

**The 19th International Conference on
“Technical and Physical Problems of Engineering”
ICTPE-2023
31 October 2023
*International Organization of IOTPE***



COMPUTATIONAL THINKING AS A NEW COMPETENCE IN EDUCATION

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Introduction

Mathematics, as all its related subjects, is a fundamental grounding element of engineering education and proficiency in the area is expected.

At the same time, the contemporary skillset of undergraduates includes a degree of sophistication in the application of Information and Communication Technology (ICT) within their daily lives.

The assessment of mathematic skills and competences (as well as in many other subjects) using ICT is increasingly appearing in many programs, but...

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Introduction

An impressive problem in Math Curriculums in HE, is the substantial differences in Math background of the students.

An open education program, sharing innovative practices, to address skill needs and improved competencies within the domain of engineering mathematics may also be translational to other educational contexts through enhanced digital competencies.

Related to the digital change, the concept of **Computational Thinking** emerged at the beginning of the 21st century, which has been taking root in the most pioneering schools and is already part of the PISA (Program for International Student Assessment) education tests.

Computational Thinking

Wing initially linked Computational Thinking (CT) directly to Computer Science, however, later made attempts to link it to any area of knowledge. She described CT as “solving problems, designing systems and understanding human behaviour by drawing on the concepts fundamental to computer science”.

CT is a type of analytical thinking that employs mathematical and engineering thinking to understand and solve complex problems within the constraints of the real world.

Computational Thinking

Computational Thinking definitions can be classified into two main categories: first, generic definitions that focus on Computational Thinking as a thought process; and second, operational or model definition that describe what Computational Thinking entails.

We have chosen to define Computational Thinking as a type of analytical thinking that employs mathematical and engineering thinking to understand and solve complex problems within the constraints of the real world.

Computational Thinking

The main skills of Computational Thinking are now broadly considered to include:

- abstraction,
- decomposition,
- algorithmic thinking,
- analysis and representation of data,
- generalization,
- evaluation and adjustment.

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Classroom experience

We have conducted several tests in class with engineering students, using problems, tests, and also measuring the capacity of computational thinking from exercises of engineering subjects, such as Calculus.

The objective is to improve the teaching and learning processes of the competencies involved in Computational Thinking, so that future engineers are better prepared to take on the challenges demanded by contemporary society.

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Classroom experience

Material was developed for these subjects focused on the main knowledge of Computational Thinking, such as abstraction, decomposition, algorithmic thinking, etc.

In the practices, sometimes the strategy of learning based on problems is used, as part of the improvement with active methodologies.

The aim is to motivate students in different careers by developing problems that are useful to them in their profession.

Classroom experience

Computational thinking is not programming, or even thinking like a computer does; it is a way of solving problems.

Our effort is focused on the introduction of computational thinking in formal education not being limited to computer science and the more technical areas, but being a transversal education, applicable to different fields of knowledge.

Conclusions

The decision to include Computational Thinking in a country's curriculum is becoming a matter of necessity.

Computational Thinking is still making its way, being included in some countries within the subject of Computer Science, in others within mathematics, and in others within ICT.

Thus, the introduction of Computational Thinking in educational systems, from the early years to the university stage, can improve students' preparation, not only in some subjects, but also in their preparation for professional life in any area of knowledge.