# Enhancing Teacher Education Through STEAM Integration in Informatics*

Anita Juškevičienė[0000−0003−1772−5537]

Vilnius University, Akademijos str. 4, Vilnius 08412, Lithuania
anita.juskeviciene@mif.vu.lt

**Abstract.** In the realm of modern education, the fusion of Science, Technology, Engineering, Arts, and Mathematics (STEAM) principles with informatics has emerged as a transformative approach to teacher education. This poster presentation delves into the innovative intersection of STEAM education and informatics, elucidating its profound impact on the professional development of educators.
As the educational landscape evolves in response to technological advancements, this poster encourages institutions and educators to embrace the synergy of STEAM education and informatics, fostering a cadre of proficient, innovative, and adaptable teachers prepared to lead their students into an era of boundless possibilities.

**Keywords:** Informatics · STEAM education · 3C4Life · teacher education.

## 1 Introduction

### 1.1 Motivation

Teacher shortages have become a pressing issue in Europe, prompting the initiation of an EU-funded endeavor with the primary objective of enhancing the appeal of the teaching profession. collaborative initiative, known as 3C4life [1] underscores the necessity for educators to modernize their pedagogical abilities, competencies, embrace digital methodologies, and exhibit self-sufficiency. 3C4life consortium takes on a critical challenge that hinders optimal conditions for STEM education throughout the continent: the insufficiency of STEM education systems in adequately supporting teachers to thrive in their roles.

The culmination of 3C4Life project's efforts has resulted in the creation of an online platform, "teach4life," tailored to cater to aspiring STEM student teachers, emerging teaching professionals, and seasoned in-service STEM educators. The platform serves as a means to bolster the appeal of the STEM teaching profession and enable comprehensive growth.

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In order to enhance the allure of the teaching profession, several imperative prerequisites have been identified:

- The cultivation of a positive perception of the teaching vocation is imperative, both among educators themselves and within the broader society.
- Embracing the teaching profession as an ongoing journey of development, characterized by the integration of innovative teaching methodologies, is crucial.
- Encouraging and establishing collaborative practices and communities for professional learning is a pivotal step.
- Teachers must be provided with consistent support from the outset of their careers and throughout their professional trajectories, facilitating continuous professional advancement.

Project's measure represents a cutting-edge digital platform for STEM teachers, marked by its inventive approach to professional progression. The initiative is structured around three key viewpoints:

- Career: It encompasses both vertical and horizontal trajectories, offering comprehensive career guidance.
- Cooperation: Fosters collaborative practices among pertinent stakeholders within the national educational sphere. This primarily involves pre- and in-service STEM educators, higher education institutions engaged in training and research, providers of professional development, policymakers in education, and practitioners in schools.
- Competence: Focuses on the continual development of contemporary teaching and leadership competencies, ensuring educators remain updated and equipped with relevant skills.

The competence area provides activity ideas for implementing STEM activities in the classroom using innovative pedagogy:

- The use of inquiry-based learning allows learners to pose research questions, formulate hypotheses and test them through research.
- The principle of authentic context allows for the inclusion of research topics that are relevant to learners' interests in STEM learning activities.
- The social aspects of science encourage learners to engage in dialogue, discussion and debate. Their nature is often controversial. Learners have to form opinions and make decisions involving scientific, moral, ethical or social issues.

This study explores the dynamic integration of STEAM elements within teacher education, specifically focusing on the realm of informatics. By infusing pedagogical practices with creative and interdisciplinary thinking, teachers are equipped with a diverse toolkit to engage and inspire the next generation of informatics enthusiasts.

Poster highlights the positive influence of STEAM-infused informatics education on teachers' confidence, competency, and enthusiasm for teaching complex

technological concepts. By fostering an environment of innovation, adaptability, and cross-disciplinary collaboration, this approach paves the way for educators to nurture the analytical, computational, and creative thinking abilities of their students.

The poster also underscores the role of ongoing professional development and mentorship in sustaining the momentum of STEAM-integrated informatics education. It explores the transformative power of continuous learning, networking, and collaborative platforms, which further enrich the teaching and learning experience. Through captivating visuals and informative content, this poster not only underscores the significance of STEAM education in teacher training for informatics but also advocates for a paradigm shift in educational approaches to nurture a new generation of teachers equipped to navigate the ever-evolving digital landscape.

### 1.2 What to be presented at ISSEP 2023

The poster showcases diverse approaches to incorporating STEAM concepts into teacher training, i.e., project-based learning and collaborative problem-solving, designed to empower educators with the skills needed to foster a holistic understanding of informatics. In the teach4life platform competence area (see Fig. 1) you can find a large collection of tasks for the classroom that follow innovative pedagogical concepts, sorted by subject and methodology. For example, in an


**Fig. 1.** Teach4life platform competence area.

engineering subject Authentic Context is presented the lesson "How to build a (pneumatic) pontoon bridge to evacuate civilians?" Engineering Design Process is an analytic and creative problem-solving process that engages a person in opportunities to make something physical and/or digital that matters. Project based learning can be implemented by using design thinking approach that also integrates computational thinking practices [2]. Design thinking serves as an educational framework due to its inherent attributes that foster the cultivation of specific skills essential for a productive learning approach. These skills lay the foundation for an enriching learning experience, encompassing factors such as

the drive for exploration, receptiveness to novel concepts, imaginative thinking, and various metacognitive proficiencies [3]. Design thinking has the potential to expand the scope of STEAM instruction. Moreover, it offers educators a structured avenue to foster enhanced creativity and interdisciplinary engagement, not only as a foundational element in their own pedagogical approach but also as an integral facet of students' immersive STEAM encounters [4]. The first activity was implemented based on this topic, however we decided to develop smart car security system by using Arduino controller kits (see Fig. 2, left).

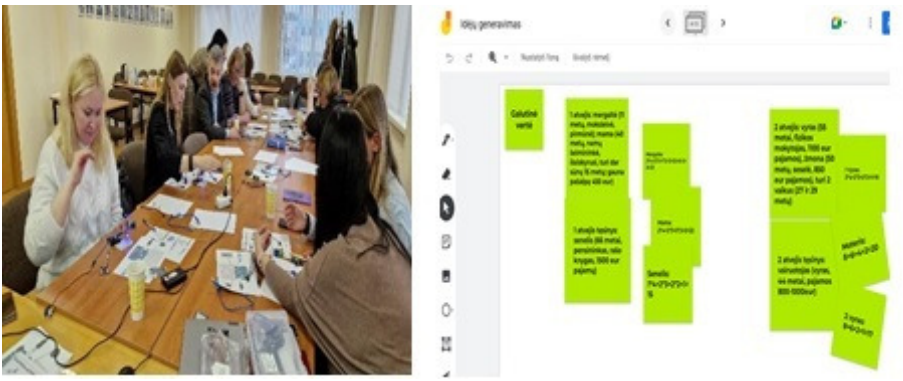

**Fig. 2.** Design thinking implementation activity (left); Jamboard environment (right).

Collaborative problem solving - idea generation is one of the stages of design thinking. There are various methods and tools for collaboration. To stimulate teachers' creativity and digital literacy, we have chosen a very timely topic - the morality of autonomous machines - and an easily accessible and usable online tool - Jamboard. The second activity was implemented based on Engineering area Socio-Scientific Issues in STEM Education topic "Should self-driving cars have a moral conscience?". Using Jamboard, we asked teachers to identify the factors that they think might influence the life-saving decisions of autonomous machines. We then asked them to rank them in order of importance and give numerical values. In the final stage, we presented several possible scenarios and mathematically calculated whose life should be saved first (see Fig. 2, right).

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