

Development of algorithmic thinking through mathematical tasks

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Abstract

Changes are being implemented in connection with revising curriculum documents (Revize RVP gymnázií v digitální oblasti, 2023) in the Czech Republic, which currently concern mainly Computer science education. The revised documents shift the attention from computer literacy to the development of computational thinking (Wing, 2006), of which the essential component is algorithmic thinking.

This paper aims to show how the development of algorithmic thinking can be supported through mathematical tasks. How they can be utilized is illustrated through selected examples. The solution of the tasks is always discussed from a mathematical point of view, and then the solution procedure is illustrated using a flow chart. The tasks are designed to be understandable for both mathematics and computer science teachers. The tasks can be applied to the teaching of both subjects without the teacher necessarily having a mathematics and computer science qualification at the same time.

The application of this type of tasks in teaching was pilot tested in two groups of high school students. Two tasks were selected, one easier and one more complex. Then the results of the students' solutions were analysed in terms of the correctness of the solutions, the analysis of the way of solving, the mistakes they made, and unusual and interesting ways of solving.

In the future, we would like to incorporate this type of tasks into teaching mathematics or computer science subjects in a broader range of schools through secondary and even primary school teachers and investigate the impact on learning outcomes. We believe that tasks where the solution includes a flow chart showing the progression of the solution not only promote the development of algorithmic thinking but also aid understanding of the problem and its solution and is a means of countering formalistic learning. This can then have a positive impact not only on their performance in computer science or mathematics but also in other subjects.

References

- Wing, J. (2006). Computational thinking. *Communications of the ACM*, 49(3), 33-35; Revize RVP gymnázií v digitální oblasti. (2023). Retrieved May 30, 2023, from <https://revize-ict-g.rvp.cz/>

Keywords

Computational thinking, algorithmic thinking, algorithm, flow chart