Chapter 1
Personalized Learning in STEAM:
A Comprehensive Overview

Nguyen Duc Son
https://orcid.org/0000-0001-7227-2679
FPT-Greenwich Vietnam University, Vietnam

ABSTRACT

In contemporary education, personalized learning is emerging as a significant trend to enhance the learner experience and augment teaching efficacy. When integrated into STEAM, personalized learning improves the customization of educational content and promotes the cultivation of creative thinking, problem-solving capacities, and practical skills. This chapter synthesizes theories and knowledge from many recent research papers on personalized learning in the field of STEAM, from the theoretical foundations to implementation models, as well as characteristics of this approach. The study focuses on highlighting the role of teachers in guiding, supporting, and personalizing each student's learning journey and experience. Teachers apply appropriate technology and teaching strategies to convey inter-disciplinary knowledge and cultivate project-based skills, attitudes, and motivation in each learner. The study also highlights some effective ways to implement personalized learning to ensure that personalized learning in STEAM can develop sustainably in the future.

1. INTRODUCTION

In recent decades, global education has witnessed profound transformations due to the development of technology and advances in educational research. Personalized learning is a strategy to meet the needs, interests, and abilities of individual learners. Nowadays, it is one of the emerging approaches (Pane et al., 2015). The integration of customized learning with STEAM (Science, Technology, Engineering, Arts, and Mathematics) education enhances the development of critical thinking, creativity, and problem-solving—vital competencies in the digital era (Li Si et al., 2024). Personalized learning is increasingly recognized as essential for students' holistic development, particularly in cultivating creativity and problem-solving abilities, due to its learner-centered approach (Gunawardena et al., 2024). A study by Basham et al. (2016) showed that personalizing learning content helps students increase their confidence

DOI: 10.4018/979-8-3693-7718-5.ch001

in generating creative ideas, thanks to access to appropriate learning resources. In addition, integrating arts into personalized STEAM learning programs also helps students develop interdisciplinary thinking, which is the foundation of creativity (Li Si, Rajendran Nagappan, 2024). Personalized learning helps establish an educational environment where students can freely solve real-world challenges through experiential solutions to assignments and projects that are customized to each individual student... This can form and promote the use of creative problem-solving abilities of learners (Candy & Edmonds, 2018). Consequently, customized learning methods can boost students' problem-solving abilities (Joseph & Uzondu, 2024).

Personalized learning and STEAM are two rapidly growing fields in modern education and are the subjects of much academic research to understand how they can complement and support each other. As a result, there is a great deal of research that explores the intersection between the two fields. Research focuses primarily on the application of technology, the development of personal competencies and the encouragement of creative thinking. In addition to the research on the role of technology and the arts, it also points to the potential of personalized learning in creating a flexible educational environment that meets individual needs and fosters creativity. Here are some main research directions:

Technology application in personalized learning and STEAM. Many studies have confirmed that technology is at the heart of connecting personalized learning with STEAM. For example, Basham et al. (2016) highlighted the role and importance of digital tools in supporting teachers in designing personalized learning paths for each learner, especially in STEAM subjects. Moreover, technology assists educators in comprehending the requirements of students by utilizing learning data. This enhances the adaptability of education in a multicultural and worldwide context. In the same way, Pane et al. (2015) noted that the implementation of AI in STEAM classrooms has enabled the creation of adaptable learning strategies customized to each different student.

Developing individual competencies in STEAM environments. Several studies have focused on leveraging personalized learning to promote individual competencies in STEAM. According to Keane et al. (2016), combining personalized learning with STEAM projects helps learners develop soft skills, such as teamwork, communication, and problem-solving skills. In the same line of research, Henriksen et al. (2018) pointed out that personalized STEAM activities can encourage students to explore their passions and develop creative, analytical, and critical thinking in interdisciplinary fields of science and art.

Art as a bridge between personalized learning and STEAM. It is essential to connect and integrate personalized learning into STEAM education. Perignat and Katz-Buonincontro (2019) showed that integrating arts into science subjects helps personalize the learning experience as well as encourages students to use creative approaches to problem solving in STEAM projects with personalized solutions. Kashaka, N. D. (2024) also emphasized that art is an integral part of STEAM. It helps create emotional and personally meaningful learning experiences.

Learning outcomes from the combination of personalized learning and STEAM. Studies have shown that the combination of personalized learning and STEAM can improve learning outcomes. Therefore, learning effectiveness is enhanced. According to the study of Means et al. (2010), learners in personalized STEAM classes tend to achieve higher grades, and they often demonstrate better creative skills than those in traditional classes. In the same line of research, Means et al. (2017) emphasized that personalized education methods significantly improve learner engagement and can therefore lead to better, more sustainable learning outcomes.