


# Chapter 14

## Adaptive Online STEAM Education: Insights From Stakeholders' Perspectives

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### ABSTRACT

*This chapter outlines the findings of national focus group discussions, as part of a European Erasmus Plus project. It examines the evolution of STEAM education, shaped by online teaching methods during the COVID-19 pandemic. The chapter includes a literature review, research methodology, and an in-depth data analysis. Key themes include the impact of online teaching on STEAM subjects, adaptive teaching, and the skills and requirements necessary in this educational field. The chapter captures the perspectives of students, teachers and technical staff. It summarizes the challenges and potential of online STEAM education.*

### INTRODUCTION

The global COVID-19 pandemic online education, inspired by the philosophy of connectivism (Rodriguez, 2012), transitioned from an option to a critical necessity. It transformed the educational landscape; compelling institutions to adapt to new teaching methods, when no every university was technologically ready (Mishra, Gupta & Shree, 2020). This shift towards remote learning emphasizes the findings of Bakera, Bujaka, and De Millo (2012), who assert that “effective institutions are those that proactively explore innovative and effective approaches to restructure the

DOI: 10.4018/979-8-3693-7645-4.ch014

delivery of ‘content’ in conjunction with change” (p. 330), highlighting the critical need for adaptability. These new approaches must include a deep understanding of the benefits and the consequences of implementing technological solutions designed to complement traditional pedagogy. Moreover, innovative change needs to improve current practice, be compatible with existing values and generate observable results (Rogers, 2003), such as students satisfaction.

In online education, student satisfaction is dependent on a well-rounded support network, including institutional, administrative, instructional, and technical support (Butt, Mahmood & Saleem, 2022). However, the shift to online learning during the pandemic frequently led to inadequate support, causing inconsistent student satisfaction and engagement.

In parallel, these educational strategies must effectively ensure that all learners, regardless of their unique needs, learning styles, and experiences, have equitable opportunities for success. In this context, adaptive teaching emerges as an innovative educational approach that uses advanced educational technology, data analytics, and artificial intelligence to personalize learning content, processes, and methods (Wu et al., 2023). This allows teachers to respond more effectively to learners’ diversity, creating learning experiences that are more suitable for individual characteristics (Wang et al., 2023). During the pandemic, educational models failed to accommodate the diverse challenges faced by learners with different needs.

This chapter examines the challenges and innovations within online education precipitated by the COVID-19 pandemic, focusing on the STEAM disciplines. Overall, this external crisis accelerated educational transformation to rethink the learning-teaching process, stressing the need for adaptive learning practices and opened opportunities for long-term innovations in STEAM education, including applications of artificial intelligence, machine learning and big data (Anush Kumar, Amudhavan, Arun Kumar & Sasikala, 2021). These changes brought to light challenges such as the rapid need for educators to develop competencies to design and deliver on line and blended courses (Mirriahi et al, 2015), the struggle to maintain student motivation and engagement remotely, and the technological disparities affecting student participation and performance.

Changing the learning environment also means changing the psychosocial and emotional dimensions of a classroom, including relationship, perceptions and attitudes (Fraser, 2012). To explore the perception of the main stakeholders (students, teachers and technical staff) uses focus group discussions. Through the voices of students, teachers and staff, this research analyze the complexities of transitioning to digital platforms, the difficulties of maintaining student engagement in a virtual environment, and the need to develop adaptive teaching methodologies. Results reveal significant transformations in teaching strategies, highlighting the critical

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