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Review paper

## CHALLENGES IN SMART EDUCATION ENVIRONMENTS: AN INSIGHTFUL OVERVIEW

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### Abstract

As technology continues to advance, it has a profound impact on various aspects of society. One of the areas where smart technology can be applied is in the field of education. However, the process of implementing these technologies is complex and requires a multidisciplinary approach. While there are numerous benefits to using these technologies, there are also various challenges that need to be addressed. This paper delves into some of the challenges that arise in the implementation of smart education and categorize them for better understanding. The research builds upon previous studies and reveals new challenges that emerge with deeper implementation of smart technologies in educational environments.

**Keywords:** *Smart Education, Smart Technology, Smart Learning, Electronic Learning*

### Introduction

Modern life trends dictate the application of IT in many spheres of life, including in education. The digital transformations currently taking place in society are revolutionary in their scale, speed of change, and breadth of coverage [1]. Apart from the transformation of traditional business into electronic, traditional education has been transformed into electronic education as well. However, the transformation of education did not halt there. In response to further technological development and new social norms, smart education emerged.

The objective of smart education is to improve learner's quality of lifelong learning.

With the increasing use of IT in education, comparisons between traditional education and online education have been more frequent. Although e-education seems to have become indispensable in recent years, opinions are divided.

Despite the advantages and potential of smart education, as an innovative approach, in the process of implementation, it also faces many challenges. One of the first steps to overcome challenges is to identify them.

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In the following chapter of this paper, by theoretical aspects and practical application, the concept of Smart Education is presented. Also, the main elements of Smart Education are presented innovatively.

The third chapter presents the identification and sublimation of challenges in the Smart education environment. The categorization of challenges according to characteristics was also carried out.

In the fourth chapter, the approaches to dealing with the perceived challenges are presented. As a final point, the importance of this research is summarized, suggestions are given for approaching strategies for facing the challenges, as well as consideration of future development in a global context.

## Smart Education

We are witnessing the significant impact of technology on all spheres of society. Education is one of the spheres in which the impact of technology is reflected rapidly. With the development and application of technique and technology, electronic education was created from traditional education, but the further development of technology conditioned the development of the next level, i.e. smart education. It should be mentioned that smart education does not mean the simple application of smart technologies [2] but also the symbiosis of new approaches. Although there is no official definition of smart education, a certain number of authors have defined that term. So according to the [3], Smart education represents the effective and coherent use of information and communication technologies to reach a learning outcome using a suitable pedagogical approach [3].

It is significant to note that the word “smart” in the term smart education refers to intelligent, personalized, and adaptive. But for different entities and/or educational situations, the meaning of ‘smart’ has different definitions. For learners, ‘smart’ refers to wisdom and intelligence [4]. For educational technology, ‘smart’ refers to accomplishing its purpose effectively and efficiently [5]. For the educational environment, ‘smart’ refers to engaging, intelligent, and scalable [4]. Through further research, we have defined new approaches which are shown in Figure 1.

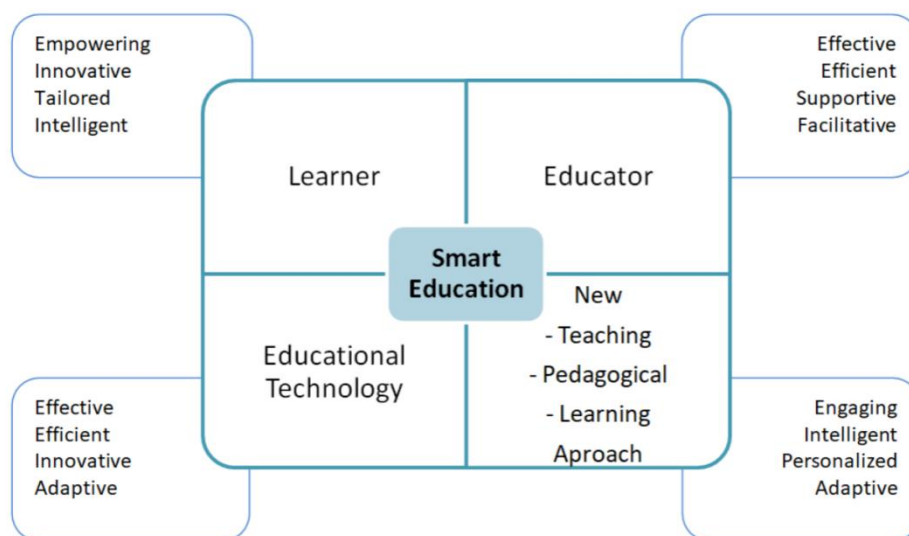


Figure 1: The main Smart Education elements and approaches



Smart learning environments, sometimes used to refer to smart education, “represent a new wave of educational systems, involving an effective and efficient interplay of pedagogy, technology and their fusion towards the betterment of learning processes” [6]. Notice that smart education is not just about technology. It is also about new teaching and learning approaches [6].

The smart education vision should help to achieve this requirement and overcome the shortcomings of the current education methods and systems. To realize the smart education vision, we need to develop new or improved teaching and learning techniques along with a coherently designed set of educational information and communication technologies. Smart education frameworks are essential for smart education implementations [7].

### Challenges in the Smart Education

Implementation of smart education is a complex process, during which numerous challenges arise. In this chapter, challenges have been categorized, both those that have already been identified and those that have been additionally noted. Categorization was performed according to the characteristics.

Table 1: The categorized challenges in Smart Education

Challenge	Category							
	1	2	3	4	5	6	7	8
Lack of internet connection	+							
Internet speed	+							
Lack of devices for digital educations [3], [8]	+							
Device incompatibility	+							
Poor Scalability	+							
Network issues [9]	+							
Lack of tech knowledge [4], [10]	+	+				+		
Oversaturation with information [9]		+						
Qualification [11]		+						
Lack of self-efficacy [9]		+				+		
Procrastination [9]		+				+		
Lack of control and monitoring [9]		+				+		
Over rely on online teaching aids		+						
Perceived student satisfaction			+			+	+	
Lack of examples			+					
Learning assessment			+					
Learning outcomes			+					
Lack of practical part of teaching			+					
Security threats		+		+				
Technology threats [9]				+				
Personal data protection				+		+		
Cyber-bullying [9]				+		+		
Mischief by students [9]		+		+		+		



Lack of legal regulation [11]				+				+
Resource required for online education [10]	+				+	+		
Sustainability					+			
Economic situation [9], [11]					+	+		
Home environment [9]	+				+	+		
Classroom environment [9]	+		+		+			
Training costs					+	+		
Unequal allocation of funding					+			+
Scheduling flexibility						+	+	
Feeling disconnected						+	+	
Getting distracted						+		
Health issues [9]						+	+	
Lack of interaction [9]						+	+	
Feeling overwhelmed						+		
Academic confidence [11]						+		
Lack of focus and attention [9]						+		
Technological confidence [10], [11]		+				+		
Different learning style						+		
Social support [11]						+		
Rapid cultural shift [3]						+	+	
Motivation [11]						+	+	
Laboratory exercises [3]						+	+	
Practical training [3]						+	+	
Online fatigue [3]						+	+	
Communication challenges						+	+	
Time challenge [11]						+	+	
1 - Technical 2 - Competency 3 - Content 4 - Security 5 - Financial 6 - Student Experience 7 - Pedagogical 8- Rules and Regulations								

The categorization shown in Table 1 was structured according to the relatedness of the challenges, that is, common characteristics. In the following paragraph, the basic characteristics of the categories are given.

Technical challenges are challenges that mainly concern infrastructure and access to modern technology, in the process of smart education.

The lack of competence of educators in working with smart educational technology, as well as the insufficient level of knowledge to work in a smart environment, is the next challenge.

Challenges related to the content category are challenges in adapting content to different learning styles, and implementing the practical part of teaching (laboratories, workshops, fieldwork, etc.), but also challenges in creating content that is adapted to students with different needs.

Security and privacy challenges relate to system security, as well as protection from potential threats, but also protection of personal data.

Financial challenges represent challenges that are the result of a lack of financial resources, i.e. money, both for the purchase of equipment and technology in the classroom and at home, and are in line with the economic situation of the country.



One of the challenges that needs to be given significant attention is the experience of students, and it refers to the difficulties of students in adapting to a smart way of education. Pedagogical challenges relate to the problems of integrating technology into the learning process, problems of teacher training, the application of personalized learning, and adapted assessment methods.

The challenges of rules and regulations refer to the challenges of compliance of smart education with the laws of each country, as well as adaptability to legal changes while protecting privacy, data, and copyright.

### Addressing Smart Education Challenges

Since the number of challenges that arise during the implementation of smart education has been pointed out, facing the mentioned challenges is necessary to realize the full potential of smart education. Due to the complexity of smart education, it is necessary to approach it from several aspects. In this paper, several aspects of the approach are proposed:

- Pedagogical approach
- Approach from the aspect of technology selection and application
- Approach from the aspect of regulatory frameworks
- Approach from the economic aspect

By defining such aspects of the approach, all categories of challenges are covered, and they are shown in Figure 2.

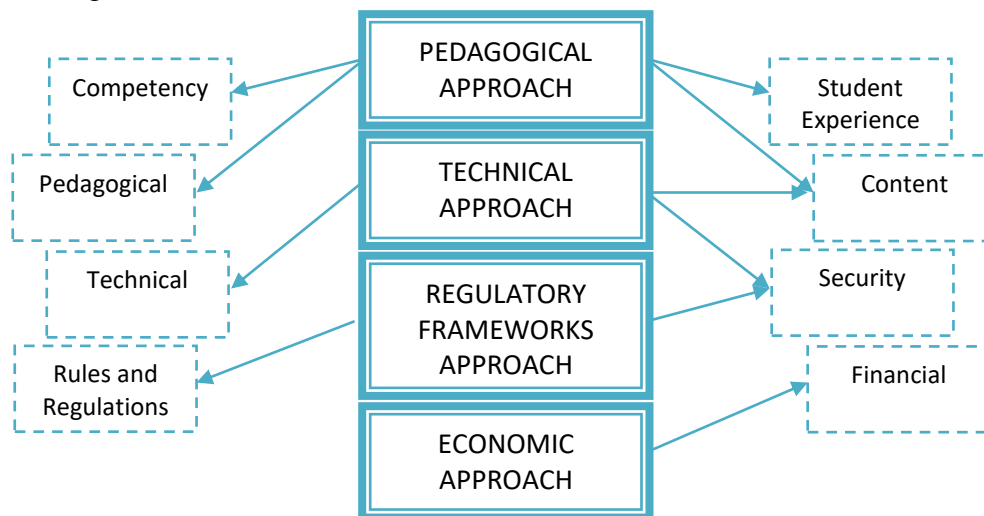


Figure 2: Approach to facing the challenges of smart education

### Conclusion

This paper presents some of the challenges facing the implementation of smart education. Challenges are categorized by characteristics. In addition to identifying challenges, approaches are suggested to address each category of challenges identified. As it is a multidisciplinary approach, it is necessary to ensure the cooperation of all institutions that would provide support in their domain, whether they are educational institutions, technological innovators, regulatory bodies, etc. With the ever-deeper application of smart



education, new challenges are encountered, but some existing ones are also overcome. Therefore, the continuation of research and adaptation of strategies should be aligned with further technological development, but also with real human needs, especially since the greatest number of challenges are recognized in the student experience of smart education, as well as the engagement of educators, and the impact of smart education on various aspects of their lives and health.

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