pdf (Accessed February 10, 2016)
3. Ershov A. P. Programming - the second literacy [Electron. resource] // Electronic archive of Academician A.P. Ershov. Institute of Informatics Systems, Siberian Branch of the Russian Academy of Sciences. Access mode: http://ershov.iis.nsk.su/russian/second_literacy/pred (Accessed February 10, 2016)
4. Papert S. Revolution in consciousness: children, computers and fruitful ideas: translated from English. Moscow: Pedagogy, 1989. 220 p.
5. Papert S. An Exploration in the Space of Mathematics Educations // International Journal of Computers for Mathematical Learning. Vol. 1. No. 1. R. 95–123. 1996.
6. Papert S. Mindstorms: Children, Computers, and Powerful Ideas. New York: Basic Books, 1981. $242 14. Report of a Workshop on The Scope and Nature of Computational Thinking. Committee for the Workshops on Computational Thinking; National Research Council. 2010. The National Academic Press. 2010. 115 rubles. [Electron. resource]. Access

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mode: http://nap.edu/12840 (Accessed February 10, 2016).

7. Wing J. Computational Thinking [Electron. resource] // Communications of the ACM. March 2006 Vol. 49. No. 3. R. 33–35. Access mode: https://www.cs.cmu.edu/~15110-s13/Wing06-ct.pdf (Accessed February 10, 2016).