FORMATION OF CREATIVE COMPETENCE OF STUDENTS BASED ON STEAM EDUCATION

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Abstract
This article discusses ideas and reflections on the formation of students' creative competence based on STEAM education. In today's rapidly evolving world, creative competence has become an essential skill for students. Not only does it enhance their ability to think innovatively, but it also prepares them for a workforce that increasingly values problem-solving, adaptability, and interdisciplinary thinking. One effective approach to nurturing creative competence is through STEAM education, which integrates Science, Technology, Engineering, Arts, and Mathematics into a cohesive learning framework.

Keywords: STEAM education, interdisciplinary learning, problem-solving skills, hands-on learning, project-based learning, exploration and curiosity, innovation in education, collaboration in learning, digital literacy.

Introduction

Creative competence involves the ability to generate new ideas, think critically, and approach problems from multiple perspectives. For students, this skill goes beyond simply learning to create art or complete hands-on projects; it empowers them to envision innovative solutions, collaborate effectively, and navigate complexity in various domains of life. In a world increasingly shaped by technological advancements and unpredictable changes, these abilities are crucial. They provide the foundation not only for personal and professional success but also for societal progress, as students become equipped to address challenges in unique and transformative ways.

Traditionally, STEM education has focused on science, technology, engineering, and mathematics. While these fields are critical, there has been a growing recognition of the need to integrate the arts to foster creativity and holistic problem-solving. This addition of "A" in STEAM introduces creative arts, emphasizing the value of aesthetics, design, and innovative thinking alongside scientific and technical skills. By merging the arts with STEM, STEAM education encourages students to think beyond the constraints of traditional disciplines, blending analytical skills with creativity to produce well-rounded, adaptable learners.

The arts contribute significantly to cognitive development by enhancing spatial reasoning, emotional intelligence, and visual perception. Integrating these with STEM subjects encourages students to explore solutions creatively while grounding their ideas in scientific and mathematical principles. This interdisciplinary approach opens new possibilities and perspectives, helping students become more versatile thinkers and enabling them to tackle problems in innovative ways.

STEAM education promotes a culture of exploration, where students are encouraged to experiment, make mistakes, and learn from them. This is central to building creative competence, as students gain the confidence to pursue novel ideas without fearing failure. By engaging in open-ended projects and inquiry-based learning, students learn to ask questions, seek answers, and develop a deeper understanding of the subjects they explore. STEAM education places significant emphasis on experiential, hands-on learning, where students actively engage with materials, tools, and processes. This tactile approach helps students make real-world connections, enabling them to see how abstract concepts are applied in practice. Through projects that require design and construction, like creating simple machines or designing art-infused mathematical models, students learn to apply theoretical knowledge creatively.

PBL is a core component of STEAM, where students tackle real-world challenges that do not have straightforward solutions. For example, they might be tasked with designing sustainable housing solutions, building robots for environmental monitoring, or creating art installations that raise awareness about climate change. Through PBL, students learn to approach problems holistically, combining creative and analytical thinking to devise solutions.

Collaboration and Interdisciplinary Learning: Creativity flourishes in collaborative environments, and STEAM projects often involve teamwork and interdisciplinary learning. Students work together, combining their unique skills and perspectives to solve complex problems. This collaboration helps students appreciate the value of diverse ideas and learn how different disciplines interact, reinforcing the importance of creativity in group dynamics.

Integration of Technology and Art: The fusion of technology and art is another unique aspect of STEAM education. In projects like digital storytelling, animation, and coding art-based apps, students learn to leverage technology creatively. They acquire digital literacy skills while engaging in artistic expression, thereby learning how technology can be a tool for creativity rather than just a technical skill. Creative competence requires resilience— the ability to keep trying despite setbacks. STEAM projects often involve trial and error, where students must adjust their strategies or rethink their designs. By navigating these challenges, students learn resilience and adaptability, which are crucial components of creativity.

Schools can incorporate a project-based STEAM curriculum that includes tasks like building eco-friendly models, designing app-based games, or creating art installations influenced by scientific concepts. Projects should be designed to encourage risk-taking,

innovation, and iterative thinking, allowing students to test and refine their ideas. Maker spaces are becoming increasingly popular in schools as they offer a dedicated environment for hands-on learning. Equipped with tools such as 3D printers, robotics kits, and art supplies, these spaces allow students to experiment with different mediums and technologies. Here, they can collaborate on projects, build prototypes, and explore the intersections of art and technology, further enhancing their creative skills.

Regular workshops and labs focused on STEAM-related projects can help reinforce classroom learning and provide a platform for students to explore their interests. Schools can invite industry professionals, like engineers, artists, or scientists, to lead workshops, offering students a glimpse into how STEAM skills are applied in real-world careers. These labs and workshops can help students develop a passion for lifelong learning and creative exploration.

To deepen the learning experience, students should be encouraged to reflect on their STEAM projects. Reflective practices, such as journaling or presenting their work to peers, help students analyze their creative process, learn from mistakes, and think critically about how they could improve. This reflection fosters a mindset of continuous improvement, which is essential for developing creative competence. Projects that involve digital art, coding, and multimedia creation can help students see the potential of technology as a creative tool. For instance, students could create interactive art using programming languages like Scratch, produce digital animations, or develop virtual reality models. Such projects not only enhance technical skills but also inspire innovative thinking by showcasing how art and technology intersect.

Recognizing and celebrating students' creative achievements can motivate them to continue exploring their potential. Schools can organize STEAM fairs, exhibitions, and competitions, where students present their work to the community. This validation of their creative efforts builds confidence and inspires them to continue honing their skills.

Dynamically developing technologies are being introduced in all areas of human activity. Future professionals will need comprehensive education and knowledge from different areas of Technology, Science and engineering. STEAM brings to our children - the future generation of inventors, explorers, research as scientists, technology formation, design as engineers, creator as an artist, analytical thinking as a mathematician-through the game. Today, STEAM education is developing as one of the main trends in the world, and practice is based on the integration of five areas into a single training scheme when applying the approach. The conditions of such an education are its continuity and the development of children's ability to interact in groups, in which they accumulate thoughts and exchange thoughts. Therefore, the main educational program includes modules for the development of logical thinking, such as Lego-technologies, children's research. This approach will help solve life problems in children in the future.

STEAM is one of the innovative techniques that is currently the most fundamental tradition of the world education system. In one view, STEAM abbreviations seem very complex, but if we see it separately, we can suggest that it is simple and clear, namely: S-science, T -

technology, E - engineering, a - art, M - mathematics, or natural sciences, technology, engineering arts, creativity, mathematics. In simple words, they are the most demanded disciplines in the modern world. It is no secret that in order to achieve great success in many branches of Science, the integration of knowledge in various fields of study is required. It is STEAM technology that helps in solving such problems.

This methodology makes it possible to conduct education in a mixed type and to form the skills of being able to apply the acquired theoretical knowledge in everyday life. STEAM is an innovative technology that allows you to carry out project and research activities both at school and outside of school. With this method, subjects are taught in integrated rather than separate networks, showing a common correlation. In addition to showing subjects related to everyday life, technology can also show students ' creativity. This approach presents a number of tasks to students ' activities, learning to show their creativity as the student solves them. With the help of such tasks, the reader not only comes up with ideas, but also learns to implement them in his daily life.

Conclusion

STEAM education holds transformative potential for fostering creative competence in students. By blending science, technology, engineering, arts, and mathematics, STEAM encourages students to think beyond the conventional boundaries of each discipline, approach problems from multiple angles, and embrace a mindset of innovation. The hands-on, exploratory nature of STEAM education allows students to develop resilience, adaptability, and a lifelong passion for learning. For educators, the challenge lies in creating an environment that celebrates creativity and nurtures each student's unique potential. With thoughtful implementation, STEAM education can equip students with the creative competence they need to succeed in the 21st century. By prioritizing creative development alongside technical skills, we are not only preparing students for future careers but also empowering them to become active contributors to society, capable of envisioning and building a better future for all.

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