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DEVELOPING PEDAGOGICAL SKILLS THROUGH INOVATIVE STEAM EDUCATION METHODS FOR FIRST YEAR PRIMARY AND PRESCHOOL EDUCATION STUDENTS

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Abstract: *In the context of contemporary education, integrating the STEAM (Science, Technology, Engineering, Art, and Mathematics) approach into the initial training of future teachers becomes essential for developing pedagogical skills adapted to current demands. This work explores the impact of innovative STEAM-based activities on first-year students. By integrating STEAM activities into the training of future teachers, we will significantly contribute to the development of skills necessary for a modern and efficient educational act.*

Key words: *STEAM education; initial training; students; pedagogical skills; teaching practice; innovation in education.*

Introduction

Postmodern education adapts to the needs of the society we live in. To keep up with and respond to new changes, we must adapt and use what we have learned, thus combining traditional and modern approaches. "In order to carry out the teaching mentoring activity in a coherent and systematic process, it is necessary to design the mentoring activity out to create a kit, which includes the basic tools, starting from a comprehensive analysis of development needs, to activity observation sheets, observation sheets focused on various areas of teaching activity, to professional dialogue sheets, progress evaluation sheets, final evaluation sheets of the mentoring activity" (Chișiu C.M., 2023, p. 84–101).

The potential benefits of STEAM education are multiple. It can help young people develop critical thinking, problem-solving skills and creativity, which are essential for success in the 21st century (Kewalramani, 2021; Lin, 2021). In a postmodern digital society, promoting STEAM learning experiences is essential to achieve innovation for the future. STEAM education, on the other hand, includes the arts as an integral part, aiming to promote creativity, innovation, and

problem-solving skills among students. (Hunter-Doniger, 2021; Land, 2013; Magnuson & Bachman, 2023). (Adapted from Weyseng Yang, Sarika Kewalramani, and Jyoti Senthil, 2023, p.29)

Theoretical Foundations of STEAM Education

STEAM education (Science, Technology, Engineering, Arts, Mathematics) is an interdisciplinary approach that integrates five essential domains for the development of skills needed in the 21st century skills. "Teachers should know how to capitalize on the various learning experiences of students from non-formal or informal education and find ways, ways to capitalize on their own learning experiences outside of formal learning, to energize and streamline teaching processes which they build. Teachers should share their own learning experiences, resulting in a certain attitude towards knowledge and an intellectual work style, to create a stimulating climate for students, the satisfaction of using their full cognitive and metacognitive potential in the teaching process." (Egerău A.M, Coşarbă E.M, Torkos H., 2022, p. 34–52)

Initially, STEM education was promoted in the United States to improve young people's preparation in technical and scientific fields. Later, Georgette Yakman introduced the STEAM concept, adding the arts, arguing that they are essential for creativity and innovation. According to Yakman (2008), STEAM represents a transdisciplinary method where science and technology are understood through engineering and arts, all supported by mathematics.

The needs of future occupations are rapidly changing, and the knowledge and skills acquired today are insufficient to prepare young people for tomorrow's life. Researchers estimate that 65% of people will be employed in new fields of work not yet known today. These occupations emphasize the need for 21st-century skills: digital competencies, critical thinking, teamwork, innovative and adaptive thinking.

STEAM education helps students develop competencies that emphasize logical, mathematical, experimental, and scientific thinking by applying what they have learned to real-life situations.

Developing Pedagogical Skills Through Innovative STEAM Education

Modern education emphasizes the development of transversal skills necessary for preparing future teachers. In this context, the STEAM approach offers an innovative method that supports students' didactic training through practical, interdisciplinary, and creative experiences. This method stimulates critical thinking, problem-solving, and collaboration, essential competencies for future educators.

"The main directions for modernizing the Romanian curriculum are

based on an analysis of the current curriculum and the education system, as well as several European guidelines, such as the qualifications framework and key competences. The OECD promotes curriculum flexibility through personalized education and a focus on the student. These directions require a deep understanding of each student's developmental needs, which serves as the foundation for educational approaches." (Torkos H., Coșarbă E., 2023, p. 307–323)

STEAM education integrates science, technology, engineering, arts, and mathematics in a holistic manner, offering students active learning opportunities. According to Yakman (2008), STEAM not only imparts knowledge but also develops pedagogical skills, such as:

- the ability to design interactive lessons based on exploration and creativity
- enhancing communication and collaboration skills in interdisciplinary teams
- applying methods based on investigation and experimentation

Although interest in the innovative STEAM method has grown in recent years, researchers have stated the following: "Cook and collaborators (2020) investigated how primary education teachers develop a STEAM curriculum. Using the STEAM teaching model developed by Quigley and collaborators (2017), they analyzed plans created by 25 teachers. Their results showed that the model developed by Quigley and colleagues is useful in developing teachers' STEAM competencies." (Lavinia-Denisa Șuteu, 2024, p.32)

Within universities, pedagogical practice represents an essential moment in the training of future teachers, offering them the opportunity to develop didactic and pedagogical skills through authentic classroom experiences. Motivation is the key for the efficiency of learning. In this case: "it is important for students to receive information that is as useful and applicable as possible to their daily lives, as well as to grow for their future careers; they are responsible for the activities they perform on their own and not only when it comes to learning new things, but also when allocating time for study. It is important to overcome certain obstacles that may occur when encountering learning difficulties." (Felea M.I., Roman A. F., 2022, p. 10–20). In this context, the integration of innovative STEAM activities contributes significantly to the development of critical thinking, creativity and practical skills of first-year students.

Through the activities of pedagogical practice "the student can genuinely and directly demonstrate the professional and transversal competencies acquired through foundational, domain-specific, specialized, and complementary subjects in an experiential but advised (mentored) form. We are convinced that the variety of educational situations encountered during the pedagogical practice period will

challenge each student to arguments and decisions, some in time intervals, which will have their origin in their scientific and humanistic training, in their cultural heritage, and, not least, in their learning experience" (D. Herlo, A. Egerău, Ev. Balaș, T. Dughi, C. Bran, A. Roman, 2020).

We exemplify through an activity during the workshop that took place at Aurel Vlaicu University of Arad during the EFASTUD student conference, in November 2024, where first-year PIP students participated:

Center I – SCIENCE
Activity Topic: "Autumn Experiments"
Means of Implementation: Experiment
Activity Objectives:

- active participation in autumn experiments
- developing understanding of the phenomena demonstrated during experiments

Methods and Procedures: Experimentation, demonstration, conversation, observation, explanation, practice
Teaching Materials: Containers, plastic cups, autumn leaves, apples, vinegar, baking soda, lemon, Coca-Cola, milk
Center II – TECHNOLOGY
Activity Topic: "Autumn Globe"
Means of Implementation: Construction and assembly
Activity Objectives:

- building an autumn tree using natural and synthetic materials
- properly assembling autumn elements to create the "Autumn Globe"

Methods and Procedures: Conversation, explanation, demonstration, observation, practice
Teaching Materials: Glass jars, autumn decorations, glitter, autumn leaves, twigs
Center III – ENGINEERING
Activity Topic: "The Playful Hedgehog"
Means of Implementation: construction and assembly
Activity Objectives:

- designing a 3D image of an autumn hedgehog using natural and synthetic materials
- creation of the playful hedgehog by correct assembling of the component elements

Teaching Materials: Potatoes, toothpicks, matchsticks
Center IV – ART
Activity Topic: "Autumn Painting"
Means of Implementation: Gluing, decorating, assembly (collage

technique)

Activity Objectives:

- creating an autumn-themed painting using natural and synthetic materials
- cultivating artistic and aesthetic sense through assembling the elements that compose the autumn painting

Methods and Procedures: conversation, explanation, demonstration, observation, practice

Teaching Materials: natural and synthetic autumn materials, autumn decorations

Center V – MATHEMATICS

Activity Topic: "In the Fairy's Autumn Garden"

Means of Implementation: Problem-solving and exercises

Activity Objectives:

- solving mathematical exercises on the worksheet to develop mathematical skills
- discovering the fairy's autumn fruits and vegetables by solving exercises correctly

Methods and Procedures: Explanation, practice, demonstration, conversation, problem-solving

Teaching Materials: Worksheets, fruits, and vegetables

Conclusions

The implementation of innovative STEAM activities in the initial training of first-year students represents an effective strategy for developing essential pedagogical skills for modern education: By using interactive methods based on experimentation, future teachers improve their practical abilities, capacity to design innovative activities, critical thinking, creativity, and application of learned concepts in real life.

According to research of Popa and Ciascai (2017), students' positive attitudes towards STEM education demonstrate its potential to develop critical thinking and creativity. Zsoldos-Marchis and Ciascai (2019) highlighted that students specialized in pedagogy for primary and preschool education perceive STEAM education as an integrative approach that allows them to connect pedagogical theories with innovative practices.

On the other hand, studies accomplished by Bărnuțiu-Sârca and Ciascai (2021), reveal that primary and preschool teachers acknowledge the value of STEM-based approaches for developing interdisciplinary teaching skill development. Berisha and Vula (2024) demonstrated that involving students in collaborative action research enhances their understanding and application of integrated STEM education.

Redeș and colleagues (2023) emphasize the impact of a positive organizational climate on intentional integrative-quality behavior in

preschool education, underscoring the relevance of STEAM for systematic approaches. Also, the contributions of Purcar and colleagues (2024) highlight the role of visual reasoning in solving mathematical problems, a central component of STEAM education.

At the same time, Souca, Pop-Ignat, and Bocoș (2020) emphasize on the objectives of early education in Romania, arguing that an effective STEAM integration contributes to the formation of multidimensional competencies. Câmpean and colleagues (2024) indicate that positive feedback is crucial for building students' confidence in their abilities, encouraging participation in STEAM activities. Parallelly, Bocoș and colleagues (2023) emphasize the importance of mentoring and metacognition in teacher training, essential components for successfully implementing STEAM. Rad and Bocoș (2024) explored advancements in learning organizations, highlighting STEAM's role in creating adaptive and innovative educational environments. Last but not least, Țifrea and collaborators (2024) demonstrated that extracurricular activities based on STEAM could develop specific behaviors even among kindergarten children, showcasing the potential of this approach across all educational levels.

The integration of these perspectives validates the importance of STEAM activities for students' initial training, promoting the development of essential transversal skills in modern education.

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