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CONFERENCE PROCEEDINGS

12th of December, 2023

KONFERENCIJOS PRANEŠIMŲ MEDŽIAGA

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ADVANCED LEARNING TECHNOLOGIES AND APPLICATIONS. EMPOWERING LEARNING THROUGH DIGITAL PEDAGOGY

Conference proceedings

International conference "Advanced Learning Technologies and Applications. Empowering learning through digital pedagogy – ALTA'23" – aims to gather European educational actors, from policy makers to practitioners to researchers. At ALTA'23 participants were able to present their research, projects and discuss their experiences in the field of e-Learning methodologies, educational projects, innovations and new technologies applied to Education and Research.

Kaunas, 2023

Conference is organized by dr. Danguole Rutkauskiene

"Advanced Learning Technologies and Applications. Empowering learning through digital pedagogy" be open for new places of learning occupation – ALTA'23.

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Cross-Cultural and Global Perspectives in Digital Pedagogy

Empowering Lifelong Learning: Navigating the Future with Micro-modules and Micro-credentials

THE CONTENT

Dear authors, colleagues, distance learning experts,

I am delighted to present the Proceedings of our 20th annual ALTA International Conference on "**Advanced Learning Technologies and Applica-tions**". The annual ALTA International Conference is a great opportunity to share our research results and insights. It is gratifying that each year we have different themes, which gives us the flexibility to respond to changes in the field of distance learning and to highlight the most relevant trends in education today. In recent years, we have focused on personalised learning, virtual reality, augmented reality, etc., and today we feel that artificial intelligence is playing an increasingly important role in education.
I would like to point out that the authors come from a wide range of educational institutions and the geographical coverage is constantly expanding. We can certainly be proud of that.
I would like to thank you all for your attention to our conference, for the opportunity to get to know your research in more detail, and I wish you to continue to be active members of our community in the future. It is only thanks to you that various aspects of distance learning are being addressed.

President of National Association of Distance Education
Dr. Danguole Rutkauskiene

Gerbiami straipsnių autoriai, kolegos, nuotolinio mokymosi ekspertai,

Džiaugiuosi, kad jau 20-ąjį kartą turiu galimybę pristatyti mūsų kasmetinės tarptautinės ALTA „**Pažangios mokymosi technologijos ir aplikacijos**“ konferencijos straipsnių rinkinį. Kasmetinė tarptautinė ALTA konferencija – tai puiki galimybė pasidalinti savo tyrimų rezultatais, įžvalgomis. Džiugu, kad kiekvienais metais turime vis skirtingas temas, kas mums suteikia galimybę lanksčiai reaguoti į pokyčius nuotolinio mokymosi srityje ir išryškinti aktualiausias šių dienų tendencijas švietime. Paskutiniaisiais metais akcentavome personalizuoto mokymosi, virtualios realybės, papildytos realybės ir kt. temas, o šiandien jaučiame, kad vis svarbesnį vaidmenį švietime vaidina dirbtinis intelektas.
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EMOTIONAL INTELLIGENCE AND MIDFULLNESS IN THE CONTEXT OF THE AI EXPANSION

Gitana Nauduziene[1] and Edita Butrime[2]

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Abstract. It is aimed in this paper to analyze what is the possible role that emotional intelligence (and its development) may have on the individual's abilities to cope in everyday and professional settings in the context of the expansion of the artificial intelligence (AI). The critical analysis of sources, theoretical considerations, results of the empiric study are presented, which enable formulation of the conclusions. It was found the people with higher levels of Emotional intelligence have higher levels of self-esteem, perseverance, are better at stress management, are happier. Study also found that more mature people have higher levels of Emotional intelligence, which allowed formulation of hypothesis (which remains to be tested) that individuals with higher levels of Emotional intelligence may potentially have more internal initial resources to cope in the context of the AI expansion in everyday and professional settings.

Keywords: Emotional Intelligence, AI, internal resources.

INTRODUCTION

Contemporary situation is characterized by a unique approach to emotions, which is fundamentally different from previous periods (Khorana et al., 2019). Contemporary people live in a society of ontological insecurity (Giddens, 1992; Valera Pertegas, 2017), because they are constantly confronted with extreme societal challenges (European Association for the Education of Adults, 2019), life in contemporary society passes too quickly, and the current world is full of surprises and new beginnings (Beck, 2006; Bauman, 2009; Pietrocola et al., 2021). One of those changes that are so fast that at times we do not have time either to reflect on it, or attribute the meaning to it, and certainly struggle to incorporate meaningfully into our daily or professional settings is the expansion of the artificial intelligence (Magapu & Vaddiparty, 2019). Research has shown that the more external stressors there are in the environment, the more relevant are the competencies to maintain emotional and psychological balance and resilience to environmental influences, which are in their own turn strongly influenced by Emotional intelligence (Matić, 2020) which is why the development of Emotional intelligence is becoming increasingly relevant in contemporary world (Sun et al., 2020; Warrier et al., 2021; Muñoz-Oliver et al., 2022).

Therefore, this paper **aims** at analyzing what is the possible role that emotional intelligence (and its development) may have on the individual's abilities to cope in everyday and professional settings in the context of the expansion of the AI.

The analysis is based on two **Research Questions (RQs):** What is the relation between the Emotional intelligence and Mindfulness (empirically tested suggestions are formulated regarding this RQ)? What are the prospects for assisting individuals to cope in private and professional settings in the context of the AI expansion (the personal considerations of authors/researchers are formulated regarding this RQ)?

Methods of critical analysis of references, also quantitative empiric study with the elements of qualitative study and the personal considerations of authors were employed for the development of the paper.

Emotional intelligence in the context of the AI expansion

Today competences that reveal individual potential and individual strengths are more relevant than ever for any individual (Di Fabio et al., 2018; Fernández-Gavira et al., 2021). According to numerous studies, Emotional intelligence is a key component for personal and professional success, also, studies show that Emotional Intelligence influences personal performance (Brackett et al., 2011; Furnham, 2012; Chagelishvili, 2021), and provides the basis of mental and emotional health, life satisfaction, and general well-being (Zeidner et al., 2012; Lucas-Mangas et al., 2022).

Also, Artificial Intelligence technologies are rapidly evolving and revolutionising society, influencing a wide range of social processes and creating new products and services (Lee et al., 2018), these changes present risks, challenges and changes to society (Santana & Díaz-Fernández, 2022), changing the way people live, work and learn (Xu & Choi, 2023). Today's people therefore need new competences to adapt to the new challenges of society (Gallardo-Gallardo & Collings, 2021).

Emotional intelligence is a tool which may help people achieve goals that are meaningful to them and to society: well-being, success in life, improved stress management skills, and the necessary resources to adapt to the rapidly changing environment of contemporary life (Goleman & Boyatzis, 2017; Lamichhane, 2018). In a postmodern society, positive, rational values are replaced by postmodern values almost exclusively related to personal self-expression, personal development, and a shift from the need for physical and material security to the need for psychological and personal well-being and the fostering of autonomy (Alonso et al., 2013).

The challenges facing humanity today cannot be solved either by the arrogant optimism of modernity or by the critical perspectives offered by postmodernity (Vermeulen & van den Akker, 2010), the understanding of the world we currently have is insufficient to solve contemporary problems (Andersen Metamodernity et al., 2020), and it is therefore proposed to turn to spirituality, the past, and cultural heritage, interpret it, attribute meaning on existential and emotional level, combining emotion and rationality in new ways of thinking (Vervaeke et al., 2017; Vervaeke & Mastropietro, 2021).

Research has shown that self-regulatory competencies can influence emotional abilities (Núñez et al., 2023). Mindfulness allows ability to regulate attention, emotions, moreover, mindfulness activates brain regions associated with Emotional intelligence (Tang, 2017).

Emotions can provide important information that we need to change and develop, they are symbolic expressions of our interaction with the world, signaling what we are missing (Dirkx et al., 2016; John, 2016). Mindfulness practices are a process of changing perspectives and habits of thought, altering behavior and thinking (Owen, 2020). The contemporary approach to Mindfulness has been largely influenced by the work of two researchers. Ellen Langer treated mindfulness as a socio-cognitive approach to reduce 'mindlessness' in everyday life (Langer & Moldoveanu, 2000). Jon Kabat-Zinn emphasized meditative mindfulness, defining it as inner awareness and mindfulness (Kabat-Zinn, 2015; Schell et al., 2019). Mindfulness may be

analyzed as a specific kind of contemplative approach, a kind of mind training tool and a method of psychological transformation (Dahl & Davidson, 2019).

The theoretical Model for the Development of Emotional intelligence while practicing Mindfulness is constructed (it is based on the analysis of the effects of Mindfulness on brain plasticity and the analysis of the psychological mechanisms that Mindfulness has on Emotional intelligence) (Naudužienė, 2023). The Model, we feel, may be useful in analyzing the is the possible role that emotional intelligence (and its development) may have on the individual's abilities to cope in everyday and professional settings in the context of the expansion of the AI.

The Model consists of three levels.

The **first** level includes motivational factors grouped into social, societal and individual motivation factors.

The **second** level encompasses the most important mechanisms of Mindfulness.

The **third** level includes mechanisms that influence Emotional intelligence while practicing Mindfulness.

The Model also reflects the transformative effects of Mindfulness, through which the social, societal and individual preconditions for the development of Emotional intelligence are transformed into more positive and empowering ones, enabling people to adapt to the processes and changes that are taking place in contemporary society.

The empiric study was completed for the testing of the Model (Nauduziene, 2023). Here, due to the limitations for the scope for the paper just a small part of data is presented, and also contextualization of emotional intelligence and the mindfulness is discussed in the linkage of the AI expansion.

The methodology of empiric study

The Convenience sampling was used for inviting participants, the procedure was anonymous, in total 504 participants from Lithuania, representing different walks of life, ages, occupations expressed their perspective on Mindfulness, Emotional intelligence and 3 experts provided critical comments, expertise on the procedure of research itself. To measure Emotional intelligence, this study uses the Trait Emotional Intelligence Inventory (TEIQue) developed by Petrides and colleagues at the London Psychometric Laboratory in University College. The Five Facet Mindfulness Questionnaire (FFMQ) was used to assess Mindfulness.

Some results of the empiric study

It was found that that there is a significant link between Mindfulness and Emotional intelligence. Statistical analysis of the results of the study was used to test whether statistically significant predictive (dependent) relationships existed between aspects of Mindfulness and the factors and domains of Emotional intelligence. *Table 1* shows the relationships between Emotional intelligence and Mindfulness found in the study.

TABLE 1. Predictive relations between Mindfulness and Emotional intelligence

Factors and domains of Emotional intelligence			Aspects of Mindfulness (competencies)	Value of standardized coefficient Beta
Emotional intelligence			Description	**0,414**
			Conscious action	0,335
			Non-response to internal exp.	0,228
	Emotianality		**Description**	**0,432**
			Conscious action	0,246
		Emotional awareness	Conscious action	0,209
			Non-judgement of internal exp.	0,209
		Emotional expression	Description	0,312
			Observation	0,266
		Relations	**Description**	**0,384**
		Empathy	Observation	0,318
	Social awareness		**Description**	**0,430**
		Regulation of emotions	–	–
		Perseverance	–	–
		Social awareness	Non-response to internal exp.	**0,415**
	Self-control		**Non-response to internal exp.**	**0,520**
			Conscious action	0,346
			Non-judgement of internal exp.	
		Stress management	**Non-response to internal exp.**	0,513
		Regulation of emotions	Non-response to internal exp.	0,270
			Non-judgement of internal exp.	**0,350**
		Impulsivity	Non-judgement of internal exp.	0,224
			Non-response to internal exp.	0,224
	Well-being		**Description**	**0,318**
			Conscious action	0,221
			Non-response to internal exp.	0,194
		Trait of Happiness	Description	0,309
		Self-esteem	Description	**0,441**
		Trait of Optimism	Non-judgement of internal exp.	0,415
	Additional domains			
		Adaptation	Description	0,384
		Individual Motivation	**Non-judgement of internal exp.**	**0,350**
			Non-response to internal exp.	0,270

It was found that certain factors of Emotional intelligence and general Emotional intelligence are in weak or moderate correlation with satisfaction with one's (professional) activity and the success in (professional) activity, however, the factor of social awareness is excluded *(Table 2*).

TABLE 2. Factors of Emotional intelligence and satisfaction with activities, success in activity

	Satisfaction with one's activity	**Success in activity**
Factors of Emotional Intelligence		
Well-being	**0,421****	**0,409****
Social awareness	0,169	0,212
Self control	**0,237****	**0,313****
Emotionality	**0,260****	**0,351****
Emotional intelligence	**0,376****	**0,429****
Expression of emotions	0,172	**0,299****
Relationships	**0,269****	**0,299****
Self-esteem	**0,283****	**0,344****
Understanding emotions	**0,248****	**0,416****
Empathy	0,072	0,119
Individual motivations	**0,373****	**0,305****
Impulsivity	0,185	**0,277****
Regulation of emotions	0,163	0,266
Social consciousness	**0,266****	0,074
Management of stress	0,187	0,025
Trait of Optimism	**0,328****	**0,369****
Trait of Happiness	**0,432****	**0,377****
Perseverance	0,700	0,178
Adaptation	**0,363****	0,119
Controlling emotions	0,045	0,178

Note. * p ≤ 0,05, **p ≤ 0,01.

Satisfaction correlates with Relationships, Self-esteem, Individual motivations, Social Consciousness, Trait of Optimism, Trait of Happiness, Adaptation, the strongest correlation is identified with Individual motivation and the Trait of Happiness.

Statistically significant correlation is found with Expression of emotions, Relationships, Understanding emotions, Impulsivity, Regulation of emotions, the Trait of Happiness.

It was found that Empathy, Stress management, Perseverance do not correlate.

The study focused on whether and in what way Mindfulness is related to satisfaction with activity and success in professional activity. The results are illustrated in *Table 3*.

TABLE 3. Mindfulness and satisfaction with activity and success in professional activity

	Satisfaction with one's activity	**Success in professional activity**
Mindfulness		
Conscious action	**0,345****	**0,376****
Observation	0,031	-0,017
Non-judgement of internal experience	**0,279****	**0,293****
Non-response to internal experience	0,181	0,161
Description	**0,307****	**0,384****

Note. ** indicate Pearson's correlation values, while p < 0,01.

In order to analyse more thoroughly the meaning of Emotional intelligence and learning from life experiences for the participants of the study, the participants were asked to share personal perspectives in a series of open-ended questions. For example: ***What are the skills and knowledge related to Emotional intelligence that you have acquired over the course of your life?***

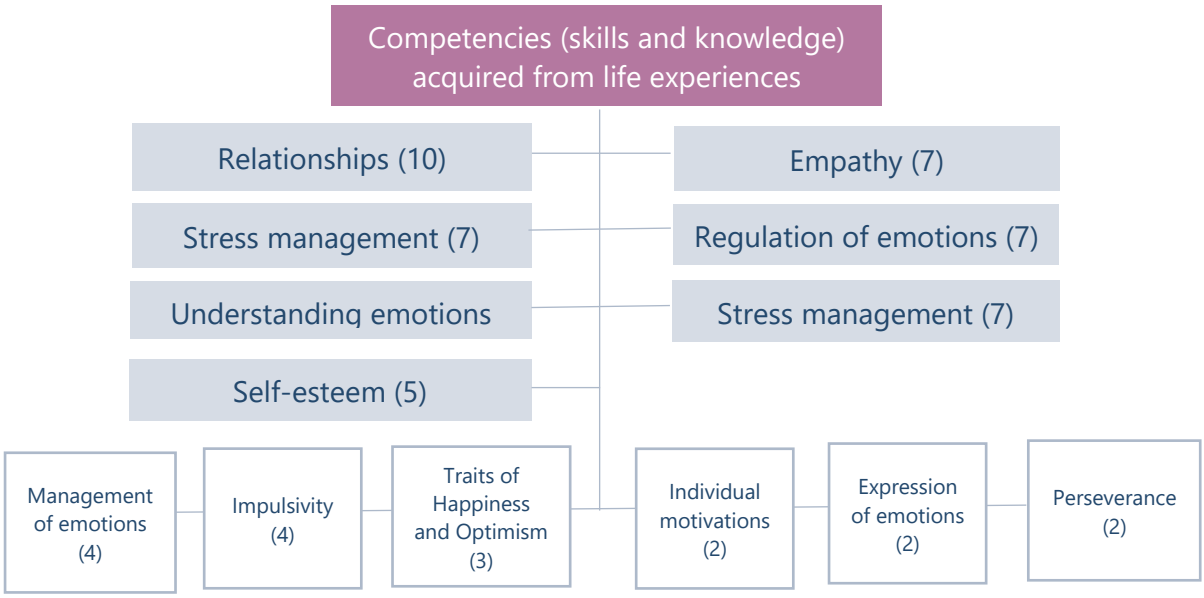

Figure 1. Competencies (skills and knowledge) of Emotional intelligence acquired from life experiences

We think that this finding, namely: the relationship found between Emotional intelligence and age confirms that Emotional intelligence is not just an inherited skill but can be learned (even if the relationship between age and Emotional intelligence is weak in several regards).

However, if we analyse individual's readiness to cope in private and professional setting in the context of the AI expansion, these findings - we feel - are important because of several reasons.

Firstly. While addressing second RQ: What are the prospects for assisting individuals to cope in private and professional settings in the context of the AI expansion? we may with significant degree of confidence suggest the positive possible impact of developing Emotional intelligence on ability to cope in the context of the AI expansion. If individual's well developed Emotional intelligence has a positive impact on perseverance, stress-management, self awareness, self control and other aspects (as presented above), it stands to reason, that such individual is better equipped to cope in the context of the AI expansion. As the AI expansion integrates fast changes, necessity to react to changing roles in professional (and even everyday / private) settings, necessity to learn quickly and to re-evaluate one's place and value in fast emerging new reality. Thus, it stands to reason that a person who is well adjusted, is able to control the impulsivity, is happy, has self esteem will have more internal resources in the situation. Surely, these are personal hypothetical considerations of the authors, which remain to be empirically tested.

Secondly. In the light of the empiric findings that more mature people have higher levels of Emotional intelligence, it may be surmised that mature people have the initial level of internal resources to cope in the context of the AI expansion, even if, surely, they need additional consultations in order to cope in professional (and even private) settings of this fast-changing reality that we are all witnessing.

DISCUSSIONS AND CONCLUSIONS

Regarding the first RQ (What is the relation between the Emotional intelligence and Mindfulness) it was found that Emotional intelligence influences any person's life: mental and spiritual health and individual success in different areas of life, it is instrumental for overcoming environmental challenges.

The following prerequisites are identified: (motivational factors) for the development of Emotional intelligence in contemporary society: External: 1) Social preconditions (Metamodernist approach to solving the challenges of postmodern society) (personal responsibility for the expression of emotions; regulation of emotions; the process of individualisation and the need to create one's own identity; emotional capital and emotional effort; emotional uncertainty and the risk society; increased self-reflexivity; emphasis on personal relationships; happiness and success, and the constant need for management of emotion. 2) Societal preconditions (need to develop the skills and abilities necessary to adapt to change and stressful situations; valuing emotional intelligence skills as a key life skill and a prerequisite for personal and societal well-being. Personal preconditions: 1) Emotional intelligence as a prerequisite for personal success in life (successful life; quality of life, personal well-being, life and work satisfaction) 2) The need for learning in contemporary society (the need to address the meta-crises of today's world by promoting metacognition, combining spiritual, practical and scientific thinking, the need for self-care that can help people transform and change). Mindfulness is conceptualised as a transformative contemplative method of developing Emotional intelligence. The skills acquired through the practice of Mindfulness enable a person to adapt more effectively to the challenges and demands of the world, to become more aware of oneself and others, to learn to appreciate and enjoy one's own life, despite all the unpleasant and sometimes frightening circumstances that cause even painful emotions.

The impact of Mindfulness for developing Emotional intelligence is based on the following assumptions: 1) the plasticity of the brain and the influence of practicing Mindfulness on the neural networks of the brain areas related to Emotional intelligence; 2) the principles of psychological mechanisms of Mindfulness and their influence on Emotional intelligence. Empirically it was found that Mindfulness (rather - practicing Mindfulness) influences the development of Emotional intelligence.

The empirical study found that Emotional intelligence and Mindfulness have from moderate to strong statistically significant positive relationship. Study also found that more mature people have higher levels of Emotional intelligence.

Regarding the second RQ (What are the prospects for assisting individuals to cope in private and professional settings in the context of the AI expansion?) resulted in the formulation of hypothesis based on the findings of the empiric study: people who have higher levels of Emotional intelligence will have (potentially) sufficient initial level of internal resources to cope in the context of the AI expansion, even if, surely, they need additional consultations and assistance in order to cope in professional (and even everyday / private) settings of this fast changing reality that we are all witnessing. The hypothesis remains to be tested empirically, which the authors of the paper intend to undertake in the near future.

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STUDENTS' ATTITUDES TOWARDS LEARNING FOREIGN LANGUAGES FOR SPECIFIC PURPOSE VIA AI MEDIATION

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Abstract. This research investigates students' attitudes towards acquiring foreign languages for specific purposes, focusing on the role of AI in facilitating language learning experiences. In the context of digital language education, the research aims to unravel the perceptions and preferences of students engaging with AI - mediated language learning platforms for specific-purpose objectives.

Employing a mixed-methods approach through surveys and interviews, the research explores key aspects such as motivation, efficacy, and satisfaction with language learning tools, emphasizing the influence of AI on the acquisition of language skills required for specific purposes. Preliminary findings suggest a positive correlation between students' attitudes towards learning foreign languages via AI and the effectiveness of this medium in their language learning journey.

The research also addresses potential challenges and identifies areas for improvement in the integration of AI-driven language learning tools within this context. By contributing to the existing literature on language education, this research provides insights valuable for educators, policymakers, and developers of language learning technologies. Understanding students' attitudes towards utilizing AI for foreign language learning for specific purposes is crucial for optimizing language education strategies in the digital era.

Keywords: Foreign Languages for Specific Purpose, Artificial Intelligence, higher education, Introduction, algorithm, ChatGPT, Chatbots.

INTRODUCTION

In the dynamic landscape of higher education, the intersection of artificial intelligence (AI) with specialized foreign language learning emerges as a key area of investigation. This transition is not solely motivated by the potential of AI to revolutionize language education at the tertiary level but also by the acknowledgment of the necessity to adjust teaching approaches to meet the changing needs of learners. As this collaborative integration takes precedence, it becomes imperative to comprehend student attitudes towards this evolving educational paradigm. Numerous researchers, including Shuai, Rollins, Moulinier, Custis, Edmunds, F. Schilder, Vaswani, Shazeer, Parmar, Uszkoreit, Jones, Gomez, Kaiser, Polosukhin, Radford, Narasimhan, Salimans, Sutskever, Huang, Zhang, Mao, Yao (2017), Jatautaitė (2018), Zuzevičiūtė (2022) and many others, delve into the dynamic landscape of generative Artificial Intelligence (AI). They specifically focus on the transformative impacts of Mixture of Experts (MoE), multimodal learning, and the speculated advancements towards Artificial General Intelligence (AGI).

The Background of Artificial Intelligence. The landscape of artificial intelligence (AI) in education is deeply rooted in the 21st-century surge of technological demands, reshaping the teaching and learning process across all educational levels. The integration of AI into educational systems signifies a transformative paradigm shift, influencing student learning dynamics, teacher pedagogy, and institutional functioning. This technological surge has particularly revolutionized education, notably in the domain of Foreign Language (FL) learning,

prompting critical investigations into the advanced impact of AI technologies on education and students' perspectives (Chen et al., 2020).

The renowned 1968 film "2001: A Space Odyssey", directed by Stanley Kubrick and based on a story by Arthur C. Clarke, although not explicitly focused on AI, has etched its mark with the iconic HAL computer (Artificial Intelligence and the Future of Teaching and Learning (PDF) (ed.gov).

While not the direct source of widespread cultural awareness regarding artificial intelligence, the film significantly influences popular perceptions and discussions about the potential risks associated with advanced technology, epitomized by HAL 9000 (Bory 2019).

Moreover, the historical integration of artificial intelligence (AI) into education, particularly in foreign language learning, has roots dating back to the 14th century. The practical application, known as AI in Education (AIED), has gained substantial traction in the past 25 years, reshaping teaching and learning methods (Barnes-Hawkins, C. 2016). Defined as a branch of computer science, AI systems leverage hardware, algorithms, and data to create "intelligence", enabling decision-making, pattern discovery, and various actions. Newer AI systems often employ machine learning algorithms, marking a shift from rule-based systems. The term AI narratives encompass narratives featuring intelligent machines (The Royal Society 2018).

The introduction of generative AI chatbots in late 2022 and early 2023 became a focal point for higher educational institutions teaching foreign languages for specific purposes, prompting a comprehensive reevaluation of AI's adaptability to various educational tasks. Dating back to the creation of the first chatbox, Eliza, in 1966, followed by Parry in 1972 and Alice in 1995, modern chatbots like SmarterChild, Apple Siri, Amazon Alexa, IBM Watson, Microsoft Cortana, and Google Assistant have evolved with technological advancements (Reis et al., 2018). The ongoing modernization of chatbots, initiated in 2016, has significantly impacted education, with surveys and studies supporting their potential to enhance students' learning experiences, especially in the context of learning foreign languages for specific purposes (Artificial Intelligence and the Future of Teaching and Learning (PDF) (ed.gov)).

For example, the history of ChatGPT is closely tied to the evolution of OpenAI's Generative Pre-trained Transformers (GPT) series. GPT models are based on transformer architecture, a type of deep neural network architecture that has proven highly effective in natural language processing tasks. Prior to ChatGPT, OpenAI released GPT-2 in 2019. GPT-2 was a highly advanced language model with 1.5 billion parameters, capable of generating coherent and contextually relevant text. Its release sparked discussions about the potential risks associated with large language models. In June 2020, OpenAI introduced ChatGPT as a research preview. It was designed as a chatbot with improved conversational abilities, allowing users to engage in more dynamic and interactive conversations with the model.

OpenAI continued to refine and enhance the capabilities of ChatGPT. In the subsequent iterations, OpenAI released models with increasing numbers of parameters, leading to improved performance in understanding and generating human-like text.

Trained on a vast corpus of data, ChatGPT responds in a conversational manner, showcasing capabilities such as language translation, text summarization, question answering, creative writing, content generation, and code correction. Studies have validated ChatGPT's success in passing Law School and Master of Business Administration (MBA) examinations (Eke, 2023). The latest version, ChatGPT-4, released on March 14, 2023, exhibits enhanced power and

capabilities, trained on a larger and more diverse dataset. Its increased size enables advanced natural language processing, making it adaptable and proficient in handling complex tasks, including providing detailed descriptions of images and responding to handwritten queries presented as graphics (Stahl, 2024).

The capabilities of a chatbot, including natural language processing, machine learning, deep learning, and artificial neural networks (Nirala et al., 2022), have varied effects on language learning, influencing language acquisition. The impact of AI technologies on language learning, accelerated by the emergence of deep learning technologies, has been prominent since at least the 1980s, establishing AI in education (AIEd) as a cohesive academic research field (Williamson & Eynon, 2020). In AIEd, two approaches involve developing AI-based tools for classrooms and utilizing AI to gain insight, assess, and enhance language learning (Holmes et al., 2019).

The strategic integration of AI into education, especially in foreign language learning at the higher education level, responds to the changing attitudes and expectations of modern students. This fusion of technological advancements with pedagogical needs not only facilitates personalized learning experiences but also propels educational institutions toward a future that is both inclusive and technologically adept.

Exploring Diverse Perspectives on AI: A Comprehensive Overview

AI elicits a nuanced spectrum of attitudes in literature, featuring divergent viewpoints. Predominantly, narratives lean towards pessimistic projections speculating on AI's future impact, as noted by Cave, Coughlan, and Dihan (2019), contrasting with the optimism demonstrated by Fast and Horvitz (2017). Despite persistent concerns and constraints in personal choices, a discernible inclination towards supporting AI emerges, evident in the widespread acceptance of applications like Siri (Siri is Apple's voice-enabled virtual assistant powered by artificial intelligence, machine learning, and voice recognition) (Whitney, 2024).

Ethical considerations, particularly regarding the potential displacement of human workers by robots, shape public perception both negatively (Granulo, Fuchs, & Puntoni, 2019; Lacity & Willcocks, 2017) and positively (Wilson, Daugherty & Morini-Bianzino, 2017). Recognizing AI's benefits in daily life, from safe driving to medical care (Hamet & Tremblay, 2017), and its transformative role in education (Seldon & Abidoye, 2018), prompts considerations of its potential as an efficient learning tool, as suggested by Loeckx (2016). However, this potential adoption faces resistance reflecting polarized human attitudes toward technology (Joinson, 2004).

In the contemporary digitization of education, AI applications present opportunities for improvement, serving as individualized learning tools bridging the gap between students and traditional learning environments. Previous studies, exemplified by Boulay (2016), underscore the benefits of AI digital learning tools in monitoring student input, delivering relevant tasks, providing effective feedback, and enabling interfaces for human-computer communication. Consequently, the evolving role of AI in education challenges the traditional position of teachers (Fenwick, 2018), prompting an exploration of the shifting dynamics within this educational landscape.

The success of integrating AI into foreign language learning hinges significantly on students' attitudes towards this approach. Investigating and comprehending these attitudes is crucial for optimizing the implementation of AI tools in language education. By gauging student

perspectives, educators can tailor AI-driven interventions to align with students' preferences, needs, and learning styles.

In the realm of AI in Education (AIEd), the community is increasingly delving into the ramifications of AI systems in foreign language learning for specific purposes in higher education. Roll and Wylie (2016) advocate for heightened involvement of AI systems in facilitating communication between students and instructors, extending their application beyond traditional school contexts. Simultaneously, Zawacki-Richter and collaborators (2019) conducted a comprehensive review of AIEd publications spanning from 2007 to 2018, revealing a notable absence of critical reflection on the ethical impact and risks of AI systems on learner-instructor interaction. Popenici and Kerr (2023) delved into the influence of AI systems on the dynamics of learning and teaching, uncovering potential conflicts between students and instructors, including privacy concerns, shifts in power dynamics, and issues of excessive control. These studies collectively emphasize the need for further research to scrutinize the impact of AI systems on learners and instructors' interaction, aiming to identify any gaps, challenges, or barriers hindering AI systems from realizing their intended potential.

Undoubtedly, learners of the foreign language and teachers of foreign languages interaction hold a pivotal role in the realm of learning. Kang and Im (2013) illustrated that elements such as communication, support, and presence in learner-teacher interaction positively influence students' satisfaction and learning outcomes. This interaction also significantly shapes students' self-esteem, motivation to learn, and confidence in confronting new challenges (Laura & Chapman, 2009). Despite this, there remains a limited understanding of how the introduction of AI systems in learning will alter learner-teacher interaction Guilherme (2019) anticipated a profound impact of AI systems in the classroom, foreseeing a transformation in the teacher-student relationship. Additional exploration is imperative to unravel the mechanisms and reasons behind how various forms of AI systems influence learner-teacher interaction in the context of online learning (Felix, 2020).

As the educational landscape continues to evolve, the integration of AI technologies demands not only scrutiny but also strategic adaptation. Considering the pivotal role of learner-teacher interaction, ongoing research becomes crucial to navigate potential challenges and foster a harmonious coexistence between AI systems and traditional educational dynamics. This concerted effort is essential for unlocking the full potential of AI in education while ensuring a seamless integration that benefits both learners and instructors alike.

Significance of Exploring Student Attitudes in Foreign Language Learning

Understanding student attitudes towards AI in foreign language learning holds paramount importance for educators and policymakers, acting as a guiding force in shaping effective educational strategies in higher education. This research serves as a crucial compass, offering valuable insights into the potential challenges, concerns, and preferences that students may harbor in the context of language education (Zuzevičiūtė, Vaiva; Jatautaitė, Dileta, 2022). By delving into student perspectives, educators can fine-tune AI applications, ensuring their alignment with the evolving goals and expectations of modern learners (UNESCO, 2021).

AIEd community's growing exploration of AI systems in education underscores the need for a comprehensive understanding of student attitudes. Though, Roll and Wylie's (2016) advocacy for increased AI involvement in student-teacher communication beyond traditional contexts is a testament to the evolving educational landscape. In parallel, Zawacki-Richter and colleagues'

(2019) extensive review reveals a crucial gap in critical reflection on the ethical implications and risks of AI systems on learner-teacher interaction, emphasizing the necessity for further research.

Recognizing the pivotal role of learner-instructor interaction in online learning, highlighted by Kang and Im (2013), is essential. Their findings illustrate that communication, support, and teacher presence significantly impact students' satisfaction and learning outcomes. This interaction also plays a crucial role in shaping students' self-esteem, motivation to learn, and confidence in facing challenges, as indicated by Laura and Chapman (2009).

Despite this awareness, the introduction of AI systems into learning environments introduces a novel dimension that remains inadequately understood. Guilherme's (2019) anticipation of a profound impact on the teacher-student relationship suggests the need for thorough exploration and in particular, students' attitude. Further investigation is imperative to unravel the mechanisms and reasons behind how diverse AI systems influence learners' interaction within the context of learning, as emphasized by Felix (2020).

In essence, researching student attitudes towards foreign language learning with AI in higher education is not merely an academic pursuit but a practical necessity. It addresses the evolving landscape of education, ensuring that technological integrations align with the needs and expectations of students. Through this research, a more comprehensive understanding of the challenges and opportunities presented by AI in language education emerges, providing a foundation for informed decision-making in educational policy and practice (Jatautaitė, Dileta; Butrimė, Edita; Zuzevičiūtė, Vaiva (2023).

The research. The advent of Artificial Intelligence (AI) has ushered in a transformative era across various sectors, notably in education. Within language learning, AI-driven tools and applications present innovative possibilities for elevating the learning experience, particularly in specialized areas such as English for Specific Purposes (ESP). In the context of ESP, Business English holds particular significance, necessitating a nuanced exploration of how students perceive and engage with AI-based learning tools.

The problem of the research. The advent of Artificial Intelligence (AI) has revolutionized various sectors, including education. In language learning, AI-driven tools and applications offer innovative avenues for enhancing the learning experience, especially in English for Specific Purposes (ESP). Business English, being a vital subset of ESP, demands a nuanced understanding of how students perceive and interact with AI-based learning tools. Moreover, the lack of studies on students' attitudes towards learning a foreign language for a specific purpose via ChatGPT could possibly be due to the novelty of the technology and privacy concerns, methodological challenges in research, the need for long-term data, and perceived limitations of AI in language learning. In a nutshell, researching students' attitudes toward learning a foreign language via ChatGPT is relevant and important for advancing educational practices, optimizing language learning strategies, fostering global communication skills, improving efficiency and accessibility, and addressing ethical considerations in the integration of AI in education.

The aim of the research. This research endeavors to explore students' perspectives on AI in the context of learning and teaching Business and Law English, aiming to identify their fears, challenges, and optimism regarding AI integration in educational settings. Researchers in the

field of AI in language learning and teaching have adopted diverse methodologies to understand student perceptions.

Methodology. The researchers employed the chosen methodology to gain a comprehensive understanding of students' perspectives on the integration of artificial intelligence (AI) in foreign language learning, specifically in the context of Business and Law English. The methodology facilitated the exploration of students' fears, challenges, and optimism regarding the implementation of AI in educational settings. By utilizing a mixed-methods approach involving surveys, interviews, and observations, the researchers aimed to collect diverse and nuanced insights into students' attitudes and experiences with AI-driven language learning tools.

Drawing on the expertise of researchers such as Chen, Guilherme (2019), Haryanto, Mukminin, (2012), Jia (2009), Liton (2015) and many others the methodology was designed to gauge attitudes, uncover underlying reasons for sentiments, and observe real-time interactions with AI tools. This multifaceted approach allowed for a holistic examination of the subject, enabling the researchers to identify potential challenges, gaps, and areas of improvement in AI integration within language education.

The chosen methodology was instrumental in providing a thorough understanding of students' attitudes and experiences, offering valuable insights for educators, curriculum designers, and developers aiming to enhance AI-based language learning tools.

Methods. Employing a mixed-methods approach, data collection involves surveys, interviews, and observations to gather comprehensive insights on teaching English via ChatGPT. ChatGPT's conversational, adaptable, and personalized nature, combined with its advanced Natural Language Processing (NLP) capabilities, real-time feedback, and versatility, make it a compelling choice as an AI tool for teaching foreign language learning for specific purposes while taking into account students' attitudes and preferences.

Research Objective. This research aims to delve into students' perspectives on AI concerning the learning and teaching of Business English. The goal is to identify their apprehensions, challenges, and optimistic views regarding the integration of AI into educational settings. Researchers in the AI in language learning and teaching domain have adopted diverse methodologies to comprehend student perceptions, drawing on insights from Chen E., Lerman K., Ferrara E. GitHub (2020) work on student attitudes towards AI tools such as ChatGPT, Prof. John Smith's qualitative research methods, and emphasis on direct observation of students interacting with AI tools in real-time.

Research Participants and Design. The research involved a total of 127 participants, consisting of first-year students from Vilnius University Business School (VU BS) and a control group of 27 full-time law enforcement students from Mykolas Romeris University (MRU). The VU BS group exclusively studied Business English via ChatGPT, while the MRU control group focused on Law English for specific purposes without any AI ChatGPT implementation in their curriculum. Both groups were in their first year of study. The research utilized a questionnaire with 20 questions, designed after collecting student opinions on AI-integrated ChatGPT Foreign Language for Specific Purposes (FLSP) from November 2022 to February 2023. The scale, which was prepared in 3 point-Likert type, was transformed into a 3-grade form based on expert opinions, taking into account the age and grade levels of the students. These degrees are “strongly agree”, “partially agree” and “strongly disagree”. The methodology process

involved conducting surveys to identify candidate items for the questionnaire, aiming to understand students' perspectives on AI-integrated ChatGPT FLSP. The design of a Foreign Language Teaching and Learning (FLTL) curriculum/program for Specific Purposes (SP) was based on the regular Business module, comprising 64 hours or 5 ECTS, with a focus on the target language relevant to the disciplinary field (Business and Law). The primary objective of the curriculum was language acquisition in alignment with the subject course.

Data Analysis and Results. The collected data underwent a thorough analysis by two language education program professors and two AI assessment experts. Results indicated that 80% of surveyed VU students acknowledged the potential of AI, particularly ChatGPT, as a valuable tool in the classroom for foreign language acquisition. Over 70% felt that AI significantly motivated and enhanced their confidence in learning a foreign language independently.

Demographic Information. The survey provided insights into the demographic composition of the participants, with 95% falling within the age range of 18-22. University affiliation revealed that 100% of VU students actively used ChatGPT for learning Business English, while 100% of MRU students reported not using ChatGPT in class.

Regarding motivation to learn a foreign language via ChatGPT, 97% of VU students rated their motivation at 5 according to the Likert scale of a five (or seven) point that is used to allow an individual to express how much they agree or disagree with a particular statement (extremely motivated), while MRU students reported 0% usage of ChatGPT for language learning.

VU Students expressed high levels of stimulation and motivation (99%) for learning language via ChatGPT, appreciating its real-life conversation simulation (97%) and effective instant feedback (97%). However, a significant majority (98%) preferred a mixed approach, combining teacher-led instruction with ChatGPT.

Here's a representation of the data for the attitudes of Vilnius University (VU) students and Mykolas Romeris University (MRU) students toward AI in language learning.

TABLE 1. Hypothetical Attitudes of VU and MRU Students Toward AI in Language Learning

Attitude Category	VU Students (%)	MRU Students (%)
Extremely Positive	85	45
Positive	10	30
Neutral	3	15
Negative	1	8
Extremely Negative	1	2

In this data analysis, the attitudes of Vilnius University (VU) and Mykolas Romeris University (MRU) students towards AI in language learning were examined. The data suggests that VU students, representing 85% of respondents, generally exhibit extremely positive attitudes, with 95% providing positive responses overall. The majority of VU students (85%) reported being extremely motivated to learn a foreign language via ChatGPT, and 90% appreciated the real-life conversation simulation feature. Additionally, 85% found ChatGPT effective in providing instant feedback on language proficiency.

On the other hand, MRU students displayed a more diverse range of attitudes. While a significant portion (45%) expressed extremely positive attitudes if they could learn the foreign

language via use of ChatGPT, 10% indicated negative sentiments. For example, they mentioned that even without ChatGPT they are very motivated and this mainly depends on the qualification and motivation of the teacher who teaches the subject. In terms of motivation, 30% of MRU students reported being extremely motivated without AI, and 50% appreciated the real-life conversation simulation feature without ChatGPT but directly led the subject by the teacher. The effectiveness of instant feedback was acknowledged by 40% of MRU students. Surprising interesting was that both groups VU 87% and 92% MRU stated that learning a language involves not only linguistic competence but also the development of social and communication skills. Teachers provide opportunities for students to engage in meaningful conversations, debates, and collaborative activities, promoting a holistic language learning experience. VU 82% and 94% MRU claimed that Language learning can be challenging, and teachers play a crucial role in providing encouragement and emotional support. The interpersonal bond between teachers and students contributes to a supportive learning environment, helping students overcome difficulties and build confidence. Moreover, VU 89% and 91% MRU reported that Teachers can dynamically adapt to the unique dynamics of a classroom. They can adjust their teaching methods based on the collective needs and progress of the entire class, fostering a collaborative and cohesive learning environment. And finally, 82% from MRU students confirmed (VU 34%) stated serve as role models for proper language use, pronunciation, and communication etiquette. Students can observe and emulate these language skills in a way that might not be easily replicated by interacting solely with an AI-driven platform. This research questionnaire emphasizes the variability in student attitudes towards AI in language learning between institutions, highlighting the importance of considering diverse preferences and institutional differences when implementing AI in educational settings. The data suggests that VU students generally have a more positive attitude towards AI in language learning, with higher motivation levels, a stronger appreciation for real-life conversation simulation, and higher perceived effectiveness of instant feedback. In contrast, MRU students exhibit a more varied response, with a significant portion expressing positive attitudes, but also a noticeable proportion having neutral or negative sentiments.

This data emphasizes the importance of considering the diverse attitudes and preferences of students from different institutions, providing insights for educators and policymakers to tailor AI integration strategies based on the specific needs and perceptions of each group.

The results of the research indicate:

Strong positive perceptions among VU students, emphasizing stimulation, motivation, and appreciation for ChatGPT features.

A preference for a mixed approach, indicating a desire for a balanced integration of AI and traditional teaching methods.

Overwhelmingly positive attitudes towards AI, specifically ChatGPT, among VU students.

A notable acceptance and enthusiasm for AI tools, suggesting a growing inclination toward technological advancements in language education.

Recognition of AI, particularly ChatGPT, as effective in enhancing communication skills among students.

Specific insights into the perceived impact of AI on distinct language skills, emphasizing its relevance in language acquisition.

Personalized and engaging learning environments positively impact students' attitudes.

CONCLUSIONS

The survey results underscore a high level of acceptance and enthusiasm for ChatGPT-mediated language learning among VU students, particularly those studying Business English. While ChatGPT is viewed as effective in simulation and feedback, it is perceived as a valuable complement rather than a complete replacement for traditional teacher-led language learning. The findings highlight the potential benefits of AI integration in higher education, emphasizing the need for a customized approach that aligns with specific educational needs. The overwhelmingly positive responses among both university students, coupled with identified areas of skill improvement, suggest a fertile ground for the effective utilization of AI in language education.

The research advocates for continued exploration and implementation of AI tools to optimize the language learning process. The findings are anticipated to guide educators, curriculum designers, and developers of AI-based educational tools in addressing student concerns and maximizing the potential of AI integration in ESP education. The perceived effectiveness of traditional teaching methods, including student-teacher interaction, may influence educational practices. If there is a belief that direct interaction with a teacher yields better results in language learning, there may be less motivation to explore or integrate AI tools.

The adoption of AI in education often requires significant resources, including training for educators and infrastructure support. Educational institutions often have specific pedagogical philosophies that shape their approach to teaching and learning.

Students and educators may not be fully aware of the potential benefits of AI in language learning. Limited exposure or understanding of how AI tools like ChatGPT can enhance language acquisition might result in a preference for more traditional teaching methods.

The balance between student-teacher interaction and technology-assisted learning can vary widely among educational institutions, and preferences may evolve over time as awareness of AI's potential in education grows. Therefore, findings from research might contribute to pedagogical innovation, guiding educators in incorporating effective and innovative teaching methods that align with students' preferences and learning styles.

Overall, studying students' attitudes in foreign language learning for specific purposes is crucial for creating a more responsive, effective, and learner-centric language education system.

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DIGITAL PEDAGOGY: POSSIBILITIES AND PERSPECTIVES OF APPLYING A NEW WAY OF TEACHING AND LEARNING

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Abstract. In the 21st century, the life of society, the needs and expectations of students, and thus the teaching methods, the role of the teacher, have changed significantly, and as a result, a new concept of education - digital pedagogy - has been formed. Understanding the possibilities and perspectives of digital pedagogy allows educators to stay abreast of current trends, adapt to new technologies, and continuously improve teaching methodologies. The purpose of this article is to reveal the concept of digital pedagogy and the possibilities and perspectives of applying this new way of teaching and learning. The article analyzes the latest scientific literature, on the basis of which the concept of digital pedagogy, principles, and application possibilities in education are revealed.

Keywords: digital pedagogy, learning, digital technologies.

INTRODUCTION

Digitization and technological evolution have changed the perception of traditional professions' competencies. Currently, no profession is inseparable from the ability to know digital technologies. However, teachers are those persons who must not only know them, but also encourage them, be the first to apply them and teach children (Howell & McMaster, 2022). In addition, education is not static, it evolves with societal changes. Thus, the role of the teacher has changed significantly in the 21st century. Primarily because technological advances (artificial intelligence, robotics, etc.) have changed the nature of the skills students need. The modern education system must be based on the education of communication, cooperation, creativity, and critical thinking (Lunevich, 2022), in order to respond to changes in the organization of social life and work. In addition, it is claimed that the modern generation of children has grown up with video games and spends much more time using digital technologies than without them, so the learning habits and style of children have inevitably changed, which leads to a situation where traditional learning methods no longer work (Vitytė, 2016), it has been proven that increased access to open information sources has reduced students' desire and motivation to learn in structured environments and methods (Lunevich, 2022). This also led to changes in pedagogy, the relatively recent emergence of the discipline of digital pedagogy transformed the understanding of teaching and learning with the help of digital technologies (Bećirović, 2023). However, digital pedagogy is not only the application of digital technologies in the educational process, but rather a change in the philosophy of education, when digital technologies are integrated and combined with educational content in order to modernize teaching (Cabañero, 2022). Understanding the possibilities and perspectives of digital pedagogy allows educators to stay abreast of current trends, adapt to new technologies, and continuously improve teaching methodologies. Considering the development of the philosophy of digital pedagogy, it is appropriate to analyze what digital pedagogy is and how it changes the understanding of education.

The purpose of this article is to reveal the concept of digital pedagogy and the possibilities and perspectives of applying this new way of teaching and learning.

1. THE CONCEPT OF DIGITAL PEDAGOGY

Digital pedagogy is the new educational philosophy of the 21st century, characterized by complexity and versatility, so it is necessary to discuss the concept and principles of digital pedagogy in more detail.

1.1. Definition of Digital Pedagogy

Digital pedagogy is described in various ways in the scientific literature. Yadav & Ingole (2023) define digital pedagogy as the selection and use of digital technologies. However, other authors disagree and indicate that the use of digital technologies in the educational process alone does not define digital pedagogy, because according to Murty & Rao (2019) it is "teaching outside wall, seats, chalkboards, and podium - in short, enhancing the learning process through technology" (p. 2) Toktarova & Semenova (2020) describe digital pedagogy as a science of purposeful and systematic human formation activities, education and training, forms and methods using information technology and the Internet. And according to Ilaltdinova, Belyaeva, & Lebedeva (2019), digital pedagogy is a branch of pedagogic science that reveals the essence and regularity of digital education, "digitalized" educational process in the growth of personality, developing practical methods and their means to improve efficiency. It is also argued that digital pedagogy is the study of how to teach using digital technologies. In other words, it is not only the use of digital technologies, but also understanding what and how effectively the technologies of scientific practices can be used, what learning technologies can be applied to various digital technologies (Howell & McMaster, 2022). Santoveña-Casal & López (2023) recognized that there are various definitions of digital pedagogy in the scientific literature, therefore, they distinguished from all of them such features as the education of the use of technology and digital resources, the improvement and change of the learning experience, teaching through collaboration and play, personalizing education and aiming to do teaching and learning more active, flexible, high-quality, meaningful, engaging, motivating and stimulating ideas.

Thus, the concept of digital pedagogy is based on the fact that it is not enough to just learn to use one or several digital technologies, but it is necessary to constantly learn and improve in the field of digital technologies. This idea is based on the fact that technologies are constantly developing and changing, therefore educators must develop the habit of constantly being interested in new tools and incorporating them into the teaching process, looking for various ways of application. The key word here is customization, i.e. it is not enough to simply take advantage of the emerging technology, but it is appropriate to understand how to use the new digital technology so that it can be meaningfully incorporated into the educational context (Howell & McMaster, 2022). It may be stated that digital pedagogy is a part of pedagogy, the purpose of which is to create suitable conditions for the use of digital technologies and resources in order to create such educational situations that help to achieve versatile and changing educational goals (Istrate, 2022).

In essence, digital pedagogy is about using technology as a means to enhance the teaching and learning process, with a focus on effective pedagogy, student engagement, and the development of 21st-century skills in an ever-evolving educational landscape.

1.2. Elements and Principals of Digital Pedagogy

Yadav & Ingole (2023) indicate that the essential features of digital pedagogy are that education uses such digital tools and resources that best respond to the individual needs of students and the way of learning, education is based on collaborative learning and choosing the most appropriate digital technologies, students learn by asking and discussing with the teacher, and this process is dynamic and constantly changing, and both teachers and students simultaneously immerse themselves in the search for new experiences while learning. Therefore, in digital pedagogy, technology is used to enrich the interaction between teacher and student (Nanjundaswamy, Baskaran & Leela, 2021).

At its core, digital pedagogy emphasizes the application of sound pedagogical principles. It involves thoughtful consideration of how technology can support and enhance traditional teaching methods to achieve specific educational goals. It's not about technology for its own sake but about using it as a tool to improve the overall learning experience (Yadav & Ingole, 2023). Digital pedagogy involves the seamless integration of various digital technologies into the teaching and learning process, promotes student-centered learning approaches. It empowers students to take an active role in their education, encouraging collaboration, critical thinking, and creativity, leverages online platforms and collaborative tools to facilitate communication between students, educators, and even global learning communities, fostering a more connected and interactive educational experience (Biswas, 2022). All this corresponds to the principles of digital pedagogy presented in *Figure 1*.

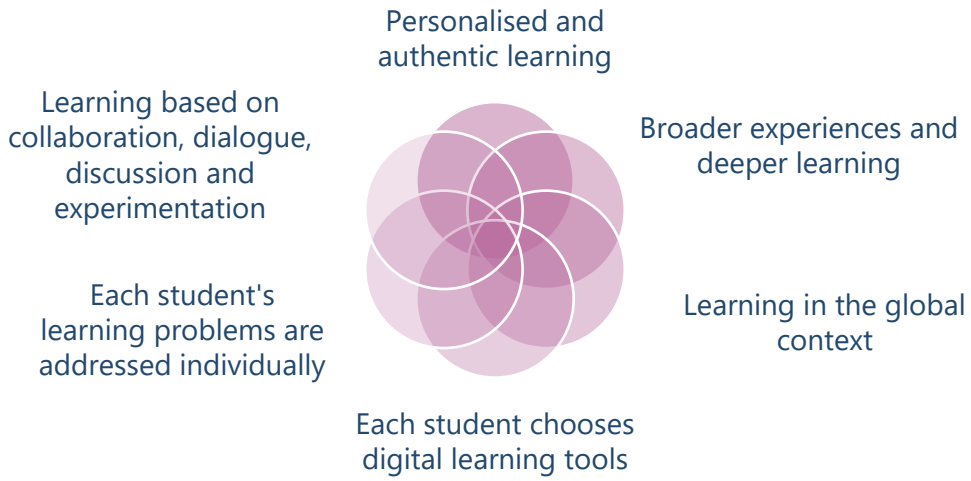

Figure 1. Main principles of digital pedagogy (Yadav & Ingole, 2023; Biswas, 2022)

From the teacher's perspective, digital pedagogy, according to Väätäjä & Ruokam (2021) and Cabañero (2022), is based on three pillars: pedagogical orientation (the teacher's understanding of effective teaching methods and strategies, depending on how inclined he will be to integrate digital tools into the educational process), pedagogical practices (the extent to which the teacher creates a technologically rich, creative and problem-solving-oriented teaching environment) and digital competences of the pedagogue (skills, knowledge related to digital technologies, i.e. the ability to integrate digital technologies into education). It is

argued that only such an educator who is inclined to improvise, experiment and respond to changes in the environment can implement the philosophy of digital pedagogy (Biswas, 2022).

2. POSSIBILITIES AND PERSPECTIVES OF THE APPLICATION OF DIGITAL PEDAGOGY

Lunevich (2022) states that the formation of knowledge and skills is not a finite process, and the result is never perfect and only through experience one can increase one's knowledge and skills, and digital pedagogy enables such experiential education. With the rapid advancement of technology, incorporating digital tools and platforms in education has become not only feasible but also necessary. Understanding the possibilities and perspectives of digital pedagogy allows educators to harness the potential of technology for effective teaching and learning.

The use of digital technologies empowers the student to act independently, with the help of technologies that can help realize their ideas. In this way, the student's creativity is released, self-reliance, responsibility, autonomy, self-confidence and other feelings are very important for effective learning and motivation (Nanjundaswamy, Baskaran & Leela, 2021). In addition, digital technologies are very important in promoting student engagement in learning. According to Girdzijauskiene et al. (2022), engagement is important because it helps students overcome difficulties, perform complex tasks, and develop competencies that are important not only in learning, but also in life. And low engagement leads not only to lower academic achievement, but also to reduced interest in learning, behavioral problems, increased burnout, absenteeism, or even dropping out of school.

Another important advantage of digital learning is that with the help of technology, education can be personalized by adapting tasks to the capabilities of each student, which is a great help to the teacher (Nanjundaswamy, Baskaran & Leela, 2021). The essence of personalized education is the satisfaction of students' self-directed learning, cognitive, emotional and social needs (Girdzijauskienė et al., 2022). In addition, it responds to the trend of moving from education for all to education for individuals, i. e. personalized education and training, recognizing that people's experiences, needs, aspirations are different and they learn at different paces and ways. Learning together becomes "social" - learning is done in partnership, in groups, in teams, in various social and virtual networks (Kondratavičienė, 2018). In other words, digital pedagogy enables these changes in the teaching paradigm and is a part of it, since it would be almost impossible to personalize education without the help of technology (Girdzijauskienė et al., 2022).

Digital pedagogy enables gamification of learning, which according to Vitytė (2016) is the latest trend in education and best responds to the learning characteristics of the new generation of students, as it includes essential areas: educational opportunities, entertainment and technology. The author singled out such gaming possibilities as game - based learning/digital game - based learning, serious games, edutainment, lecture games. However, gaming is not the only digital pedagogy tool, Murty & Rao (2019) indicate that MOOCs (Massive Open Online Courses), LMSs (Learning Management Systems), virtual and augmented reality, 3D models, online response systems (polls, surveys), cloud computing, video conferencing, blogs, audio, video recording, images and info graphic creation, social media, mobile apps and other information and communication technologies are a tool that can be used in digital pedagogy to enrich the learning and teaching processes. Yadav & Ingole (2023) indicate that one of the latest trends is the application of IoT and artificial intelligence. So, it can be said that digital

pedagogy offers interactive and engaging learning experiences, capturing the interest and motivation of students. This is especially relevant in a world where distractions compete for students' attention, making effective teaching methods crucial for successful education outcomes.

After systematizing the information on the possibility and perspective of the application of digital pedagogy in education, it is possible to distinguish perspectives of digital pedagogy that reflect how this philosophy of education will change education (*Figure 2*).

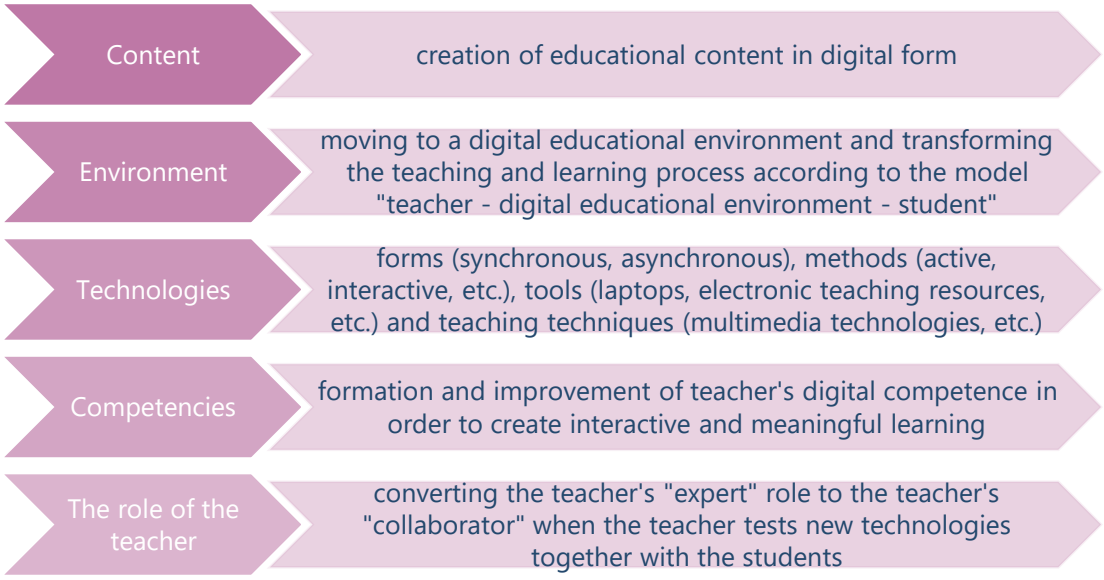

Figure 2. Perspectives of digital pedagogy
(Toktarova & Semenova, 2020; Howell & McMaster, 2022)

Main possibilities and opportunities of digital pedagogy that Murty & Rao (2019) determined are: facilitating independent learning (because the student can easily find information by himself with the help of digital resources), future adaptability (digital skills acquired at school can be useful in the labor market), economic (accessibility of information costs less), edutainment (using digital technologies can create animated, gamified, more engaging teaching materials), learning any where any time (enables distance, hybrid education), cultural communion (encourages cross-cultural experience for learners). Thus, digital pedagogy becomes "a vital part of the learning process" (Cabañero, 2022, p. 63), when the educator modernizes and harmonizes the educational process by combining all the most important elements of effective and successful education: content, pedagogy and technology.

3. CONCLUSIONS

In the ever-evolving landscape of education, the integration of technology has emerged as a transformative force, ushering in a new era of teaching and learning known as digital pedagogy. This paradigm shift goes beyond the mere introduction of digital tools in classrooms, it encapsulates a holistic reimagining of educational methodologies, pedagogical approaches, and the overall learning experience. Digital pedagogy not only leverages

technology to enhance traditional teaching methods but also explores innovative ways to cultivate critical thinking, creativity, and adaptability in learners.

The concept of digital pedagogy creates vast possibilities and perspectives that arise when educators and learners embrace the potential of digital pedagogy in reshaping the future of education. Digital pedagogy emphasizes the development of skills such as critical thinking, collaboration, creativity, and digital literacy, which are essential in the modern workforce. Digital tools facilitate personalized learning experiences, catering to individual learning styles and paces. This adaptability is crucial in addressing diverse student needs and ensuring a more inclusive and effective educational environment. In essence, digital pedagogy is about using technology as a means to enhance the teaching and learning process, with a focus on effective pedagogy, student engagement, and the development of 21st-century skills in an ever-evolving educational landscape.

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LET US BE VIGILANT: TECHNOLOGIES AND EDUCATION

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Abstract. The paper is dedicated for reflection on the recent events around the software Horizon, and the connected issues. The paper aims at discussing some of the dangers of un-vetted and un-critical employment of technologies and the mission of the education in the context. Methods of critical analysis of personal experiences and references were used for the development of the paper. The conclusions are provided that contemporary education (including higher education) must proceed with the mission it had for thousands of years: help people to learn to think critically, to cooperate, to exercise intellectual caution against established matter of things (that is, dogma), to ask questions, take up responsibility for immediate professional challenges, to look for many avenues of action, to ask for help, to provide help. The educational tools (work in pairs, in groups, discussions, debates, critical appraisal, critical commentary of one's or peer's work and other) are there; the aim is to use the tools when appropriate in order to avoid helplessness and fearfulness at the face of ever-increasing technological sophistication of a contemporary world.

Keywords: sophisticated technologies (including AI), faulty technology, dangers, mission of education, educational tools.

INTRODUCTION

For many years now, probably as many as 15 or so, I (surely, together with colleagues, among the most prominent and dedicated researchers in the field here in Lithuania is my dear friend and sister-in-arms in discussions, sometimes hearted ones - assoc. prof. dr. Edita Butrimė, but, surely, there are also others) am the one, who constantly - in publications nationally and internationally - call for critical thinking on technologies, their role, intersection between education and technologies.

While there is no doubt that technologies are extremely important in everyday life of a contemporary person and society, and in all walks of life, including education, however, it is extremely important to be cautious in the degree to which we sacrifice (willingly, after short deliberation, choosing seeming efficiency instead of in-depth attention to the matter, or unwillingly, without any thought at all) all our agency to technologies.

While I analysed these questions either personally or together with co-authors (see., e.g., Zuzevičiūtė, Butrimė, 2019), at times it seems, under the ever rising flood of the technologies, including the AI, that discussions are mute, that there is no point to address an issue any longer, because it is pointless, because the flood is too overwhelming. But the recent events amplified my worries and encouraged to revisit the issue.

The paper **aims** at discussing some of the dangers of un-vetted and un-critical employment of technologies and the mission of education in the context.

Methods of critical analysis of personal experiences and references were used for the development of the paper.

1. SOME OF THE DANGERS OF UN-VETTED AND UN-CRITICAL EMPLOYMENT OF TECHNOLOGIES, INCLUDING THE AI

Recently it came to my attention the tumultuous discussions that right now people in Great Britain are involved in[1].

Evidently, at the beginning of the century, a software, developed by the Japanese firm Jujitsu, hence - by a reputable firm, from a reputable country, which is important for this conversation - Horizon was installed in post offices all over the country.

It was faulty.

To a degree that instead of making the everyday performance more effective and helpful, it allowed - actually caused - grave accountancy discrepancies, post office operators were blamed, and even if many of them addressed the issue for the Post Office authorities, and even the Minister - their pleas fell on deaf ears. Many - hundreds! - of small post office operators went bankrupt, some of them were imprisoned for faulty operation of the software, moreover, there are evidences of four (at least four, because there may be others, still unaccounted ones) operators having committed suicide because of their ruined life financially and psychologically.

All this is still not resolved, not that the people who died may be resurrected, but what about those who still live on the ruins of their shattered lives.

In 21st century.

In Great Britain.

Because of a faulty software.

Thus, my dear Reader, I am sure, you will agree that this discussion is worth having. We should discuss the issue, and we should shout about the issue, and be constantly vigilant about the issue. Thus, this paper, though sometimes, surely, it may seem that the concerns I have may be caused by some degree of paranoia, but this scandal in Great Britain shows: no, the concerns are valid, and worth discussing.

In this paper I want to discuss three main statements/claims.

Firstly, the role of a personal responsibility in supervising the operations of the technologized processes. Namely: the crucial necessity to maintain vigilant attention to what is being done, to the quality of the processes, and to the results and the consequences; competence in technologies must be enhanced at least to some extent even if a person's profession is not technology-orientated.

Secondly, the role of education and each and any educator in the process. Namely: the crucial necessity to educate critical, independent, sufficient, may be even skeptical, responsible, flexible, brave thinker and at least to some degree competent technology user at any level of education, in any educational setting, for any profession.

Thirdly, cooperation, work in teams, reciprocity in professional activities (I would go as far as to argue that even in personal settings, such as banking, financial investments, e.g., pensions

[1] Post Office scandal explained: What the Horizon saga is all about (2024); accesed on 9 January, 2024, available at https://www.bbc.com/news/business-56718036, accessed on 9 January, 2024.

and similar) is crucially important (as, indeed, it has always been during the millennia of human history).

Regarding the first claim. If we still analyse the GB Post office scandal, the crucial facet of the story for this analysis is the fact that there were complaints, many of them, some of them reaching up the minister. And they all fell on deaf ears. The responsible authorities, instead of reacting to the signals of worried, later on - desperate post office operators, blamed them instead, told each of them that he or she was the only one complaining. It is difficult to phantom; how is it possible, instead of analysing situation, checking-re-checking it, automatically blame people and lie to them (that he or she is the only one). Why not check? Why not invest some energy in checking the system, rather than prosecuting colleagues, ruining them, putting them in jail? Any critically thinking person will just shrug their shoulders in disbelief at a chosen course of action. The same amount of energy, or even less, that was used to squash complaints and people's lives could have been used to check the system. Just out of curiosity may be, if authorities blindly believed in fault-free software, even if authorities did not see any 'rational' reason at first? What about responsibility? What about the duty to the sector you are responsible for? None of that triggered any audit of the system. Let me remind my dear Reader that at least - that we know of at the moment - four lives were lost.

What has already happened to the contemporary person's psyche that instead of addressing, checking another human being's concerns, we already tend to automatically believe a software. Where does it lead us, as a civilization? Surely, an opposing argument may be provided that the scandal was not caused by a 'belief' in software, but rather by pure laziness of those in authority to address the issue. Even if this may have been a reason for horrible developments, I am not inclined to ascribe a high degree of probability here, and not only because that will indicate people in authority being really, purely sinister. But also due to the fact that they worked hard: just instead of checking the system, they were prosecuting the victims of its faultiness. Here, surely, I am just speculating, but one of the important reasons for the blindness in the matter could have been either the fear of the technology, because the highly developed items of technology really supersede the level of competencies a person not privy to the sector could have. And this is in ten/hundred times more true in the case of the AI. As Arthur C. Clark put several decades ago: "*Any sufficiently advanced technology is indistinguishable from magic*."[2] Let us admit - how many of us really know how the AI works; isn't its operations already approaching that stage that A. Clark alluded to? Or - even worse - the fear to display one's lack of competence in the field. Thus, the automatic defense mechanism is switched on (Metzger, 2014). Rather than checking (more accurately - initiating the checking) of the software, which is so complicated that it becomes an entity superseding a humble, technologically uninitiated persons - thus, seemingly, faults-free, we will check human brother or sister, whom we definitely know to have a history or inclination to fault. Another aspect to address here (again, I am just speculating) is the fact that the software had been developed by a reputable firm, from a reputable country; again, a similar (may be even sub-conscious) bias might have caused the blindness. Because: how is it possible that a reputable firm's product is faulty, no way, these humble post office operators must be at fault…

Thus my argument for the validity of the first statement (the crucial necessity to maintain vigilant attention to what is being done, the quality of the processes, the results and the

[2] https://lab.cccb.org/en/arthur-c-clarke-any-sufficiently-advanced-technology-is-indistinguishable-from-magic/

consequences; competence in technologies must be enhanced at least to some extent even if a person's profession is not technology-orientated): in any professional (today - even personal) setting we must be attentive to what we do, what is being done, why it is being done and how it is being done. While I do not posit that each professional (and even each person in his/her personal capacity) must be competent enough to check the technology that his or her performance relies on (it is impossible in contemporary context of highly technologized life), but at least a person must be competent enough to formulate questions to professionals (engineers, software developers, etc.). Or have the courage to do so.

This argument leads to the second claim: the crucial necessity to educate critical, independent, sufficient, may be even skeptical, responsible, flexible, brave thinker and at least to some degree competent technology user at any level of education, in any educational setting, for any profession. While this mission for education (especially, higher education) has always been very important, today it increases in importance (e.g., for the safeguarding of democracy) (Krzywosz-Rynkiewicz et al, 2018).

For our analysis, it is evident that the possession of certain personal traits, such as bravery, flexibility, skepticism and possession of certain competencies, such as being able to think critically might have saved the day, had the people in authority had them. One may not - and will not - be in our complex world technologically savvy outside one's immediate professional field; and even then, the level will vary; but a person may be brave, flexible and competent enough to at least formulate questions for experts. That is, in educational settings it is impossible to acquire competencies outside immediate professional remit; but it is possible - it is crucial - to learn to ask questions, to ask for explanations rather than shy away from them. As the Post Office scandal has illustrated: when technology is involved, there is no place for defense mechanisms, no place for fear to show off one's lack of competence in specific field, because the results and then consequences are grave or even tragic.

In education we have the tools: discussions, debates, critical appraisal, critical commentary of personal, or peer's work are among those. Contemporary education has some of the tools for several thousand of years (such as Socratic dialogue), some of the tools are a fraction more recent. The challenge here is to use those educational tools, to integrate them in everyday classes lectures, seminars, laboratory work, demonstrations rather than emphasize just information (data, theories). While the idea about the need to help a person to acquire and develop skills of critical thinking, of exercising certain level of skepticism as an antidote for fanaticism and the dogma, which thus may lead to independent thinking, the progress, emancipation is probably as old as at least 2500 years or so. This idea is either directly formulated or alluded to in the works of Pluto, Aristotle (some of them attributed to Socrates), this idea, the same as the idea of democracy, is still valid, the same it has been through centuries. Moreover, there were times in human history when the idea (also, the idea of democracy) was stomped on, was derided, was forgotten; led to people mentioning the idea to be sanctioned or even killed (Teresevičienė et al, 2006). You frown: why oh why you, the author of this paper, remind us about that here, we know it, surely: critical thinking is a good thing as is democracy, why this lecturing?

Well, because of the Post Office Scandal. Evidently, we, contemporary people of the - oh so advanced - era, and even those of us in high positions, who, surely, received the best education available out there, either did not have critical thinking, or did not exercise it (in that case they were just corrupt and sinister). Then the discussion of course is pointless. Morality is beyond

the scope of discussion of this paper. But, if we put that aspect aside just for the sake of the argument, we are left with illustration of why critical thinking, independent thinking is so important in contemporary education. The fear of disclosing one's lack of competence is one of the main characteristics of an adult learner (Teresevičienė et al, 2006). This issue at the face of ever increasing complexity of technologies, also has to be addressed in education, especially, in higher education: there is no shame of not knowing things; it is a shame not to try out finding out what is going on.

In all educational settings the fact that technology may be faulty, that we will not understand it in many cases, but that we must check and re-check - with the help of experts - must be discussed. Actually, a healthy pitch of skepticism regarding the inner working of technologies and the experts' activities is also reasonable. Experts in specific field may be blind to certain aspects of the situation also, thus asking questions, receiving honest and detailed answers rather than an off-hand 'that is the way it's response is also important.

Information is an alluring siren because there is so much of it today. We, teachers in HE, barely mange cover the immediate and necessary for professional performance information just because our complex world has generated so much of it. And yet, as the Post Office scandal has demonstrated so compellingly, that the development of critical thinking, flexibility in thinking, also attention to personal traits, such as bravery, skepticism is necessary.

These arguments lead to the last the third claim (importance of cooperation). While the history of human kind is the history of cooperation, I know, I know, the argument: what about brutal wars. Well, there are two answers to that concern. Firstly, we - oh so modern and enlighten people run at least two well known of wars right now (in Ukraine and in the Middle East), not to mention several others (e.g., in Yemen), these are just not covered that much in media. And also, the brutal wars throughout history required extremely high degree of cooperation: when someone is in a battle, or campaign, there should be those who equip, who harvest, who deliver, who take care of the wounded and the killed ones. It may be claimed that human history is the history of the forms and re-configuration of cooperation formats. Without joint efforts people would have been unable to secure shelter and food, because without technology, they relied just on their own physical power, perseverance, intergenerational learning. It would seem that with the advancements in technology, e.g., modern agriculture does not need the drivers any longer, because the agricultural machinery may be (and in many advanced farms - is) operated remotely. Thus, the individualism. Thus, the alienation. We think we do not need each other any longer, because we have the automated processes to rely on for everything we need: to secure shelter, food, goods, entertainment, even health care. Well, until everything works.

And it does not. Horizon failure is a glaring example of that.

Not that I am advocating for ignoring social networking if everything works; on the contrary: I am all for encouraging young people to have hobbies, interests, to meet other people in person, to forge friendships and participate in smaller or larger communities. I am merely stating that superficially it may seem that a contemporary person is less dependent on another person. But - no: we are more dependent on each other now, if want to maintain the standard of civilization as we have it, because in the highly technologized world we are so reliant on the experts of each system for the system's success. The failures in the sophisticated systems mean that we are unable to step-in and take over a faulting system, because it takes decades of

education and practice to build the necessary competencies to run (and expand, advance) any given system.

Thus we, educational professionals, must emphasise cooperation in educational process. Again, we have the educational tools: students may be encouraged to work in pairs, in small groups, report on specific tasks to peers in groups, brief each other on a specific piece of information, comment, provide critical comments, compete. Seems simple. Yes, it is, but, while facing the challenges of the sheer amount of information that must be covered in education (including higher education), sometimes these educational tools are put aside.

2. CONCLUSIONS

Regarding the dangers of technologized (including AI) world the first one is the illusion of its continuity and its presence. The second one is that due to the high degree of sophistication of technologies we, uninitiated technologically (and actually, it is not possible for any person out of the 8 bln. living souls on the planet Earth, because of that specialised sophistication in each particular sector: agriculture, industry, medicine, transport) must rely on the systems working properly, and on the experts of any particular system maintaining that particular system properly, as we simply do not have competence (outside our immediate professional field) to do anything about it, in the case of failure.

Thus, contemporary education (including higher education) must proceed with the mission it had for thousands of years: to help people to learn to think critically, to cooperate, to exercise intellectual caution against established matter of things (that is, dogma), to ask questions, to take up responsibility for immediate professional challenges, to look for many avenues of action, to ask for help, to provide help. The educational tools (work in pairs, in groups, discussions, debates, critical appraisal, critical commentary of one's or peer's work and other) are there; the aim is to use the tools when appropriate in order to avoid helplessness and fearfulness at the face of ever increasing technological sophistication of a contemporary world. The dangers of un-vetted and un-critical employment of technologies may be at least to some extent countered by a critical stance in the matter, cooperation, asking tough questions, seeking experts' (and the second) opinion. It is imperative to address that in education, because the failures to do so are too expensive as the Horizon (think about the irony of the title) scandal has demonstrated, we must not allow technologies and their performance go un-vetted.

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STEAM IN ENGINEERING EDUCATION: METHODOLOGICAL APPROACHES AND TOOLS

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Abstract. STEAM (Science, Technology, Engineering, Arts, Mathematics) is a student-centered active learning approach which integrates multiple disciplines. It promotes creative thinking and develops students' problem-solving skills by applying technologies to real-life problems. The STEAM-Active project, which is developed under Erasmus+ programme, provides university engineering teachers with bibliographic review on STEAM approaches, protocol for designing STEAM teaching-learning sequences (TLS), e-learning course on STEAM, collection of TLSs for socio-scientific-technological problems. In addition to the description of project results, the paper presents the piloting results of one of the TLS.

Keywords: STEAM, problem-based learning (PBL), teaching-learning sequences (TLS).

INTRODUCTION

STEAM is an acronym for Science, Technology, Engineering, Arts, and Mathematics (Park, Wu, & Erduran, 2020). It was developed by adding Arts and humanities to the group of STEM disciplines in order to facilitate students' creativity and innovation learning (Mejias et al., 2021). Although STEAM concept has not been clearly defined, it is often presented as a student-centered transdisciplinary learning approach that employs problem-based learning to solve real-world problems using technologies (Quigley, Herro, Shekell, Cian, & Jacques, 2020). In the educational context, STEAM is often associated with active learning, solving real-world problems, working in groups, and high-level engagement in learning activities (Chu, Martin, & Park, 2019). It fosters 21st century skills, such as critical thinking, creative designing, ethics, powerful communication, collaboration for mutual benefit and trust (Belbase et al., 2022). Developed STEM-literacy results in the skills and competencies required for problem solving, interpreting data, and providing reasonable argumentation (Quinn, Reid, & Gardner, 2020). However, STEM/STEAM related frameworks rarely introduce equity aspect and lacks ensuring equal opportunities to the minoritized students (Jackson et al., 2021). It was demonstrated that exposing women STEAM experts encourages female students to pursue their carer in STEM subjects (Kijima, Yang-Yoshihara, & Maekawa, 2021). The comprehensive analysis on motivation in STEM courses from the perspectives of individual views, pedagogies, gender, time span help to design inclusive and student-centered learning experiences (Stolk, Gross, & Zastavker, 2021).

The STEAM-Active project ("The STEAM-Active project," 2022) aims to tackle engineering students' underachievement and gender inequality by providing university teachers with consistent STEAM-based teaching methodologies and tools. The project unites 7 contractual partners (The University of the Basque Country, Machine Tool Institute, Baden-Wuerttemberg Cooperative State University, University of Peloponnese, Kaunas University of Technology, University of Perugia, Pixel Association) from 5 countries (Spain, Germany, Greece, Italy, Lithuania). The partners contribute to the project by sharing their good practice in different

educational systems and approaches as well as creating the content related to STEAM approach.

The aim of this paper is to present the methodological approaches and tools created in the Erasmus+ project STEAM-Active and illustrate their practical application.

1. STEAM IN ENGINEERING EDUCATION

The STEAM methodology in engineering education is important as it enables to demonstrate different perspectives occurring in the real-life problems in the opposite to the isolated problem with clearly defined limitations and instructions. It also develops students' competencies and skills necessary to successfully operate later while implementing or creating innovations in the working environment.

The target groups of the STEAM-Active project are both university engineering teachers and engineering students. Well prepared teachers can guide students through the problem-based learning (PBL) process to obtain the desired skills and competencies by implementing a STEAM project, In the scope of STEAM-Active project, the education methodology is considered STEAM if it integrates content, skills, and beliefs of at least two disciplines used in the acronym and focuses on the real-life context with consideration of circular economy and fighting gender inequality. The results of STEAM-Active project, namely, the bibliographic review, protocol for teachers, e-learning course, collection of teaching-learning sequences for socio-scientific-technological problems are described in detail in further sections.

1.1. Bibliographic Review and Protocol for Teachers

The bibliographic review covers more than 60 articles related to the topics of "Definition and characteristics of STEAM", "STEAM intervention (teaching strategies, evaluation, …)", "Gender inequality", "Sustainability and circular economy", "Students' difficulties". For each article, a short summary and relevance to STEAM methodology are provided. It helps to understand the variety of approaches existing in the current educational systems and different strategies possible to apply in order to achieve the desired outcomes.

The protocol for teachers summarizes the bibliographic review by emphasizing the most important aspects of the STEAM methodology. It also introduces the framework for designing, implementing, and evaluating teaching-learning sequences (TLS) in engineering focused context as well as integration of the transversal axis (gender equality, circular economy). The protocol is supplemented with a STEAM-Active TLS structure which enables to design TLS for the entire TLS duration.

1.2. E-Learning Course

The e-learning course on STEAM in engineering education is dedicated for current and future engineering teachers. Its aim is to encourage university engineering teachers to use active teaching methodologies in the educational process and therefore produce meaningful learning which meets the needs of the future labor market. The course consists of three modules "Basis of STEAM", "STEAM Active approach", "Basis for designing a STEAM Active project". The modules present the theoretical description of STEAM, characteristics of STEAM education from the methodological, teaching, and teachers' perspectives, instructions for designing a

teaching-learning sequence. Besides the theoretical description, the modules include video and reading materials, tasks and activities.

1.3. Teaching-Learning Sequences

A collection of teaching-learning sequences (TLS) for socio-scientific-technological problems is published on the STEAM-Active project website. A TLS is presented as a detailed description of main guiding question, learning objectives, learning demands, learning pathway, activities, evaluation strategies and the relationship of the separate components, integration of the transversal axis. The collection includes TLSs titled "Cycling Tour and Tourism", "Battery Systems in Electric Transportation", "Electrical Efficiency of Building", "Intelligent Traffic Management", "Planning the Placement of Recycling Containers", etc. The TLSs vary in their difficulty level (bachelor, master), integration level (interdisciplinary, transdisciplinar, metadisciplinar), prior knowledge needed, tasks (carrying out a study, developing an app or machine learning model, designing and constructing hardware, etc.).

All TLSs published on the STEAM-Active website (steam-active.pixel-online.org) are reviewed and tested by the partner institutions. Because of the different context, time, and learning goals of the specific course, adaptability is a crucial feature of TLS.

2. TEACHING-LEARNING SEQUENCE IN PRACTICE

During the fall semester, the TLS "Planning the Placement of the Recycling Containers" was piloted by Kaunas University of Technology. Although the original TLS was designed as a semester group project for master students, it was modified and implemented as a group task for the 3rd year bachelor students by maintaining the key elements of TLS, such as task presentation, group work, presentation of the results, reflection. The recommendations for adaptation procedure are also provided in the STEAM-Active e-learning course.

The TLS was piloted in the 3rd year bachelor course "Numerical Methods and Algorithms" held in English. 12 students worked in 4 groups of 2-4 students. The task description is given in *Table 1*. The task covers sustainability issues by the topic itself. It includes subjects such as engineering, informatics, math, resource management. The task contributes to sustainability thinking by analyzing the topic related to responsible consumption and production (sustainability development goal 12), and critical thinking because the students have to create the objective function and evaluate the importance of the factors included in it and the function itself.

Students prepared a report describing their solution and presented the results in a seminar. The Q&A sessions took place after each presentation and raised active discussions on the various strategies to create an objective function.

TABLE 1. Description of task

Optimization problem. Planning the Placement of the Recycling Containers
The proper placement of the recycling containers leads to the increased quantity of the recycled materials (paper, glass, plastic) and therefore contributes to circular economy. However, it is difficult to find the proper placement for the recycling spots, considering the existing network of the recycling spots, the population density, the waste collection issues (especially in the old town district with narrow streets and high urbanization level). *Help city policy makers to decide on where 10 new recycling spots should be installed. Create the objective function and find the best coordinates for the new containers using gradient optimization. Provide comments on whether the optimized locations are good suggestions. If possible, visit at least one suggested place and evaluate the possibilities to install recycling containers there (it is suggested to take a photo of the environment to prove later discussion). What difficulties could the policy makers approach following Your suggestion?* *In the file You will find the coordinates X and Y of currently existing recycling containers (paper,glass, plastic). You must also consider additional demographic and economic parameters, for example, population density, average income in the area, or similar.*

After piloting the TLS, students' feedback has been collected. The students' comments were processed by keeping the adjectives and nouns only, converting plural nouns to singular form, and constructing all possible n-grams from a phrase. For example, the comment "it provided real world experience which can be applied in future projects" resulted in two phrases "real world experience" and "future projects", thus the following n-grams were constructed:

1-gram: real, world, experience, future, project;

2-gram: real world, world experience, future project;

3-gram: real world experience.

A word cloud constructed out of the obtained n-grams is shown in *Figure 1*. It is obvious that the most common words and phrases in the comments were "real", "world", "task", "problem", "project", "real world", "application". It demonstrates the importance for students to solve the problems relevant to them in the educational process.

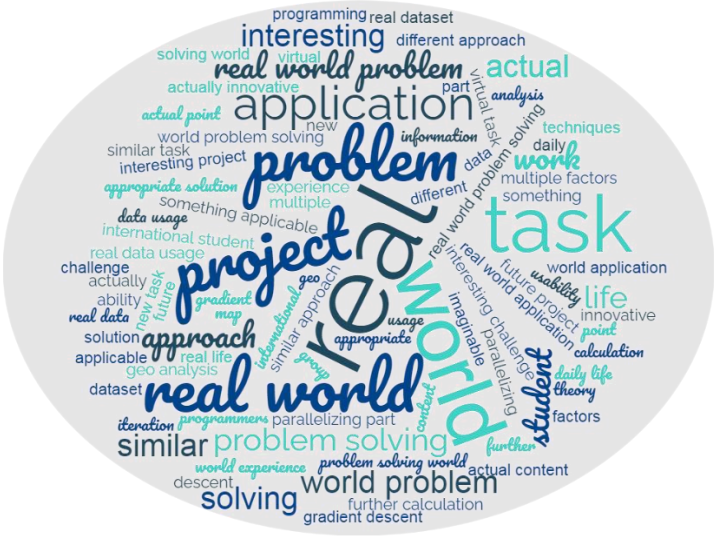

Figure 1. Word cloud generated from students' comments

In the final comments the students mentioned that "the project made us work to our full capacity", "I gained a new experience, through the new practice over the steam-active and found many solutions and ways for daily problems". The students noted the ability to experiment with various strategies and therefore construct their own optimization function with respect to the provided guidelines ("creating an equation of our own and applying the population factor was intuitive"). Working in groups of international students was also considered as the strength of the project.

3. CONCLUSIONS

The results of the STEAM-Active project enable university engineering teachers to apply the STEAM methodologies and tools in the educational activities by providing the theoretical knowledge on STEAM approaches along with re-usable and easily adaptable teaching-learning sequences on the topics related to circular economy and sustainability.

The TLS "Planning the Placement of the Recycling Containers" was piloted at Kaunas University of Technology during the fall semester. The piloting results clearly demonstrated that solving socio-scientific-technological problems relevant to students' daily lives helps them understand the benefits and limitations of applying numerical methods in problem solving and transfer the obtained knowledge to future projects.

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HE IN THE CONTEXT OF THE AI EXPANSION: STUDENTS' PERSPECTIVE

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Abstract. The paper is dedicated for the theme that captivated the imagination, the discourse and the time in numerous meetings, work-group forums and conferences in a recent year (actually, a bit longer, since the end of 2022, when the Chat GPT entered the global scene with the fanfare louder than one given for India after its successful Moon mission in mid 2023). While researchers and educators in higher education (HE) dedicated numerous hours to discussions about potential implications, advantages, shortcomings, risks, and gains of AI, our students continued with their daily lives. They worked on their term papers, studied for exams, went on with dating, juggling studies and part (sometimes full) time jobs, and continued using AI tools (Chat GPT is just one of the tools now available in busy market) without too much thought or furore. We discovered that particular perspective in informal discussions, debates with our students, however, a more structured study on the matter seemed warranted. The paper **aims** at presenting several theoretical considerations and the results of the empiric study on students' perspective on the AI expansion in higher education. **Methods** of critical analyses of references, theoretical considerations, reflection on personal experiences of authors and a two phase empiric study, involving respondents (students) were employed for the development of the paper

Keywords: higher education studies, expansion of the AI, students' perspective.

INTRODUCTION

When the Chat GPT entered the global scene, the fanfare was louder than one given for India after its successful Moon mission on 23 August, 2023[3]. While researchers and educators in higher education (HE) dedicated numerous hours to discussions about potential implications, advantages, shortcomings, risks, and gains of AI, our students continued with their daily lives.

They worked on their term papers, studied for exams, went on with dating, juggling studies and part (sometimes full) time jobs, and continued using AI tools (Chat GPT is just one of the tools now available in busy market) without too much thought or furore. We discovered that particular perspective in informal discussions, conversations with our students, however, a more structured study on the matter seemed warranted.

The **aim** of this paper is to delve the students' perspective on the AI expansion in higher education.

The **objectives** are organized around the **RQs**:

What are the main themes/issues analysed in recent studies, regarding the AI usage in higher education (HE)?

[3]Chandrayaan-3: India makes historic landing near Moon's south pole https://www.bbc.com/news/world-asia-india-66594520, accessed on 1 February, 2024

What is the students' perspective on the AI expansion in higher education?

Methods of critical analyses of references, theoretical considerations, reflection on personal experiences of authors and a two phase empiric study, involving respondents (students) were employed for the development of the paper.

1. AI IN HIGHER EDUCATION. WHAT DO WE ALREADY KNOW AND WHAT REMAINS TO BE EXAMINED

While two of the authors of this paper dedicated at least two decades for the analysis of the issues regarding intersection between education and the IT tools, indicating both positive and negative aspects (see, eg., Butrime, Zuzeviciute, 2014; Zuzeviciute et al, 2014 and many other nationally and internationally before and since), however, since the pandemic the situation changed. While the intersection between education and the IT tools used to be at the focus of the proponent-subculture representatives most often in higher education before pandemic, but since the pandemic started, all the members of the academic community (begrudgingly or not) joined the forces. Thus, our team expanded, and more research in specific study fields (such as humanities) are being carried out (see., eg.: Jatautaitė, Butrimė, Zuzevičiūtė, 2023).

While numerous researches and teams devoted their efforts for the issue, but due to its complexity, the further examination and research is useful because of there is the need for a sustained and expanded scholarly inquiry to delve deeper into the intricate layers of the issue, aiming for a more profound comprehension and potential solutions. This perspective underscores the iterative and evolving nature of scientific inquiry, acknowledging that persistent challenges often require ongoing dedication and exploration to achieve meaningful advancements. The analysis of recent studies reveals several main themes that are the forefront of research discourse. Fowler (2023) outlines the need to focus on academic ethical issues while using the AI. Shome (2021) indicated at least a potential for enhancing the pedagogy within the classroom. Elsewhere, Fowler et al (2023) note that the usage of the AI started changing the everyday performance of the HE, to the degree that the policies are being changed, which, we would add, is an absolute necessity (which we also witness and at times participate ourselves). The last three aspects are related to the fourth one, and namely, the fact that while the AI helps enhancing (at least potentially) the experiences in classes, and also the production of the academic documents, but also, there is a need to monitor the ethics. And this is being done (Swartz, 2023): the monitoring of ethical usage of the AI in studies is - itself! - being performed by using AI tools (there are many of that kind already). In other words, these concerns lead to certain ethical considerations, regarding the autonomy of a person, person's rights' possible infringements, impediment of personal space, etc.

Thus, the several main themes (though, surely, in such a complicated field many more aspects may be identified as important) are as follows:

AI potential for enhancement teaching practices in HE.

AI potential for enhancement learning experiences in HE.

AI and ethical considerations (two fold focus):

1. How to avoid breaching the authenticity of submitted work/product;
2. How to avoid breaching person's autonomy while monitoring potential breaching of authenticity of submitted work/product).

Aler Tubella et al (2024) note the need to already teach the usage of the AI in higher education as one of the important immediate steps in order to manage the dynamic situation.

This suggestion, also the issues around ethical, moral (at least two fold, which were indicated above, but there are other; due to the limitation for the scope of the paper, just some are addressed) discussions inevitably lead to the necessity to address the issue as a legal issue.

Ruschemeier (2023) outlines the complexity facing authors of any legal act attempting to address those complex issues. While it is quite common for human condition that the dynamics in social realities gets to be reflected in legal stipulations after some time[4], but we now face an exceptional situation. The dynamics of developments in the field of the AI tools is mind boggling, the potential advantages and disadvantages (including dangers) are overwhelming, thus the timely reaction is critical. Though the implied - evidently - extremely high level of technical expertise both in legal and especially - inner workings of software - only adds to the complexity of the task, the first attempts have been implemented.

The EU offered the first draft of the legal document[5], though it faced criticism and significant level of opposition, but, due to the changes in experienced realities in all walks of life (including higher education), the issue will have to be addressed sooner than later. While there are so many themes to be (already!) impacted by the AI tools (medicine, transport, law enforcement, arts), the comprehensive legal framework, most probably, will be extremely multifaceted.

For the time being, while the researchers in education and legal spheres, also in moral philosophy examine the possible implications for the humanity and its future, the attention on how these issues are perceived by students is warranted.

2. STUDY ON CONCEPTUALISATION OF THE AI IN HE: STUDENTS' PERSPECTIVE

In order to compare the theoretical considerations and also the results of analysis of personal experiences as teachers in HE and the results of extensive discussions in the field on the possible concepts that our students have regarding the matter, a two phase study was designed and implemented in Autumn semester, 2023. An anonymous approach was specifically undertaken in order to provide for the safe environment for sharing ideas. The general question/theme for in-depth discussion was formulated in order to eliminate the restrictions posed by a point of view inherent to a point of view that a researcher has.

The study was implemented in two iterations, during the first (N=37, the results are shared in a pending publication: Creativity studies, VGTU[6]).

While the during the second phase, the total N=29 shared their ideas.

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[4]Though also the opposite situation is possible and quite widely spread: for example, in the case of environmental issues. While there is a political will, then the legal acts prohibiting certain practices or promoting certain other practices are being adopted (that is especially valid in contemporary time); and then the society, its agents re-orientate themselves according to new legal stipulations, thus resulting in changed every day practices, in a changed experienced reality.

[5]Artificial Intelligence (Artificial Intelligence Act); https://eur-lex.europa.eu/legal-content/EN/HIS/?uri=celex%3A52021PC0206, accessed on 31 January, 2024

[6] Zuzeviciute V., Butrime E. (Publication pending). Creativity in contemporary higher education in the context of the artificial intelligence expansion

The procedure was the same during the two iterations, which were separated by one month. In both iterations students (N=66) in first study cycle participated, the age varied from 18 to 34; the variation is explained by the fact that in the sample 15 students study in part time studies, where majority of students have some professional experience and tend to join university later in their lives. In the sample men and women were represented almost equally. The results were processed together due to the fact that the same procedure was implemented and that only a month separated two iterations of study.

Procedure. Students were asked to discuss their opinions on the role of AI one their studies and on their professional activities (if they had such experience) and then: provide an anonymous feedback on the results of the discussion (researchers did not participate in either stage, did not participate in either phase of the study). Therefore the results are reflective of the genuinely authentic approach, are indicative of the subjective perspective of students, and that particular fact to some degree mitigates the evident **limitation** of the study. Limitation derives from a relatively small number of participants. The feedback was analysed; the contributions were grouped into certain categories.

3. RESULTS

The subjective perspectives of students (opinions, description, contribution items) were grouped, headings were applied; as they are presented in *Figure 1*.

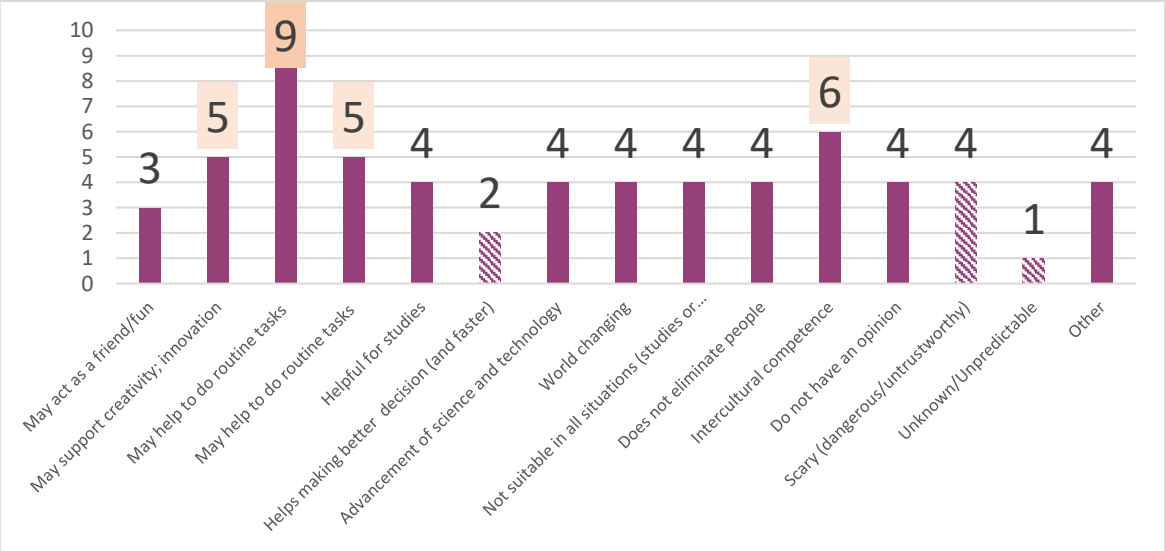

Figure 1. Respondents on the AI in studies (and - potentially - professional activities)

Analysis revealed that in most cases the interpretations in both iterations (the pending publication indicated above: Zuzeviciute V., Butrime E. (publication pending). Creativity in contemporary Higher Education in the context of the Artificial Intelligence expansion) were very similar, with the exception of three categories (shared only in the second iteration); in the second iteration the categories: "Helps making better decisions (and faster)"; also "Scary" and "Unknown" were identified (*Figure 1*). Whether the new input from students demonstrates their authentic changing perspective towards the phenomenon, or we are witnessing the

proliferation of teachers'/researchers' personal subconscious perspectives is not possible to identify at this stage. Yet, the fact that the majority (11-the same; 3-new) of categories remained the same and were reinforced in the format of additional input may lead to sufficient degree in confidence that the collected opinions are in most part reflective of the authentic opinions of students.

The responses, indicating students' perspective on the usage of the AI tools in higher education were re-arranged and compared to the results of the theoretical analysis, *Table 1*.

TABLE 1. Comparison between students' perspective on the usage of the AI tools in higher education and the results of the theoretical analysis (The authors recognize that a certain degree of subjectivity in analysis is unavoidable in this particular presentation of results)

Main themes in recent studies, regarding the AI usage in higher education (HE)	**The students' perspective on the AI expansion in higher education**	**Comments**
AI potential for enhancement teaching practices in HE.	Directly - none. May be this category may be attributed to some extent: Does not eliminate people (4)	This is **logical**, we were asking for students' perspective. Though still unexpected in the sense that students did not note any elements of usage of the AI in teachers' work, from teachers' perspective.
AI potential for enhancement learning experiences in HE.	May help to do routine tasks (9) May support creativity; innovation (5) Helpful for studies (4) Helps making better decision (and faster) (2)	
AI and ethical considerations (two fold focus) 1. How to avoid breaching the authenticity of submitted work/product and; 2. How to avoid breaching person's autonomy while monitoring potential breaching of authenticity of submitted work/product).	None	This is **surprising**: we, teachers, administrators in higher education emphasise the need for ethical and authentic work in studies (it seems no-one is exempt from making that kind of mistakes, though[7])
	New aspects (indicated by students):	
	Intercultural competence (6)	
	World changing (4)	
	Advancement of science and technology (4)	

[7]https://www.timeshighereducation.com/news/norwegian-minister-resigns-over-plagiarism-allegations

The categories, such as "Scary" or "Unknown/unpredictable" were not taken into consideration due to their evident ambivalence. The category "May act as a friend/fun' (3) has certain moral connotations addressed further.

However, the comparison demonstrates at least **two** issues.

Firstly, the students' perspectives are wider and have more facets on the issue than the theoretical analysis revealed (though, admittedly, the theoretical analysis may lack the depth due to limitations posed on the regular scope of papers).

Secondly, the students did not indicate any pre-occupation related to ethical considerations regarding production of work/term papers etc. This issue/theme occupies so much of the attention of researchers, teachers, and administrators in higher education, and yet it does not seem at all relevant from the students' perspective. It remains to be seen whether this is based on naiveté, lack of experience or other factors.

The category "May act as a friend/fun" (3) was not addressed in theoretical considerations - again - we admit the superficiality of analysis. However, the fact that the AI may act in that capacity in young person's life is worrying and adds to the complex task of contemporary higher education teachers, administrators: to build activities, opportunities for our students to find and maintain social relations with peers rather than to rely on an illusion of mistaken social connection with an algorithm.

4. CONCLUSIONS

Regarding the first RQ (What are the main themes/issues analyzed in recent studies, regarding the AI us age in higher education (HE)?) it was found that the several main themes are as follows:

AI potential for enhancement teaching practices in HE.

AI potential for enhancement learning experiences in HE.

AI and ethical considerations (two fold focus):

1. How to avoid breaching the authenticity of submitted work/product and;

2. How to avoid breaching person's autonomy while monitoring potential breaching of authenticity of submitted work/product).

It was also found that the changes require fine-tuning of policies in higher education and in creation of legal frameworks nationally and internationally.

Regarding the second RQ (What is the students' perspective on the AI expansion in higher education?) it was found that:

Firstly, the students' perspectives are wider and have more facets on the issue than the theoretical analysis revealed. Moreover, students recognize the transformative nature of AI, emphasizing its potential in cultivating intercultural settings within academic studies.

Secondly, unlike researchers, teachers, and administrators in higher education who express significant concerns, the students did not demonstrate any particular preoccupation with ethical considerations related to the production of academic work, such as work / term papers and etc.

Furthermore, it was discovered that, for some students, AI may hypothetically serve as a companion. This finding raises concerns and adds complexity to the responsibilities of contemporary HE teachers and administrators, because there is a critical need to design activities and opportunities for students to establish and maintain social connections with their peers, rather than relying on an illusory connection with an algorithm.

Finally, it is evident that there is a call for a deliberate and all-encompassing strategy to manage the influence of AI on higher education. This approach should involve adapting policies, addressing ethical considerations, and fostering genuine social interactions among students.

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DIMENSIONS OF DIGITAL ACADEMIC LEADERSHIP IN HIGHER EDUCATION: A SYSTEMATIC REVIEW

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Abstract. The concept of digital academic leadership (DAL) in higher education is advanced as an acceptable element in enhancing academic development across higher education contexts. This study employed a systematic literature review that mapped relevant literature on the topics of core dimensions of digital academic leadership. The database of sources consists of 39 articles on DAL published in the English language and in high-ranking journals between January 2003 and June 2023. The review highlights contributions to the literature on DAL and extensively expounds on the underpinning theoretical and conceptual frameworks to elucidate DAL. The result implies the dimensions of fostering the culture of DAL in higher education context.

Keywords: Digital leadership, academic leadership, higher education.

INTRODUCTION

The ongoing phase of the fourth industrial revolution, known as Industry 4.0, has sparked the commencement of digitalization and digital transformation with greater changes than ever before (Lu, 2017). Literature generally focuses on the positive effects of digital transformation (Sambamurthy et al. 2003). However, it can be a threat for traditional organizations if not managed correctly. Effective digital transformation requires skilled and competent leadership, leaders in Higher Education Institutions (HEIs) are not exempt from these changes, the leaders ought to be highly aware of all demanding challenges from investing in upskilled employees and deeply know how to motivate and inspire them (Antonopoulou et al., 2020). It is noteworthy that they be engaged in improving pedagogical strategies by implementing techniques and best practices that are effective in producing improved student outcomes in the digital environment (Orcutt & Dringus, 2017). Digital leadership can be beneficial for HEIs and it is a crucial parameter that is necessary to be promoted among academic leaders in higher education (Antonopoulou, et al., 2019).

As outlined by Aldawood et al. (2019), digital leadership is marked by steering direction, exerting influence, bringing about enduring change through information accessibility, and anticipating crucial shifts to enhance future educational accomplishments through relationship-building. Based on this perspective, there is a growing interest in the literature to articulate the key roles that leaders in the digital era should embody. Functions of digital leadership require a balance between embracing innovation and adaptability while maintaining a consistent vision and mission. Digital leaders need to take an active role in recognizing the need for change, as well as steering and utilizing change within their virtual teams. The highly interconnected landscape in which digital leaders function presents novel networking possibilities, especially with the prevalent utilization of digital platforms (Avolio et al., 2014). Scholars contend that adept digital leaders set themselves apart by their distinct ability to identify connections that yield tangible advantages (Cortellazzo et al., 2019).

Given the recent developments and the preliminary phase of exploration into digital academic leadership, there is a strong imperative for conducting a systematic review study. The systematic review will provide a nuanced understanding of core aspects of digital academic leadership. The primary objective of this research is to compile and assess the empirical literature concerning digital leadership in higher education, with a focus on addressing the following research question:

What are the core dimensions of digital academic leadership?

1. METHOD

1.1. Research design

Systematic literature review method was used in this study, as it integrates and synthesises the state of the art body of literature (Ratajczak, 2022). In the current study, we focus on qualitative research based on content analysis. Following Ratajczak (2022), the systematic literature review process in this article consists of three main steps: (i) identification of the databases and data collection; (ii) data analysis; (iii) synthesis.

1.2. Systematic searching strategies

The current study employed a PRISMA-based search strategy, illustrated in *Figure 1*, comprising three stages: (1) Identification - conducted on Scopus and Web of Science using "Title/Abstract/Keywords" for relevance, resulting in 1785 potential articles on digital leadership. (2) Screening - limited to English-language empirical articles from 2003 to 2023, leading to the exclusion of 1724 articles and retention of 61 relevant ones from the initially screened 1785.

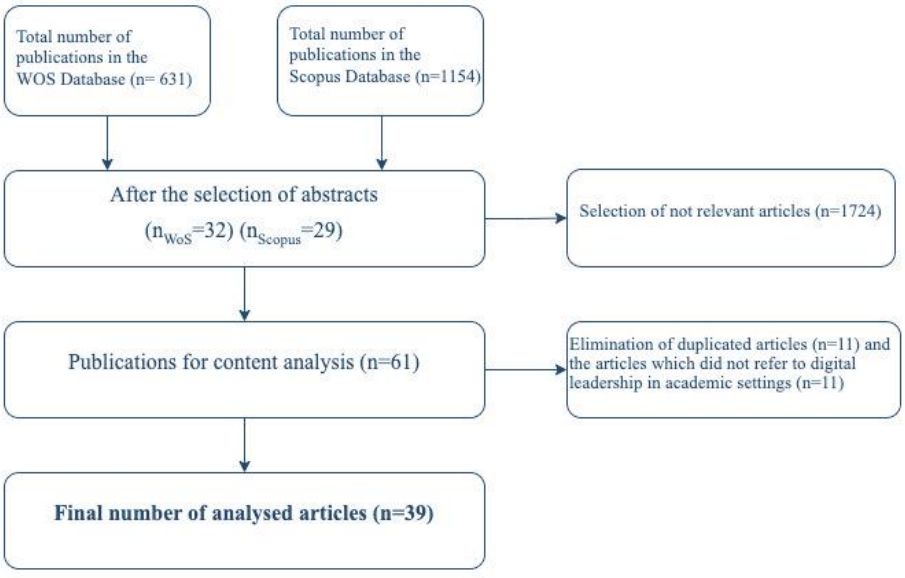

Figure 1. PRISMA diagram

(3) Eligibility, the eligibility process was utilized to exclude the remaining articles. After the selection of abstract, 61 articles were obtained. After removing duplicated articles, 50 articles were retained. Next, two researchers reviewed and assessed the contents and decide the full-text articles for analysis. A study that qualifies for inclusion must examine digital academic leadership and meet the following additional criteria: (a) Explore the following topics: investigate the conceptualization of DAL and main dimensions of digital academic leadership; (b) in HE settings; (c) Be published in a peer-reviewed English language journal from 2003 to 2023 (20 years). As a result, 39 full-text articles were selected for data analysis.

1.3. Data abstraction and thematic analysis

Thematic analysis was employed to identify trends, groupings, and relationships in the data. Two main steps were taken: 1) Generating themes from abstracted data using Microsoft Word and Excel, and subsequently grouping relevant data. 2) Employing MAXQDA2022 for a second round of analysis to unveil sub-themes, with theme and sub-theme names determined through consensus within the research team, allowing adjustments based on identified contradictions.

2. RESULTS

TABLE 1. Dimensions of dal from literature review

Theme	Category	Example code illustration	Article
Demonstrating Technology Vision	Technology Vision	Visionary leaders are prepared to change their purposes and behaviours as educators... and they emphasize the value of technology	S31
	Digital strategy	Digital strategy for digital transformation and leadership to be attained	S31
	Model for changes towards technology	E-leadership aims to change attitudes, feelings, thoughts, behaviours and performances of individuals or groups	S16
	Predicting potential adverse changes	Leaders need to be wary of change for some digital initiatives may be bad for teaching	S31
Raising digital awareness	Awareness	Leaders ought to be highly aware of all demanding challenges from investing in upskilled employees	S12
	Cultivating digital culture	Support the emergence of a transformation culture.	S14
Adopting technology	Technology leaders with digital skills	Learning how to integrate ICT into the leadership function	S19
Joint collaboration	Responsibility by various leadership levels	Various levels: the president, the vice-president, the vice-dean, head of the teaching and research department, and the director of ICT centres. All these positions take responsibility for ICT usage	S32

		and technology integration within the institution.	
	Academic ability and management competencies guide technology use	Builds a strong culture of trust, teambuilding and collaboration, and communication	S24
	Empowering others	Ability to find and synthesise diverse sources of information, to manage self, and to empower others	S15
Addressing challenges	Fighting resistance to change	University teachers need benefits and ways to fight resistance to change	S31

From the insights gathered by researchers on digital academic leadership, five fundamental dimensions of DAL have surfaced, as indicated in *Table 1*, including demonstrating technology vision, raising awareness, adopting technology, joint collaboration, and addressing challenges. Firstly, it is critical to have a technology vision (Ehlers, 2020; Msila, 2022; Yuting et al., 2022) for demonstrating technology vision and to apply digital strategy (Ehlers, 2020; Msila, 2022; Chang et al., 2022). Moreover, model for changes towards technology/initiating technological changes (Yuting et al., 2022; Hebert & Lovett, 2021; Yilmaz et al., 2020; Msila, 2022) is highlighted as well. In addition, it is essential to be wary of negative changing results or predicting potential adverse changes (Msila, 2022). Secondly, raising digital awareness (Chang et al., 2022; Msila, 2022; Antonopoulou et al., 2020) and e-culture / cultivating digital culture (Msila, 2022; Ehlers, 2020; Chang et al., 2022) emerged as the second dimension. Thirdly, adopting technology places emphasis on the necessity for digital academic leaders to possess digital skills (Yuting et al., 2022; Yilmaz et al., 2020; Dimitriadi, 2019; Chang et al., 2022; Msila, 2022). Additionally, collaboration appeared including responsibility by different leadership levels (Msila, 2022; Yuting et al., 2022; Hebert & Lovett, 2021), academic ability and management competencies guiding technology use (Chang et al., 2022; Hebert & Lovett, 2021; Yuting et al., 2022; Msila, 2022; Ehlers, 2020), virtual communication (Chang et al., 2022) and empowering others (Antonopoulou et al., 2020; Dimitriadi, 2019; Msila, 2022; Yuting et al., 2022). Finally, beating challenges (Msila, 2022; Chang et al., 2022) is highlighted as an important dimension.

3. DISCUSSIONS AND CONCLUSIONS

Based on the findings, five fundamental dimensions of Digital Academic Leadership (DAL) have been identified, including demonstrating technology vision, raising awareness, adopting technology, joint collaboration, and addressing challenges (fight resistance to change). This framework of digital academic leadership dimensions contributes to the literature by providing a comprehensive structure of what the digital academic leadership functions are.

However, little research has focused on raising digital awareness and addressing challenges. Hence, raising digital awareness, exploring the challenges of resistance to change and others, and how to overcome them are recommended as prospective areas for research. A good knowledge of DAL and skills of enhancing it are essential as they are the core of understanding

digital academic leadership and further comprehend how it works and benefits the achievement of academic members and students and also the overall institution performance.

In conclusions, DAL needs to strongly focus on the core processes of demonstrating technology vision, raising awareness, adopting technology, joint collaboration, and addressing challenges. This can be conducive to enhancing the understanding of DAL and its development and improving DAL in a comprehensive and systemic way.

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BLENDED TRAINING FOR ACADEMIC LEADERSHIP DEVELOPMENT: INSIGHTS FROM YOUNG ACADEMICS

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Abstract. In an era marked by transformative challenges in higher education, academic leadership (AL) assumes paramount importance. This study investigates young Chinese academics' perspectives on academic leadership development (ALD) and blended training through a sample of blended training program that integrate both traditional and digital training methods. And the findings showed that the blended training approach improved participants' perceptions and greatly contributed to the construction of academic networks and the accumulation of social capital.

Keywords: academic leadership, blended training, academic leadership training, young academic staff, academic leadership development.

INTRODUCTION

In the last three decades, the perception of leadership as an innate quality has shifted to the skills that can be developed (Reyes et al., 2019). The findings of many studies on leadership in higher education indicate that many leadership positions are held by academic staff with limited experience in academic roles and management responsibilities, with large gaps in academic leadership competencies and skills (Garwe, 2012; Dinh et al., 2021).

Young academic leaders, crucial for the advancement of higher education, are tasked with inspiring teams and maintaining high standards (Caliskan et al., 2021). Despite their importance, there's a lack of research on the competencies these emerging leaders need (Caliskan et al., 2021; Juntrasook et al., 2013). Academic Leadership Development (ALD) programs aim to fill this gap by enhancing knowledge, skills, and abilities, with evidence suggesting such training leads to positive outcomes (Arvey et al., 2006; Avolio et al., 2009).

Focusing on the context of higher education in China, there have been some advances in research on AL and ALD around aspects such as the definition of AL, the urgent need for academic leaders to enhance their academic leadership, and the ALD model that integrates human and social capital (Zhu and Zayim-Kurtay, 2018; Dinh et al., 2023). Despite these progresses, there are still questions about the effectiveness of this approach, especially in China. Therefore, this study investigated a blended ALD development programme in the context of higher education among Chinese academics, with a focus on the perceptions of young academic members and the practice of leadership development through blended training. The specific research questions are as follows:

What are young academic members' perceptions of ALD in the context of Chinese higher education?

What are young academic members' perceptions of blended AL training programmes in the context of Chinese higher education?

How does the blended AL training programme contribute to the practice of young academic leaders as reflected by the participants?

1. METHODOLOGY

This study adopted qualitative content analysis to analyse textual data from a blended AL training program, as part of the Erasmus+ support program, which involved 130 academic members over a four-month period in the autumn of 2021. The format of the program consisted of nine online lectures and two face-to-face seminars, incorporating expert lectures, group discussions, peer tutorials and roundtable discussions. Data collection involved transcribing the video and audio recordings of these sessions into text, which was then translated into English to ensure the privacy and anonymity of the participants.

Analyses were conducted using MAXQDA 2022 software, where 72 documents were coded to extract participants' perceptions of AL development and the impact of the blended training program. The coding framework was iteratively refined to categorise the data into relevant themes and sub-themes, and the reliability of the coding was ensured through a rigorous validation process, with a Cohen's Kappa test of consistency of 0.798. This process highlighted the methodology employed in the analysis of the data for this study, which ensured that the findings were accurate and reliable.

2. RESULTS

The analysis of data from the training programs through MAXQDA 2022 produced a table of codes that can be grouped into 3 themes: (1) Young academics' perceptions of AL development; (2) Young academics' perceptions of the blended AL training program; (3) The perceived effect of blended AL training program in improving the AL practice of young academic members and leaders.

2.1. Young academics' perceptions of AL development

By coding and categorizing the data, it is evident that young Chinese academics in this training program perceive two main themes: developmental approaches and purposes. There are 4 categories, and the details are shown in *Table 1*. The table's frequencies indicate the number of occurrences of relevant codes in the data. For instance, the frequency for applying AL styles flexibly in *Table 1* is 193, indicating that participants mentioned, and coders recorded such views 193 times. Young Chinese academics' perceptions of AL development emphasize deepening understanding, enhancing AL competencies through lectures and interactive sessions with experts, and embracing this innovative blended training and leadership knowledge in their academic practices within the context of Chinese higher education.

TABLE 1. Young Chinese academics' views on AI development

Dimensions	Categories	Most frequent codes	Frequencies
Content	Learning about leadership	Expanding knowledge; improving the understanding of leadership styles	44
	Applying AL styles flexibly	Adapting to different contexts, individual subjects, development visions, etc. Applying AL in a hierarchical or relatively flat organizational environment	193
Purpose	Self-improvement	Leading oneself; promotion; developing oneself	34
	Improving AL practices	Mobilizing academic teams; increasing the engagement of followers; motivating dealing with internal or external conflicts or challenges; academic leaders at different levels to improve leadership.	167

2.2. Young academics' perceptions of blended training programs

Regarding young Chinese academics' perceptions of the blended AL training program, in addition to achieving AL development, their perceptions revolved around 3 dimensions: sharing, growth, and social capital. *Table 2* illustrates their frequent mentions of the program's usefulness in these aspects. Examples include statements such as 'The program offered a platform to share experiences and challenges with others,' 'I had the opportunity to connect with experts in my field'.

TABLE 2. Young Chinese academics' perceptions on the blended AL training program

Dimensions	Categories	Most frequent codes	Frequencies
Sharing	Sharing problems, experience and achieving empathy	Generating or achieving empathy through sharing; Looking forward to getting help; Sharing experience	71
Growth	Growing together	Learning from each other and promoting each other; Making progress together, growing together; Leading the newcomers by experienced people and making progress together	52
Social capital	Enhancing social capital in AL	Knowing other scholars or academic leaders; Expanding contacts and networks	34
Achieving AL development: see *Table 1*			

2.3. The perceived effectiveness of blended AL training program in improving the practical skills of young academic members and leaders

Analysis of training program discussions identified three key areas essential for improving Academic Leadership (AL) practices: team leadership, problem-solving, and capability enhancement. Leading a team involves engaging and motivating the academic team, highlighting the value of strong team support as evidenced by successful academics who leverage teamwork for implementation tasks. Problem-solving addresses the challenges and pressures faced by young academic leaders, including career uncertainties and academic survival, with participants expressing a strong desire for support through the training. Enhancing capabilities focuses on the importance of developing leadership skills to effectively manage academic and administrative duties and to foster collaborative academic teams.

TABLE 3. The blended AL training program improves the AL practices

Dimensions	Sub-categories	Frequencies
Leading the team	Mobilizing academic teams	71
	Increasing the engagement of followers	5
	Motivating followers	12
Solving problems	Dealing with internal conflicts or challenges	42
	Dealing with conflicts or challenges posed by external factors	42
Improving capabilities	Learning how to improve leadership at different levels of academic leaders	45

3. CONCLUSIONS

The main purpose of this study is to understand the perceptions of young Chinese academics regarding AL development, and how blended AL training programs can improve AL practice. The study found that young Chinese academics value the acquisition of AL-related knowledge, such as leadership styles. They emphasize the importance of flexibly applying diverse academic leadership styles in practice, fostering self-reflection, and making timely adjustments to enhance AL practices. Consequently, young Chinese academic members should strengthen their knowledge and deepen their understanding of leadership theories in their daily work and switch the corresponding coping strategies and behaviors in their research, student affairs, and administrative work. By actively addressing internal and external challenges, promoting teamwork, and maximizing their AL in practice, young academics can enhance their personal and career development.

The blended Academic Leadership (AL) training program, tailored to the context of Chinese universities and incorporating perspectives from European higher education, features modules

delivered by experts from both regions. This approach enables young Chinese academics to gain substantial AL knowledge and adapt AL styles to their organizational contexts, fostering ongoing development and understanding of AL. Diverging from traditional leadership training's doctrinal approach, this blended program emphasizes critical engagement and practical application. Participants effectively translated the insights from these sessions into their professional roles, focusing on team leadership, problem-solving, and capability enhancement. The program's structure, combining theoretical knowledge with practical application and reflection, supports participants' AL development without disrupting their daily responsibilities, advancing their leadership practices significantly.

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DIGITAL MANAGEMENT AND DIGITAL MANAGEMENT AT SCHOOL

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Abstract. In the digital age, organizations must inevitably adapt to digital innovations and the advantages they require. As digital management involves using digital tools and methods to carry out processes, speed up operations, and increase efficiency, the use of digital technologies has become crucial in all areas of life, especially in business. This study aims to reveal and understand the concept of digital management and its place at schools as educational organizations.
Digital management also has become a significant concept in education sector, especially during the pandemic. Schools must respond quickly to innovations, threats, and opportunities in turbulent times. For this reason, digital technologies are used for management information systems, virtual learning environments, and administrative processes. They have become integral to contemporary education, as people organize their lives with digital devices, and educational work takes place on a virtual basis.

Keywords: Digitalization, Management, Digital Management.

INTRODUCTION

In recent years, with the challenges emerging as a result of changing environments and technological improvements in the world, organizations has needed to leave their traditional management styles and met with new technologies. This made them develop or implement new management styles adaptable to those changes and tackling the challenges. Until then, they have used technology in some parts of their operations and processes, but later they have had to change their management and working styles. This process called the digital transformations of the organizations. With the changes in business environment a number of management styles or expressions that define the managerial competencies and management processes of organizations in this sense, such as change management, crisis management, management of turbulent periods, innovation management, and digital management, have found place in the literature.

The concept of digital management, originally emerged from the business world, then, has been implemented into the educational sector as well. This integration has become particularly relevant as educational inputs and environments are exposed to constant changes.

Digital management at school refers to the strategic use of technology to carry out administrative tasks, enhance teaching and learning processes, and improve overall school operations. This approach not only modernizes school operations but also helps in preparing students for a tech-driven world.

1. DIGITAL MANAGEMET

If digital management can be defined as the role of digital transformation in corporate management, this would not be a wrong definition. Because digital transformation is defined

as the changes that digital technologies affect human life in every sense (Kaplan et al., 2010). Therefore, in the current digital age, it is not possible for institutions, like humans, to remain insensitive to digital innovations and not benefit from the advantages offered by technology. The internet of things, ranging from smartphones to smart televisions, from smart homes to smart vehicles and even smart cities, has become one of the routine concepts of today's life. No doubt, technology has made people's lives so much easier, human power has now been replaced by mind power, and technology is evolving towards artificial intelligence applications that can replace the power of the human mind. Digital innovations, new technologies and advanced methods of data use, almost completely affect and change the business processes of institutions. With digitalization, digital information including big data creates new ways for institutions to improve their activities and strategies. Social media and new communication platforms support companies to establish new relationships with partners and customers, while also requiring organizations to manage their communications internally and find new ways to communicate with their stakeholders.

Within this context, digital management, which briefly refers to the management of organizations through digital tools and methods according to the requirements of the digital age, generally means effectively planning, organizing, leading and controlling corporate activities using digital technology and tools. This definition may include the application of digital solutions to strengthen decision-making processes, speed up operations, and increase overall efficiency within the organization, as well as the use of digital platforms, data analytics, automation, and other technological tools to optimize business processes (Westerman et al., 2014).

We experienced once again how technology makes our lives easier, especially during the epidemic that affected the whole world. While official institutions and businesses have switched to remote working method, educational institutions have also switched to distance education in this process, and the use of digital technologies has become inevitable in all areas of our lives, especially in business life. Therefore, companies, institutions and organizations need to cope with difficulties such as the epidemic process we are in and learn to understand these radical changes in order to adapt to such suddenly changing situations.

Suklabaida and Sen (2013) claim that digital management, which simply means managing institutions and organizations with digital tools, refers to the processes of planning, implementing and monitoring programs, projects and activities with information and communication technologies.

Digital management, as a process of digitalization and robotization in corporate activities, covers stages such as data collection, data processing, operational decision-making, and preparing data for strategic decisions, and humans play a key role in achieving success in the management of these processes.

According to Kindler (2019), networking, openness, agility and participation are success factors for digital management. The complexity of digital transformation requires the disclosure and distribution of information. Internal knowledge carriers in the organization should also be networked and experiences used collectively.

2. MANAGEMENT PROCESSES IN THE DIGITAL AGE

Management processes are the backbone of organizational success, encompassing planning, organizing, leading and controlling to achieve goals efficiently. In the context of the digital age, these processes are undergoing significant transformation through the integration of digital technologies and tools.

When we consider management processes in terms of digital management, we encounter the following picture:

2.1. Planning

- Traditional Management

During the planning phase, organizations set goals, define strategies, and develop plans to achieve goals (Drucker, 2007).

- Digital Management

Digital tools enable more complex data analysis and predictions. Artificial intelligence (AI) and machine learning algorithms and big data analytics help organizations make data-driven decisions, improving the accuracy of forecasts and planning (Davenport and Harris, 2007; Chen et al., 2012).

2.2. Organizing

- Traditional Management

Organizing involves structuring tasks, roles, and responsibilities to ensure effective implementation of plans (Fayol, 2005).

- Digital Management

Digital tools such as project management software, collaborative platforms, and cloud-based systems facilitate virtual teamwork, document sharing, and real-time collaboration, eliminating geographical barriers and increasing organizational agility (Bassamboo et al., 2013; Leonardi, 2014).

2.3. Leadership

- Traditional Management

Leadership involves motivating and directing employees to achieve organizational goals (Bas, 1985).

- Digital Management

Digital leadership includes effective communication, remote team management, and the ability to leverage technology to foster a culture of innovation. Virtual leadership skills are becoming indispensable in the digital work environment (Cascio and Shurygailo, 2003; Avolio et al., 2014).

2.4. Control

- Traditional Management

Control involves monitoring performance against objectives and making necessary adjustments. (Koontz and O'Donnell, 1959).

- Digital Management

Digital technologies provide real-time data and analytics, allowing organizations to instantly track performance metrics. Key performance indicators can be tracked in real time, facilitating agile decision-making and rapid adjustments to strategies (Laudon and Laudon, 2016; Marler and Boudreau, 2017).

2.5. Communication

- Traditional Management

Communication is very important to convey information and ensure a common understanding among team members (Fayol, 2005).

- Digital Management

Digital communication tools such as video conferencing, instant messaging and collaboration platforms facilitate seamless communication within and across teams, regardless of geographic locations. This is especially important in the context of remote or distributed teams (Majchrzak et al., 2013; Leonardi and Meyer, 2015).

2.6. Innovation

- Traditional Management

Organizations strive for innovation to remain competitive and adapt to changes in the business environment (Drucker, 2009).

- Digital Management

Digital technologies play a central role in fostering innovation. Technologies such as artificial intelligence, internet of things (IoT) and blockchain can be applied to create new products, services and business models, transforming industries and markets (Westerman et al., 2014; Bughin et al., 2018).

2.7. Risk Management

- Traditional Management

Organizations assess and manage risks to protect their interests and assets (Chapman, 1997).

- Digital Management

With increasing dependence on digital systems, cybersecurity is becoming a critical component of risk management. Protection against data breaches, cyber attacks and ensuring data privacy are an integral part of digital risk management (Siponen and Vance, 2010; Dey et al., 2019).

2.8. Decision Making

- Traditional Management

Decision making involves selecting the best course of action to achieve organizational goals (Simon, 2013).

- Digital Management

Digital technologies, including data analytics and artificial intelligence algorithms, enhance decision-making processes. For example, predictive analytics helps organizations anticipate future trends and make informed decisions. (Chen and Zhang, 2014; Wamba et al., 2017).

3. DIGITAL MANAGEMENT AT SCHOOL

The concept of digital management, first has entered the literature in the fields of business and public administration globally. However, rapidly changing environments and technological improvements necessitate adapting digital management to the field of education, especially during recent epidemic period.

Digital management in schools has emerged as an approach that refers to the integration and use of digital tools, technologies and strategies in schools to improve various aspects of school management, teaching and learning. Digital management processes in schools provides improving administrative efficiency, teaching methodologies and overall educational outcomes. Adoption of digital management practices by schools, which aim to facilitate various processes and provide a more effective and dynamic learning environment in today's digitalizing world, will make a significant contribution to the steps of improving efficiency, communication and general education results, and will also make management more transparent to school stakeholders.

- **School Management Systems**

School management systems are comprehensive digital platforms that integrate a variety of administrative tasks such as student information management, attendance tracking, grade reporting, and communication (Smith and Brown 2018).

- **Learning Management Systems**

Learning management systems platforms facilitate the delivery of educational content, assignments, and assessments. They also support collaboration and communication between students and teachers (Johnson and Anderson, 2019).

- **Communication Platforms**

Digital communication tools such as email, messaging applications, and online forums provide effective communication between teachers, students, and parents (Clark and Mayer, 2019).

- **Data Analytics in Education**

Data analytics tools help schools analyze student performance data, identify trends, and make data-driven decisions to improve educational outcomes (Baker, 2019).

- **Safety and Security in Educational Technology**

Ensuring the security and privacy of student and school data is crucial. References in this area may cover topics such as data protection laws and cybersecurity measures (Grimson and Barth, 2017).

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UNVEILING PERSPECTIVES: A QUALITATIVE EXPLORATION OF PROSPECTIVE AND PRIMARY SCHOOL TEACHERS' INSIGHTS ON VIDEO-BASED MATHEMATICS SCENARIOS FOR ALLEVIATING MATH ANXIETY

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Abstract. This qualitative research delves into the nuanced perceptions of prospective teachers and primary school teachers regarding a video library designed to address math anxiety through scenario-based mathematics activities. With responses obtained from open-ended questions, feedback and recommendations were collected. The study provides an in-depth analysis of participants' experiences and viewpoints. Five countries participated, contributing to a rich tapestry of qualitative data. The research identifies key themes, challenges, and successes as narrated by the participants, offering valuable feedback for the enhancement of video content and instructional approaches. The findings not only illuminate the intricacies of addressing math anxiety but also provide actionable recommendations for educators and younger future teachers to better cater to the diverse needs of students and the challenges they encounter in the learning process.

Keywords: Mathematics Anxiety, Video-Based Learning, Teacher Perceptions, Prospective Teachers Feedback.

INTRODUCTION

One of the great concerns of the period in which we live is the fight against anxiety, especially anxiety in children. The most severe symptoms and forms can be assessed more easily in adults and adolescents (Balt et al., 2022). More and more studies show that children become anxious and show signs of anxiety since primary school (M. Ashcraft & Faust, 1994; M. H. Ashcraft, 2002; Kucian et al., 2018), namely math anxiety. Anxiety in mathematics has become a direction of interest for many researchers (Andersson, 2007; Balt et al., 2022) who try to make a connection between learning difficulties in mathematics and the conditions in which these difficulties appear. Knowledge of elementary mathematics is an important skill for every individual, a skill used every day and it is necessary for the development of the individual in various fields. Society benefits from individuals in society with high mathematical skills (Skagerlund et al., 2019). Early prevention of anxiety from the first signs of appearance or even the removal of factors that can lead to anxiety can generate success and skills in mathematics (Balt et al., 2022). This paper highlights the existence of the application of other modern methods of teaching mathematics, a sure way to reduce mathematics anxiety through the application of educational robots.

1. DEFINITION OF ANXIETY

Anxiety is defined as a state of restlessness, and tense expectation, accompanied by palpitations, embarrassment in breathing, etc., found in some nervous disorders (dexonline, f.a.). Understanding this definition has led to the development of the concept of anxiety and various models of emotion, which can in a finite number of emotions, be fundamentally different (McNeil et al., 2012; Haase et al., 2012).

However, mathematics anxiety can lead to various negative effects throughout the academic and social lives of affected children (Krinzinger et al., 2009; Balt et al., 2022; Kucian et al., 2018). More and more studies show that children can be anxious in two forms: when writing an assessment test or in mathematics lessons which can be related to fear of the teacher (Luttenberger et al., 2018). These two forms are addressed in 3 different ways: cognitive (concerns about failing an assessment); behavioral (trying to avoid certain situations); and physiological (emotions leading to panic) (Petruț & Visu-Petra, 2020).

It is important for children to know and be able to apply mathematics from primary school onwards. Anxiety can be seen in simple math tests: in arithmetic operations with whole numbers, in multiplication of numbers and very often in solving word problems (Ashcraft, 2002). It is known that when children do various mathematical calculations and when they apply the mathematics they put a great mental effort, but they need an even greater effort when solving word problems because they involve a complex process of reading, understanding and transcribing into a mathematical model, the greatest effort is on the working memory, which has an important role in the successful understanding of the problems and its solution (working memory) (Andersson, 2007; Kucian et al., 2018)

2. METHODS TO COMBAT ANXIETY

The causes of the onset of mathematics anxiety can differ from child to child: it can be related to the experiences they have, parental pressure to perform well in school, or the methods taught and the teacher who teaches (Haase et al., 2012) (Luttenberger et al., 2018). Whatever the causes of the onset of anxiety an important role in preventing and removing the early signs of anxiety is played by the teacher who teaches mathematics and the methods they apply (Furner & Duffy, 2022). The existence of increasingly advanced modern technologies leads to the necessity of their application in instruction, having multiple benefits among which with a special place is to reduce anxiety in mathematics (Hak, 2014). From the multiple possibilities of application of technologies, the teacher is the one who chooses and validates their benefits in different directions, one side of current technology in instruction is also the application of educational robots. The specialty literature offers many possibilities for choosing various tools for teaching-learning mathematics, tools that can encourage students to participate in interactive activities, cooperate and collaborate, help each other and understand mathematical concepts. This would be one of the directions to combat anxiety as a collaborative tool (Hak, 2014).

Teaching staff are the conductors of learning and the main actors in the didactic approach. They need learning support in terms of technologies applied to teaching and learning. A trend for teacher training is becoming video-based learning. Learning based on video-scenarios has become a new and useful tool for improving the professional vision of future teachers (Stark et al., 2023; Galatsopoulou et al., 2022).

3. METHODOLOGY

Research Design

This study employed a qualitative research design to delve into the perspectives of both prospective and primary school teachers on the effectiveness of video-based mathematics scenarios in alleviating math anxiety. The qualitative approach allowed for an in-depth exploration of participants' experiences and insights, providing a nuanced understanding of the phenomenon under investigation.

Participants

The study collected responses from a diverse sample of 367 participants, including 232 pre-service teachers/students and 135 primary school teachers. The participants were drawn from five countries: Romania, Lithuania, Turkey, Latvia, and Poland. This international scope ensured a broad range of perspectives, enriching the study with cross-cultural insights.

Data Collection

Data were collected through an online survey, which included open-ended questions prompting participants to share their thoughts on video-based mathematics scenarios and their perceived impact on math anxiety. The survey was distributed to participants in their respective languages, ensuring accessibility and cultural relevance.

Instrument

To analyze the textual data obtained from the survey responses, the Voyant software was utilized. Voyant offered a comprehensive text analysis platform, enabling the identification of recurring themes, patterns, and sentiments within the participants' narratives. This software facilitated a systematic and efficient exploration of the qualitative data.

The qualitative analysis involved several steps. First, the survey responses were transcribed and entered into the Voyant software. The software then generated visualizations and quantitative data on word frequencies, patterns, and co-occurrences. Following this, a thematic analysis was conducted to identify overarching themes and subthemes within the participants' narratives.

Ethical Considerations

This study adhered to ethical guidelines, ensuring the privacy and confidentiality of participants. Informed consent was obtained from all participants, and they were assured that their responses would be anonymized and used solely for research purposes.

Trustworthiness

To enhance the trustworthiness of the findings, measures such as member checking and peer debriefing were employed. Member checking involved sharing key findings with a subset of participants to validate the accuracy and authenticity of the interpretations. Peer debriefing involved seeking feedback from colleagues and experts in qualitative research to ensure the rigor and credibility of the study.

Research questions

1. What insights do prospective and primary school teachers share regarding their experiences with the video library, and how do these insights contribute to a deeper

understanding of the challenges and successes in using scenario-based learning for math anxiety reduction?

2. Are the qualitative narratives nuanced by cultural and demographic factors and how can these narratives inform the development of tailored strategies for diverse educational contexts?

4. RESULTS

The analyzed text corpus has 9,756 total words and 1,387 unique word forms. Most frequent words in the corpus were (*Figure 1*): students (122); videos (107); mathematics (89); think (71); learning (71).

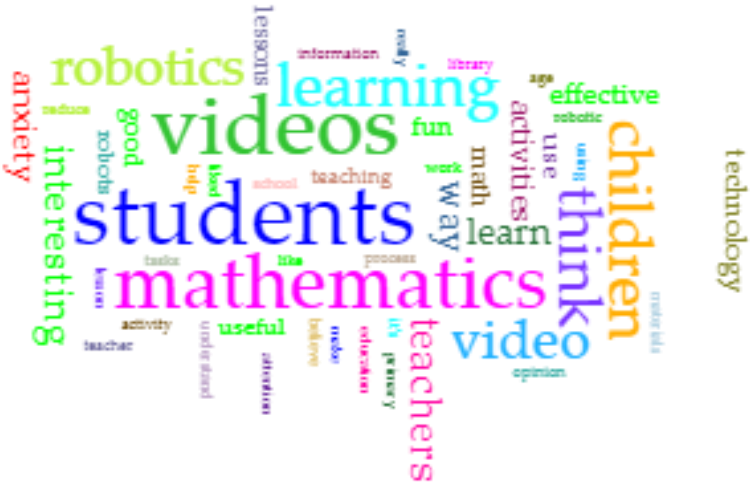

Figure 1. Most repeated words in overall answers

The consensus among participants emphasized the perceived utility and effectiveness of the videos. Many respondents characterized the materials as valuable resources that not only engaged them personally but also held great promise for enhancing the learning experiences of students. The positive sentiments extended to descriptors of videos such as "useful", "effective" and "good" signifying a unanimous appreciation for the quality and impact of the video library. Resșondans strongly connect the videos to students and their learning process (*Figure 2*).

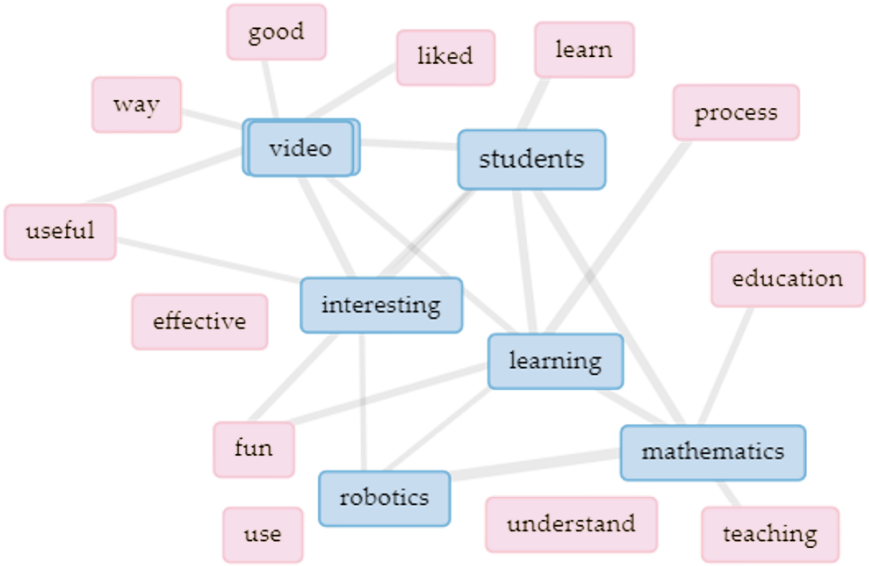

Figure 2. Links in overall answers

Below, we list the most frequent words used by respondents in different countries in relation to the video library. *Figures 3* and *4* also present the links with other variables deducted from responses.

- Latvia. Most frequent words in the corpus: robotics; children; learning; students; videos.
- Lithuania. Most frequent words in the corpus: video; useful; liked; library.
- Poland. Most frequent words in the corpus: videos; think; students; material; learn.
- Romania. Most frequent words in the corpus: students; think; videos; children; video.
- Turkey. Most frequent words in the corpus:students; mathematics; videos; think; learning.

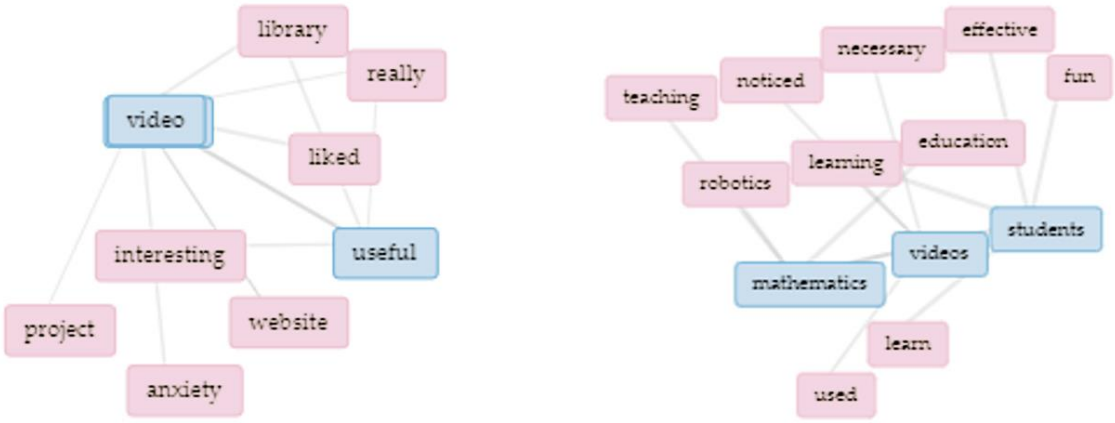

Figure 3. Teachers and pre-service teachers in Lithuania (left) and Turkey (right)

Figure 4. Teachers and pre-service teachers in Latvia (left), Romania (middle) and Poland (right)

The word frequency analysis across diverse regions reveals intriguing insights into the perceptions of pre-service and primary school teachers regarding the video materials. In Latvia, a notable emphasis on "robotics" suggests a strong connection between the videos and this burgeoning field, potentially indicating an intersection of mathematics education and technological applications. Additionally, the recurring mention of "children" underscores a focus on the impact of these videos on young learners, portraying a conscientious consideration of the target audience.

Conversely, in Lithuania, the prevalence of terms such as "video," "useful," and "liked" reflects a pragmatic appreciation for the practical utility and personal enjoyment derived from the video library. This suggests a positive reception based on perceived usefulness and individual preferences, emphasizing the importance of engaging and well-received educational resources.

Poland's word frequency analysis highlights a recurrent focus on "videos," reinforcing their significance in the teaching and learning process. The inclusion of "think" and "material" indicates a cognitive engagement with the content, suggesting that teachers in Poland view the videos not merely as passive instructional tools but as thought-provoking educational materials integral to the learning experience.

In Romania, the prominence of "students" and "children" echoes a shared concern for the impact of video-based scenarios on young learners. The inclusion of "think" suggests a reflective approach, emphasizing a thoughtful consideration of the educational implications of the videos.

Finally, in Turkey, the repeated mention of "students" and "learning" suggests a strong correlation between the videos and the broader learning objectives in mathematics education. The inclusion of "mathematics" further underscores a specific focus on the subject matter, highlighting a potential alignment between the videos and the core curriculum.

The most encountered adjectives that primary school teachers use to describe the videos are ”interesting”, ”good” and ”effective”. From their answers, anxiety is connected to teachers, as factors to reduce it. Pre-service teachers on the other side describe the materials as ”interesting”, ”fun” and ”effective”. In their narrative, anxiety is connected to math and the learning process itself.

5. DISCUSSION

The responses from both pre-service teachers and primary school teachers regarding the video library were overwhelmingly positive, highlighting a genuine enthusiasm for the instructional materials. Participants expressed a keen interest in the content, finding the videos not only captivating but also drawing connections to the realm of robotics. This linkage suggests a broader integration of technology-enhanced learning experiences and underscores the potential synergy between video-based mathematics scenarios and the dynamic field of robotics education.

Importantly, participants conveyed a strong connection between the videos and the learning process, indicating that these resources can play a role in shaping their pedagogical approaches. The integration of video-based materials was not merely perceived as an ancillary tool but rather as an integral component deeply embedded in the educational fabric. Participants articulated a sense of liking and enjoyment towards the materials, illustrating that the positive reception extended beyond mere functionality to a genuine appreciation for the content.

The strong connection participants established between the videos and students underscores the potential transformative effect of incorporating multimedia resources into mathematics education. As these educators recognize the intrinsic value of the videos, their positive attitudes suggest a promising avenue for fostering enriched learning environments and mitigating math anxiety through innovative, visually engaging pedagogical tools.

This information provides a clear answer to research question number 1, namely what insights do prospective and primary school teachers share regarding their experiences with the video library, and how do these insights contribute to a deeper understanding of the challenges and successes in using scenario-based learning for math anxiety reduction.

The examination of word frequencies among pre-service and primary school teachers from Latvia, Lithuania, Poland, Romania, and Turkey reveals both commonalities and cultural differences in their perceptions of video-based mathematics scenarios. Across all countries, a shared emphasis on "students" and "videos" indicates a universal recognition of the centrality of these materials in the educational landscape. However, cultural nuances emerge through distinctive patterns. In Latvia, the prevalence of "robotics" reflects a unique intersection of mathematics education and technological advancements, possibly influenced by a culture that values innovation. Lithuania's focus on "useful" and "liked" suggests a pragmatic and individualized approach, reflecting a culture that appreciates practical utility and personal engagement. Poland's attention to "material" underscores a cognitively engaging perspective, indicative of a culture that values intellectual inquiry. Romania's repeated mention of "children" and "think" suggests a thoughtful consideration of the impact on young learners, potentially influenced by a nurturing educational ethos. In Turkey, the emphasis on "mathematics" aligns with a focus on core subject matter, reflecting a cultural commitment to foundational academic principles. These linguistic patterns underscore how cultural differences shape the ways in which educators perceive and articulate the role of video-based materials in mathematics education.

The analysis of adjectives used by primary school teachers and pre-service teachers to describe the video materials provides intriguing insights into their distinct perspectives and associations with anxiety. Primary school teachers consistently employ terms such as "interesting," "good,"

and "effective" to characterize the videos. These descriptors indicate a pragmatic evaluation of the instructional materials, emphasizing their overall positive impact on teaching practices. Notably, anxiety, as per primary school teachers' narratives, is connected to themselves, suggesting that the videos are perceived as instrumental tools to alleviate stress and enhance their teaching methodologies.

Conversely, pre-service teachers express a similar appreciation for the videos, describing them as "interesting," "fun," and "effective." Their choice of adjectives reflects a more experiential and engaging viewpoint, emphasizing the enjoyment derived from the materials. Intriguingly, pre-service teachers associate anxiety with the realm of mathematics itself and the learning process. This distinction suggests that, for this cohort, the videos serve as dynamic resources not only to enhance teaching but also to address anxiety linked directly to the subject matter and the learning journey. The divergence in anxiety associations between primary school teachers and pre-service teachers underscores the multifaceted role of video-based materials in mitigating anxiety, catering to both instructional needs and individual experiences in the context of mathematics education.

This data provides answers to the second study question, regarding cultural and diverse educational contexts influencing perceptions.

6. RECOMMENDATIONS

Recognizing that primary school teachers often associate anxiety with their role and their capacity/responsibility to reduce it, it is essential to design video materials that explicitly address the stressors teachers face. Providing content that offers pedagogical support, classroom management strategies, and tips for handling math-related stress can contribute to a more supportive and empowering teaching environment.

Acknowledging pre-service teachers' emphasis on the "fun" and "interesting" aspects of video materials, educational initiatives should focus on creating engaging content that fosters a positive learning experience. Incorporating interactive elements, real-world applications, and collaborative activities can enhance the enjoyment and effectiveness of the videos for this demographic.

Considering the association of anxiety with mathematics content for pre-service teachers and the focus on "mathematics" in Turkey, it is crucial to align video materials with core curriculum objectives. Ensuring that the content directly supports the subject matter and learning goals can enhance the perceived effectiveness and relevance of the videos in addressing math-related anxiety.

Given the cultural differences reflected in the word frequencies, initiatives that encourage cross-cultural collaboration among educators can foster a rich exchange of pedagogical practices. Sharing successful strategies and approaches to using video materials can contribute to a global understanding of effective mathematics education.

Recognizing the role of video materials in professional development for primary school teachers, institutions should offer training programs that guide educators in effectively incorporating these resources into their teaching methodologies. Workshops, webinars, and collaborative platforms can facilitate knowledge-sharing and skill development.

7. CONCLUSIONS

In conclusions, the diverse perspectives shared by primary school teachers and pre-service teachers from various countries underscore the dynamic and multifaceted nature of integrating video-based mathematics scenarios in educational settings. Primary school teachers consistently commend the videos as "interesting," "good," and "effective," emphasizing their positive impact on teaching practices. The association of anxiety with teachers themselves indicates a potential avenue for targeted interventions, suggesting that these videos could serve as instrumental tools in addressing stressors inherent to the teaching profession. On the other hand, pre-service teachers express a similar appreciation for the videos but highlight the experiential aspects, describing them as "interesting," "fun," and "effective". Their association of anxiety with the learning process and mathematics content suggests that video materials play a crucial role in shaping positive attitudes and mitigating anxiety directly related to the subject matter. These nuanced findings underscore the importance of tailoring educational strategies to the specific needs and perceptions of educators, whether experienced or in training.

In light of these insights, recommendations can be formulated to enhance the integration of video-based materials in mathematics education. Tailoring resources to address teacher anxiety, promoting engagement for pre-service teachers, aligning videos with core curriculum objectives, encouraging cross-cultural collaboration, providing professional development opportunities, and adopting multifaceted approaches to alleviate anxiety emerge as key considerations. By implementing these recommendations, educational stakeholders can create a more inclusive and supportive learning environment, leveraging the positive impact of video-based mathematics scenarios while addressing the unique challenges and perspectives of teachers across diverse cultural contexts. Ultimately, this study contributes to the ongoing discourse on effective pedagogical approaches, emphasizing the need for context-specific strategies that cater to the dynamic landscape of mathematics education.

8. LIMITATIONS AND FUTURE RESEARCH

While this study provides valuable insights into the perceptions of teachers from multiple countries, it is important to acknowledge certain limitations. The sample size and geographic distribution may not fully represent the diversity of perspectives across different contexts. Additionally, the reliance on self-reported data may introduce biases, and the generalizability of the findings may be limited to the specific cultural and educational contexts examined.

9. ACKNOWLEDGEMENT

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ORGANIZATIONAL AGILITY AND AGILE SCHOOLS

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Abstract. In today's digital age, organizations need to embrace digital transformation to adapt constantly evolving technological improvements. The ability to quickly adapt to changing circumstances, also known as organizational agility, has become a critical managerial feature. This need has become even more evident due to the global pandemic, highlighting the significance of adaptability, innovation, and flexibility for both individuals and organizations.
Given the unpredictability caused by COVID-19, institutions rapidly had to adjust their approaches, tackle new challenges, and seize the potential opportunities. This urgent situation has extended beyond management to educational and training processes, making organizational agility a crucial aspect for educational institutions with diverse stakeholders.

Keywords: Agility, Organizational Agility, Agile Schools.

INTRODUCTION

In today's world, digital technologies offer new opportunities beyond being just tools. Adapting to changes and opportunities presented by these technologies is referred to as digital transformation. Digital technologies and the increasing speed of innovation cause continuous change and adapting to changing business environment has become an important skill for organizations. Organizational agility, defined as the ability to quickly respond to unpredictable changes in internal and external environments, (Akkaya, 2018), has become the most important skill of today's management styles.

Agile organizations with flexible management styles can effectively adapt to transformations, embrace innovation, and respond to change quickly. Especially the COVID-19 global epidemic process, which people and institutions have been to cope with the increasing risks day by day, has led to a constant uncertainty for all. The pandemic has heightened the need for organizations to quickly adapt to uncertainties, respond to threats, and seize opportunities. This crisis has emphasized the importance of agility, particularly in educational institutions with diverse stakeholders, where rapid and continuous changes are essential.

1. AGILITY

According to TDK (2020), the concept of agile, defined as "acting with ease and quickness, alert, agile", has become an expression that defines human beings among sports terms, and in this sense, agility means keeping the body and joints in the correct position in space during very rapid direction changes throughout a series of movements. It is defined as the control and coordination skill that enables

The concept of agility, which is basically defined as "the ability to move quickly and easily" physically, has also taken its place in dictionaries as "the ability to think and understand quickly" (Lexico, 2020). The concept of agility, which first found its place in the IT sector with these meanings, was later theorized in the field of education, especially in business administration,

and organizational agility, agile schools, agile leadership, and learner agility were other titles introduced to the literature.

1.1. Agile Manifesto

The concept of agility was introduced to the literature with the Agile Manifesto. The Agile Manifesto was created in 2001 by seventeen software developers in Utah, USA and brainstormed for 2 days about software development. As a result of the meeting, a set of principles have emerged, the purpose of which was to increase the productivity of software development and to evaluate different experiences and approaches in this direction, they published a 4-item set of values under the name of Agile Software Development Manifesto, which can be considered as an output of the meeting (https://agilemanifesto.org). In the past 15 years, this declaration has become a guiding and target vision for the increase of success in software projects and has turned into a mainstream approach at the same time. With this manifesto; they declared that they valued:

- Individuals and interactions rather than processes and tools,
- Working software rather than comprehensive documentation,
- Cooperation with the customer rather than contract negotiations,
- Responding to change rather than sticking to a plan.

In addition to this manifesto, 12 Agile Software Principles have also been published. These items are as follows (https://agilemanifesto.org):

1. Our top priority is to satisfy customers by providing early and continuous delivery of valuable software.
2. Changing requirements must be acknowledged even in the final stages of the software process. Agile processes use change for the customer's competitive advantage.
3. The working software should be presented to the customer regularly, preferably every few weeks or a few months, with short time intervals determined.
4. Business process owners and software developers should work together every day throughout the project.
5. Motivated individuals should be at the heart of the projects. They should be provided with the environment and support they need, and they should be trusted to get the job done.
6. Face-to-face communication is the most efficient and effective method of exchanging information in a software team.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. Sponsors, software developers, and users should be able to maintain a constant pace continuously.
9. Constant attention to technical excellence and good design enhances agility.
10. Simplicity, the art of increasing the work that does not need to be done as much as possible, is a must.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. The team thinks about how it can be more effective and efficient at regular intervals and adjusts and adjusts its behavior accordingly.

El-Abbassy, Muawad, and Gaber (2010)'s study titled Evaluating Agile Principles in Information Technology Education was one of the first studies to address agility in the education sector in terms of evaluating the adaptability of these agile software principles to ICT education.

This article focuses on the urgent need to apply the agile framework to the IT training system to improve quality and respond to changes and industry requirements. This article also attempts to link agile IT training practices to the four agile values described in the agile manifesto. The main contribution of this study is to propose a basic model for rating and evaluating educational institutions according to their capacity to provide high-quality training according to agile best practices. This model is inspired by an evaluation framework used to evaluate agile software methodologies. The model can also be used to organize improvement efforts according to the priorities of the organization (El-Abbassy et. al., 2010).

Later, training coaches such as Steve Peha started to talk about how agile practices could be adapted to education. And after a while, agile-based approaches to collaboration and innovation have moved beyond industry and even into education.

Peha (2011) found the response to slow growth in student achievement and declining teacher morale in K-12 schools by empowering school principals to become more effective organizational leaders. In particular, Peha (2011) with his proposed Manifesto of Agile Schools; suggested that:

- individuals and interactions rather than processes and tools,
- meaningful learning rather than measurement of learning,
- stakeholder cooperation rather than continuous negotiations,
- prioritizing responding to change rather than following a plan would create a powerful lever for effective school leadership.

According to Peha (2011), the agile approach offers a manageable set of proven principles that inform the culture and behavior of organizations that are interested in extraordinary results using approaches that solve important problems in unpredictable environments. Peha (2011)'s Agile School Principles have been included in the literature as follows:

1. Our highest priority is to meet the needs of children and their families by providing early and ongoing meaningful learning.
2. Welcome changing requirements, even late in a learning cycle. Drive change forward for the benefit of children and their families.
3. Give meaningful learning frequently, from a few days to a few weeks, preferring with shorter-duration scales.
4. School and family team members work together every day to create learning opportunities for all participants.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to do the work.
6. The most efficient and effective method of conveying information for and within a team is a face-to-face meeting.
7. Meaningful learning is the primary measure of progress.
8. Our processes promote sustainability. Educators, students, and families must maintain a steady pace indefinitely.
9. Constant attention to technical excellence and good design enhances adaptability.
10. Simplicity – the art of minimizing unnecessary work – is essential.
11. The best ideas and initiatives emerge from self-organizing teams.
12. At regular intervals, teams think about how to become more effective, then adjust and adjust their behavior accordingly.

While advocating for an agile approach to K-12 education in general in various contexts, Peha (2011) emphasizes the transferability of agility to educational organizations in particular and mentions a plan for better schooling, noting how suitable it is to run schools.

Another striking example after Peha, was the case study conducted by Kamat and Sardessai in India in 2012, involving 500 ICT schools with teachers trained in agile practices. In this study, Kamat and Sardessai called for changes in three key areas of educational work: teaching/learning, assessment, and management (Krehbiel et al., 2017). However, the Agile Manifesto, which was previously published for software development, has been adapted to the field of education under the name of Agile Manifesto in Education with this study. With the Agile Manifesto in Education; Kamat and Sardessai (2012) gave emphasis on:

- teachers and students rather than management and social fixed capital,
- competence and cooperation rather than compatibility and competition,
- employability and marketability rather than curriculum and grades,
- attitude and learning skills rather than ability and degree.

With this study, it was found that it was possible to integrate agile systems into existing programs, which led to higher student achievement in almost all cases (Kamat and Sardessai, 2012). Furthermore, in addition to increased learning, Kamat and Sardessai argued that students will have a smoother transition into the workforce, where job candidates equipped with an agile mindset are particularly valued in the job market, especially in sectors such as engineering (Krehbiel et al, 2017).

2. ORGANIZATIONAL AGILITY

For organizations, the term "agile" indicates that organizations respond quickly to internal and external events that they face. Achieving agility certainly requires responsibility for strategies, technologies, personnel, processes, and business opportunities (Sanadgol, 2014). Organizational agility; is defined as the ability to restructure and change strategies, internal and external stakeholders against unforeseen events, uncertainty, and change in the business environment (İleri and Soylu, 2014). Organizational agility is an ongoing process, such as continuous improvement. In order for an organization to remain adaptable to change and development, agility is a priority because it is the most important element of organizational effectiveness and excellence. As a means of achieving and maintaining high performance, agility must transcend the business process and be a key feature of an organization's members, teams, and overall organizational culture (Harraf et al., 2015).

Organizational agility is achieved by being alert to both internal and environmental changes, opportunities as well as challenges, and the ability to use available resources in a timely, flexible, economical, and appropriate manner to respond effectively to these changes (Ashton, 2015).

Organizational agility is an important factor that enables managers to react appropriately, quickly, and effectively to changes, to use the opportunities obtained appropriately, and to manage the organization through development and meeting future goals and needs (Sanadgol, 2014).

In this context, agile organizations are organizations that act harmoniously, flexibly, and quickly depending on the change in the environment, that is, they can manage change quickly and

easily, and are one step ahead in identifying, seizing opportunities, and making strategic decisions.

It can be said that agile schools are also schools with the dynamic ability to maintain a high level of performance through adaptive development in a rapidly changing environment (Breakspear, 2017).

Today, teachers in middle schools, high schools, and universities around the world have begun to create an agile learning culture in light of these principles (Briggs, 2014). In this context, learning agility is perhaps the most important factor that makes a difference in terms of the organizational agility approach in schools.

3. AGILE SCHOOLS

Agile methodologies, which initially became popular in software development, have also found their place in education, giving rise to the concept of agile schools. These schools move away from rigid structures and leverage flexibility, collaboration, and adaptability to create a more responsive and student-centered learning environment. In this respect, agile schools represent a promising change in educational paradigms. By incorporating agile principles into the learning environment, these schools prepare students with critical skills needed for success in the 21st century besides academic knowledge. As education continues to evolve, the agile school model finds its place in the literature as an innovation step that inspires educators to create dynamic and responsive learning spaces.

Today, teachers in secondary schools, high schools and universities around the world have begun to create an agile learning culture in the light of agile principles (Briggs, 2014). In this context, perhaps the most important factor that makes a difference in terms of the organizational agility approach in schools is learning agility. Agile schools that encourage learning agility also strengthen students' skills to cope with the changing world.

3.1. Understanding Agile Schools

Agile education, inspired by the agile software development methodology and emphasizing iterative progress, collaboration and responding to change (Trilling and Fadel, 2009), offers a new alternative to traditional models to meet the dynamic needs of students in the rapidly developing educational environment and prepare them for the ever-changing world. In this context, agile schools effectively transfer both knowledge and skills to students, and at the same time, they shape the learning processes with a more flexible, participatory and student-centered approach.

- **Flexibility in Curriculum Design**

One of the distinguishing features of agile schools is the flexibility they offer in curriculum design. Rather than strictly adhering to a predefined curriculum, educators in agile schools can adapt and modify content based on student needs, feedback, and emerging trends (Trilling and Fadel, 2009). This adaptability ensures that students are equipped with the most appropriate and up-to-date knowledge and skills.

- **Student-Centered Learning**

Agile schools prioritize student-centered learning experiences, recognizing that each student is unique and may have different learning styles and preferences. Personalized learning plans,

project-based assessments, and differentiated instruction (Tomlinson, 2017) are integral components of agile education and promote a more inclusive and effective approach to teaching.

- **Collaborative Learning Environments**

Collaboration is the cornerstone of agile training. Agile schools foster collaborative learning environments where students work together on projects, share ideas, and learn from each other. This approach reflects the collaborative nature of the modern workplace and helps students develop essential teamwork and communication skills (Dillenbourg, 1999).

- **Continuous Feedback and Evaluation**

Agile training emphasizes continuous feedback and evaluation rather than relying on only traditional end-of-term evaluations. This ongoing feedback allows educators to quickly identify and address learning gaps, helps students progress at their own pace, and encourages a growth mindset (Hattie and Timperley, 2007).

- **Teacher Professional Development**

Teacher professional development is vital to successfully implement agile methodologies. Agile schools invest in the continuing education of educators, ensuring that educators are knowledgeable in agile principles, technological tools, and innovative teaching methods (Darling-Hammond et al., 2009). This investment supports a culture of continuous improvement within the school community.

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THE LEVEL OF DIGITAL LITERACY AMONG EDUCATORS AND STUDENTS IN TURKEY

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Abstract. Nowadays, information and communication technologies have covered every aspect of life and are becoming an important part of people's daily lives. This situation makes the concept of digital literacy more important day by day. While digital literacy increases in importance every day, it has also become an important part of education. The use of digital tools in education makes the educational process more effective. Digital age students prefer the digital structure rather than the traditional structure in education. In this case, the tools and equipment used and the course delivery are shaped according to the needs of the students. Digital literacy in education involves educators and students having interests, skills and technical knowledge and using them effectively. The aim of this study is to reveal the digital literacy levels of educators and students in Turkey. Literature review was used in the study. The data obtained was presented in a report. According to the latest data, the digital literacy rate has increased in recent years.

Keywords: Digital Literacy, Education, Digitalization.

INTRODUCTION

With technological developments, the concept of literacy has been transformed into media literacy, information literacy, technology literacy and digital literacy, etc. types are highlighted. A literate individual can direct his life by correctly using the knowledge he has gained in his social and social environment (Kane, 2003).

Digital literacy consists of the ability to communicate in different ways, such as accessing information and communication technologies, understanding various aspects of digital media and media content, and making critical evaluations (European Union, 2006).

An umbrella term for these new skills and competences, digital literacies and the concept of being digitally literate refers to our ability to effectively make use of the technologies at our disposal. This includes not just technical skills, but perhaps more importantly, an awareness of the social practices that surround the appropriate use of new technologies (Hochly, 2016, p. 115). Developments in informatics and communication in the 21st century require individuals becompetent in both literacy and technological issues (Eryaman, 2007).

Martin (2005) and Martin (2008) mentioned in their studies that there are some basic elements included in digital literacy. These elements:

1. Digital literacy includes the ability to perform digital actions that are necessary in times of need.
2. Digital literacy is shaped according to the needs of the individual and is a process that develops in line with the needs of the individual throughout his life.
3. The concept of digital literacy also includes components of other literacies that are related to digital literacy. Additionally, digital literacy is a much broader concept than ICT literacy.
4. Digital literacy includes having the relevant knowledge, skills, attitudes and techniques and planning, implementing and evaluating the necessary digital action in case of need.

5. Digital literacy involves being aware that one is digitally literate and taking responsibility for one's own development process.

1. DIGITAL LITERACY FOR EDUCATIONAL PURPOSES IN TURKEY

TABLE 1. Proportion of individuals who conducted learning activities over the internet for educational, professional or private purposes in the last 3 months by sex, 2015-2023

Learning Activity				**Doing an online couse**			**Using online learning material other than a complete online course**			**Communicating with educators or learners using audio or video online tools**		
Year	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
2015	**7,8**	7,3	8,4	**3,0**	3,0	3,1	**5,2**	5,0	5,3	**3,7**	3,6	3,8
2016	**7,1**	6,9	7,4	**2,7**	2,9	2,5	**5,1**	5,2	4,9	**3,4**	3,3	3,4
2017	**6,5**	6,3	6,7	**2,5**	2,6	2,4	**4,4**	4,4	4,4	**3,1**	3,0	3,2
2018	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-
2019	**6,6**	6,9	6,2	**3,3**	3,7	2,7	**4,1**	4,4	3,9	**3,1**	3,2	3,1
2020	**14,8**	13,3	16,4	**8,0**	7,6	8,5	**8,6**	7,8	9,5	**9,2**	8,2	10,2
2021	**17,1**	16,4	17,8	**10,7**	10,8	10,5	**13,7**	13,0	14,4	**-**	-	-
2022	**15,9**	15,6	16,3	**7,7**	8,1	7,3	**10,7**	10,7	10,7	**10,6**	9,8	11,4
2023	**18,7**	18,1	19,4	**8,2**	8,0	8,4	**11,2**	10,5	12,0	**13,3**	12,6	14,1

Table 1 shows the proportion of individuals who conducted learning activities over the internet for educational, professional or private purposes in the last 3 months by sex, in 2015 and 2023, according to the 2023 TÜİK report. It is seen that individuals engaging in learning activities have generally increased between 2015 and 2023. This rate has increased rapidly after 2020. While the rate of online courses fluctuated between 2013 and 2019, it increased rapidly after 2020. While the rate of Using online learning material other than a complete online course decreased in 2017 and 2019 compared to the previous year, it increased rapidly in 2020. 2021 had the highest rate. The rate of Communicating with educators or learners using audio or video online tools showed a significant increase in 2020 and the increase continued in the following years. Especially the pandemic experienced in 2019 increased the use of digital technology in education.

Below are some examples of studies on digital literacy conducted in Turkey.

Aytuna and Tokgöz (2013) stated that almost all of the children participating in the study use the internet only for playing games, and they even use social networks first for gaming purposes and then for communication purposes. Timur, Timur and Akkoyunlu (2014) stated that previous studies have shown that internet use in our country is not conscious, while there is an increase in quantitative terms, the same increase is not seen in qualitative terms, and the biggest responsibility here falls on educational institutions and teachers.

Menzi, Çalışkan and Çetin (2012) examined the technology competencies of teacher candidates in terms of various variables, it was concluded that teacher candidates who use the internet more frequently consider themselves more competent in the field of technology than others. In their study examining primary school teachers' computer and internet attitudes, Bahar, Uludağ and Kaplan (2009) found a significant difference in the attitudes towards computers of teachers who had a permanent internet connection at home, but did not find a significant difference in their attitudes towards the internet. Frequency of internet use is an effective variable on the digital literacy levels of teacher candidates. Except for those who never used the internet in their daily lives, teachers' average scores from the scale progressed linearly and they felt more competent as their frequency of internet use increased. In their study, Üstündağ, Güneş and Bahçivan (2017) conducted research to determine the digital literacy levels of science teacher candidates, and at the end of the research, they stated that the digital literacy skill levels of science department students were at a good level.

Öçal (2017) stated the digital literacy competence perceptions of teachers and parents of students studying in primary schools in the central districts of Ankara and the teachers and parents of these students. As a result of the study, it was concluded that teachers and parents felt that their digital literacy levels were "Very Adequate", but that the parents felt that their children's literacy levels were "Moderate Adequate".

Duran and Özen (2018) investigated to what extent digital literacy was integrated into primary and secondary school courses. In the research, they tried to determine to what extent Turkish teaching programs were included. They examined the textbooks and determined the content that would be beneficial for digital literacy skills. As a result of the study, they observed that digital literacy found a place in the curriculum and that content related to digital literacy was included in the books.

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THE IMPACT OF THE PANDEMIC ON EDUCATION: A PERSPECTIVE FROM UNIVERSAL DESIGN FOR LEARNING

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Abstract. The COVID-19 pandemic has led to changes in the field of education, prompting a rapid shift towards innovative teaching and learning methods. This article explores the impact of the pandemic on studies and underscores the need to embrace change and innovation in education. Although the principles of Universal Design for Learning (UDL) are not widely explored, this article highlights the lessons learned during the pandemic and encourages the adoption of UDL-inspired approaches. From remote learning experiences to issues of equality, personalization, lecturer development, assessment, adaptability, and hybrid models, this article underscores the need for educational institutions to harness the potential of these experiences for the benefit of future generations. It underscores the importance of incorporating flexibility, inclusivity, and adaptability into educational practices to better prepare for and navigate accessibility challenges.
The article presents an analysis of statistical data from the MOODLE virtual learning environment of KTU and presents the importance of UDL in higher education.

Keywords: Universal Design of Learning, Distance learning, Hybrid learning, Higher education, VLE MOODLE.

INTRODUCTION

As COVID-19 infection began to spread and became a pandemic, the educational system faced the great challenge of changing practices that had been established for many years. Not only students had to adapt to the current situation, but also the entire higher education system: the quarantine forced universities to close their doors to students, and in just a few weeks, universities had to transfer their studies to the virtual space.

The pandemic forced the community, lecturers, and students of Kaunas University of Technology to adapt to the current situation, too. When analyzing the statistics of MOODLE, the virtual learning environment used at the university, a growth trend can be observed in all sections. The number of courses (e-modules) and the number of registered lecturers and students grew. The courses (e-modules) became full of life: the number of discussion forums and their announcements increased, the number of group messages increased significantly, and MOODLE tests and assignments were actively used and became perhaps the main form of assessment. Links to video conferencing systems and other external resources in courses have increased the use of the MOODLE resource URL.

When the learning process moved to the virtual space, a problem arose that needed to be solved urgently - checking the originality of written papers. The coincidence-checking systems installed and offered at the university have been actively used.

Lecturers were not prepared for distance learning; their understanding of online learning was sometimes limited to sending manuals, slides, sample assignments, and tasks to students by email and setting deadlines for assignments (Didenko et al., 2021). The new challenges encourage lecturers to improve their digital skills and their use of e-learning tools in studies so

far. They always need support and training. The Erasmus+ project Scaffolding Online University Learning (SOULSS) aims to contribute to the definition of a better strategy for scaffolding the activities of university lecturers and students, focusing on one of the most valuable pedagogical frameworks in the field: Universal Design for Learning.

1. STATISTICAL ANALYSIS OF KTU MOODLE

Although the virtual learning environment MOODLE has been used quite actively at the university for more than 10 years, the indicators of its use have increased since the beginning of the quarantine. The number of active courses in 2019 and 2020 in which students were enrolled is presented in the table below (*Table 1*). We see that active the number of e. modules increased by a third in 2020 (129%). It can be assumed that the lecturers, who previously did not use or inactively used their courses in the study process, started to do so.

TABLE 1. Active moodle modules (where students have been enrolled)

Year	Semester	Active e. modules
2019	Spring	1033
2020	Spring	1332

Comparing the spring semesters, we can see that the number of users registered with lecturer rights has increased (*Figure 1*). The data shows that the number of active e-modules increased by a third in 2020 (129%).

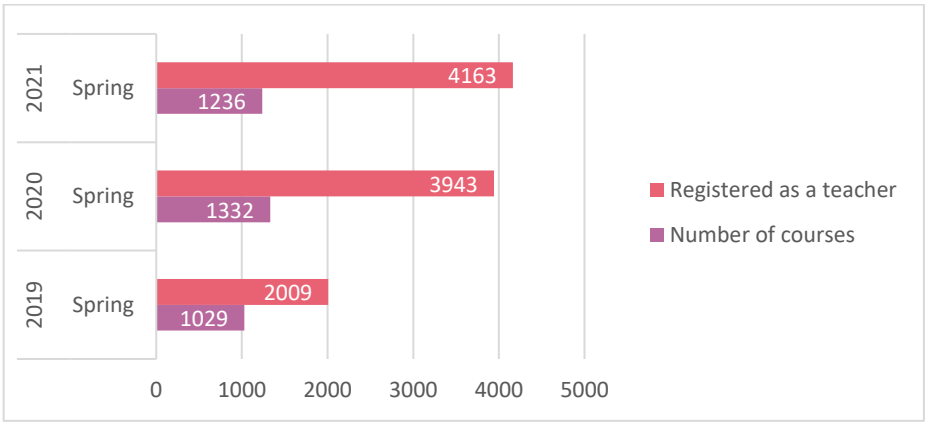

Figure 1. Dynamics of MOODLE courses and lecturers in spring semesters

A similar trend prevails when comparing the autumn semesters (*Figure 2*).

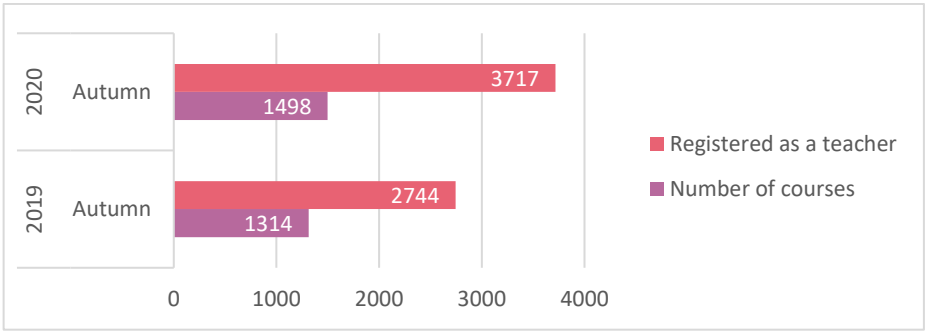

Figure 2. Dynamics of MOODLE courses and lecturers in autumn semesters

It can be assumed that lecturers who have not visited the MOODLE environment before and did not use it as a supplement to classroom work, registered and created courses based on the subjects taught.

Compared to the 2019 and 2020 spring semesters, the activity of using MOODLE activities is noticeable (*Figure 3*). The number of quizzes attempts and lecturers' announcements has doubled, and the number of quizzes and files submitted by students has almost doubled.

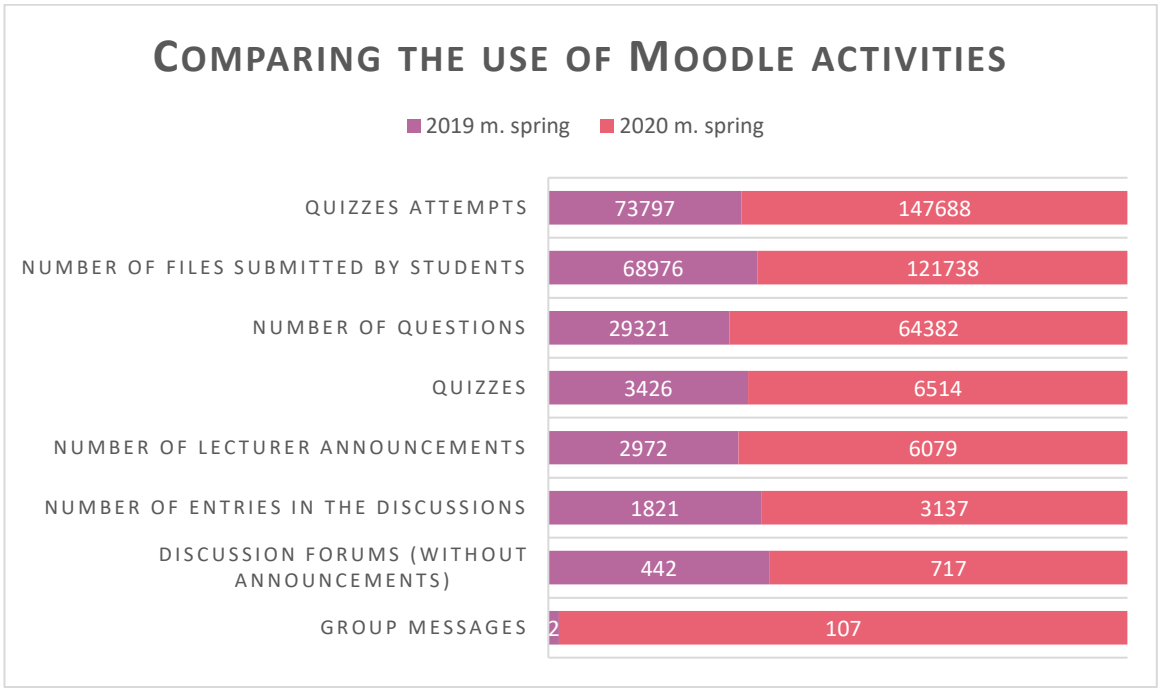

Figure 3. Growth dynamics of Moodle activities in spring semesters

The lecturers had to upload significantly more learning materials: slides, outlines, descriptions of assignments and laboratory works, and additional resources. The usability of MOODLE resources grew ~140 percent. compared to the 2019 and 2020 spring semesters: Files 134%, e. Book 118%, Folder 169%, Page 142%, URL 161%.

It can be assumed that most inactive courses have become active, various activities and assessments have been moved from classrooms to virtual learning environments, and courses have included more digital learning materials and resources.

The move of distance learning and academic activities to virtual space has increased the use of video conferencing systems. If before the pandemic, only a dozen modules used Adobe Connect and MS Teams systems, then from the spring of 2020 all modules used one of the video conference systems (in order of popularity): Zoom, MS Teams, BigBlueButton, Adobe Connect. The university purchased 500 Zoom licenses, and some lecturers shared licenses because they were in short supply. In 2020 autumn, more lecturers started broadcasting video lectures in the MS Teams environment and Moodle's integrated BigBlueButton system, which reduced the need for Zoom. Additionally, some of the studies have returned to auditoriums.

2. SIMILARITY CHECK

After the settlements moved from classrooms to virtual space, it became even more relevant to ensure academic honesty and reduce cases of fraud and plagiarism. Since 2018, a plagiarism check plugin for the Moodle environment has been installed in the Moodle environment of the University, which performs the similarity check through the eLABa electronic similarity check system ESAS. Almost three times more papers were submitted for similarity checks during the pandemic in the 2020 spring semester, compared to the same in the 2019 semester, and two times more papers in the 2020 fall semester compared to the 2019 fall semester (*Table 2*). The growing need for similarity checking led the University to purchase the similarity and grading system Turnitin, which has been successfully implemented since the 2021 spring semester.

TABLE 2. Similarity check (uploaded files)

The tool	2018 autumn	2019 spring	2019 autumn	2020 spring	2020 autumn	2021 spring
ESAS	2622	3436	7321	9882	14691	12607
Turnitin	x	x	x	x	x	8561

3. REVIEW OF LITERATURE SOURCES

3.1. Distinguishing emergency remote teaching (ERT) from online learning

Emergency remote teaching typically involves a rapid transition from traditional face-to-face instruction to an online format due to unforeseen circumstances such as natural disasters, public health emergencies, or other crises, however, "well-planned online learning experiences are meaningfully different from courses offered online in response to a crisis or disaster" (Hodges et al., 2020). In emergency remote teaching (ERT), the primary focus is often on maintaining continuity of instruction rather than comprehensive pedagogical redesign. As a result, teachers just adapt materials and activities for the online environment and this does not

always align with best practices for online learning, potentially resulting in reduced student engagement and learning outcomes.

Online learning is characterized by intentional design and pedagogical approaches, specifically for the digital environment. Online learning courses are carefully designed, including clear learning objectives, the creation of multimedia content, and the implementation of interactive learning activities. In addition, online courses are typically designed to promote active learning, collaborative problem-solving, and critical thinking skills using a variety of instructional strategies such as discussion forums, multimedia presentations, and interactive models or simulations. In general, the pedagogical approach to online learning prioritizes student-centered learning and flexibility to facilitate deep learning experiences regardless of physical location or time constraints. Although both ERT and online learning involve digital learning, their approaches to pedagogy, design, and technological support differ, emphasizing the importance of considering these factors in the educational process.

The rapid approach necessary for ERT may diminish the quality of the courses delivered. A full-course development project can take months when done properly. The need to "just get it online" is in direct contradiction to the time and effort normally dedicated to developing a quality course. Online courses created in this way should not be mistaken for long-term solutions but accepted as a temporary solution to an immediate problem. This is but one reason that universal design for learning (UDL) should be part of all discussions around teaching and learning. UDL principles focus on the design of learning environments that are flexible, inclusive, and student-centered to ensure that all students can access and learn from the course materials, activities, and assignments. (Hodges et al., 2020)

3.2. Universal Design of Learning - UDL

The UDL principles have been talked about for a long time, but the pandemic has forced us to reconsider the application of these principles more widely. Not only are technology devices necessary for success in the online environment, but the design of the online program, including the instructor, the curriculum, and student support services accompanied by a strong sense of community and connectedness within the program, are significant as well (Barr & Miller, 2013).

UDL is defined as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (North Carolina State University Center for Universal Design, 1997).

The principles of UDL play a very important role in adapting learning materials to accessibility in distance learning. Lecturers should be encouraged to use technology even more to reach students of different abilities and ensure that content is available in multiple formats, such as video, interactive material, and others.

To effectively implement UDL strategies, lecturers need professional development and training. We need to recognize the need for ongoing support to help lecturers adapt to the new teaching landscape. Traditional assessment methods were challenged during the pandemic. UDL encourages diverse assessment techniques that accommodate different learning styles and abilities. UDL is instrumental in designing flexible curricula that cater to both in-person and remote learners while ensuring an inclusive learning environment.

Overall, the findings suggest that UDL through the principle "Provide Multiple Means of Engagement" has value in its own right in recruiting and sustaining student interest and engagement through the establishment of connections between students and their learning materials, their instructors, and each other (Seymour, Mairead, 2023).

4. THE SOULSS PROJECT

The SOULSS project (Scaffolding Online University Learning: Support Systems) aims to provide needs-based training to tertiary-level lecturers to help them move forward from "emergency remote teaching" to the next stages on the road to the digital transformation of Higher Education Institutions. There are a range of innovative tools that lecturers can use to support the learning of students with different learning needs. To achieve this goal, the project's main objective is to build tertiary-level lecturers' capacity to "think like an expert instructional designer" and progress towards optimal online teaching and learning.

The project will provide, among others, a multiple-tool learning platform and a training course kit consisting of five mutually reinforcing units. The project is implemented by a consortium of seven partners from six countries. (SOULSS project website, 2023)

5. CONCLUSIONS

In conclusions, the analysis of MOODLE statistics at Kaunas University of Technology reveals a growth trend across various aspects of online education. The COVID-19 pandemic prompted an increase in the number of courses, registered lecturers, and enrolled students on the MOODLE platform. Additionally, the platform saw a surge in dynamic activities, such as discussion forums, announcements, group messages, and MOODLE tests and assignments. Furthermore, there was a substantial increase in the upload of learning materials and resources, indicating the integration of digital content into courses. The coincidence-checking systems installed at the university have been actively used.

The pandemic also accelerated the adoption of Universal Design for Learning (UDL) principles, emphasizing flexibility, inclusivity, and adaptability in education. Ensuring equitable access to education became a priority, leading to investments in technology and resources to accommodate students with special needs. UDL promoted personalized learning experiences and encouraged the exploration of adaptive learning technologies and diverse assessment methods. Professional development for teachers to effectively implement UDL strategies became essential.

However, as the transition to distance learning was rapid, many lecturers faced challenges in adequately preparing or adapting learning materials. The need for training and support for lecturers remains pressing and, in most cases, the courses remain emergency online learning with a lack of quality of online learning.

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DIGITAL FINANCIAL LITERACY ACROSS AGE GROUPS IN LITHUANIA

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Abstract. The digitalization of financial functions highlights the growing importance of digital financial knowledge, behavior, attitudes, and the impact of financial literacy on individuals, business and economical levels. However, according to the Organization for Economic Co-operation and Development (OECD), Lithuania's Digital Financial Literacy index is below average and across participating OECD countries, only 34% of adults reach the minimum target score on digital financial literacy. This study aims to determine and compare digital financial literacy skills between different age groups in Lithuania for a better understanding and more targeted approach to solving digital financial literacy issues.

Keywords: finance, digital financial literacy.

INTRODUCTION

Growing digitalization worldwide poses different challenges in all aspects of life. Digital financial literacy is no exception, and for this reason is of paramount importance in today's interconnected world where financial transactions increasingly occur online. With the proliferation of mobile banking, online investment platforms, and digital payment systems, individuals need to be equipped with the knowledge to make informed decisions about their finances. Moreover, digital financial literacy empowers individuals to manage their money effectively, avoid scams and fraud, and capitalize on the benefits of emerging financial technologies.

According to the Bank of Lithuania (2024), the financial knowledge of Lithuanians has worsened by almost 20%. This was revealed by a financial literacy survey conducted on the initiative of the Financial Literacy Centre of the Bank of Lithuania in accordance with the methodology developed by experts of the Organization for Economic Co-operation and Development. Comparing the 2023 results with the very first results from 2015, the financial literacy index in Lithuania deteriorated from 62% to 56%. In Lithuania, only one-fifth - 23% - of respondents can be considered to have reached the minimum basic level of knowledge (scoring at least 70 out of 100). Those with lower incomes and education levels, as well as those under 30 and over 60, have lower financial literacy. There is also still a slight difference between men and women, with the latter having lower literacy levels.

As shown in *Figure 1*, compared to the other 39 countries participating in the survey, Lithuania ranks 31st in terms of financial literacy score. It is below the overall average of 60 points in the Financial Literacy Index. Among the EU countries surveyed, Lithuania is only ahead of Cyprus, Romania and Italy. Latvia (59) and Estonia (67) also outperformed Lithuania. Germany has the highest financial literacy index at 76.

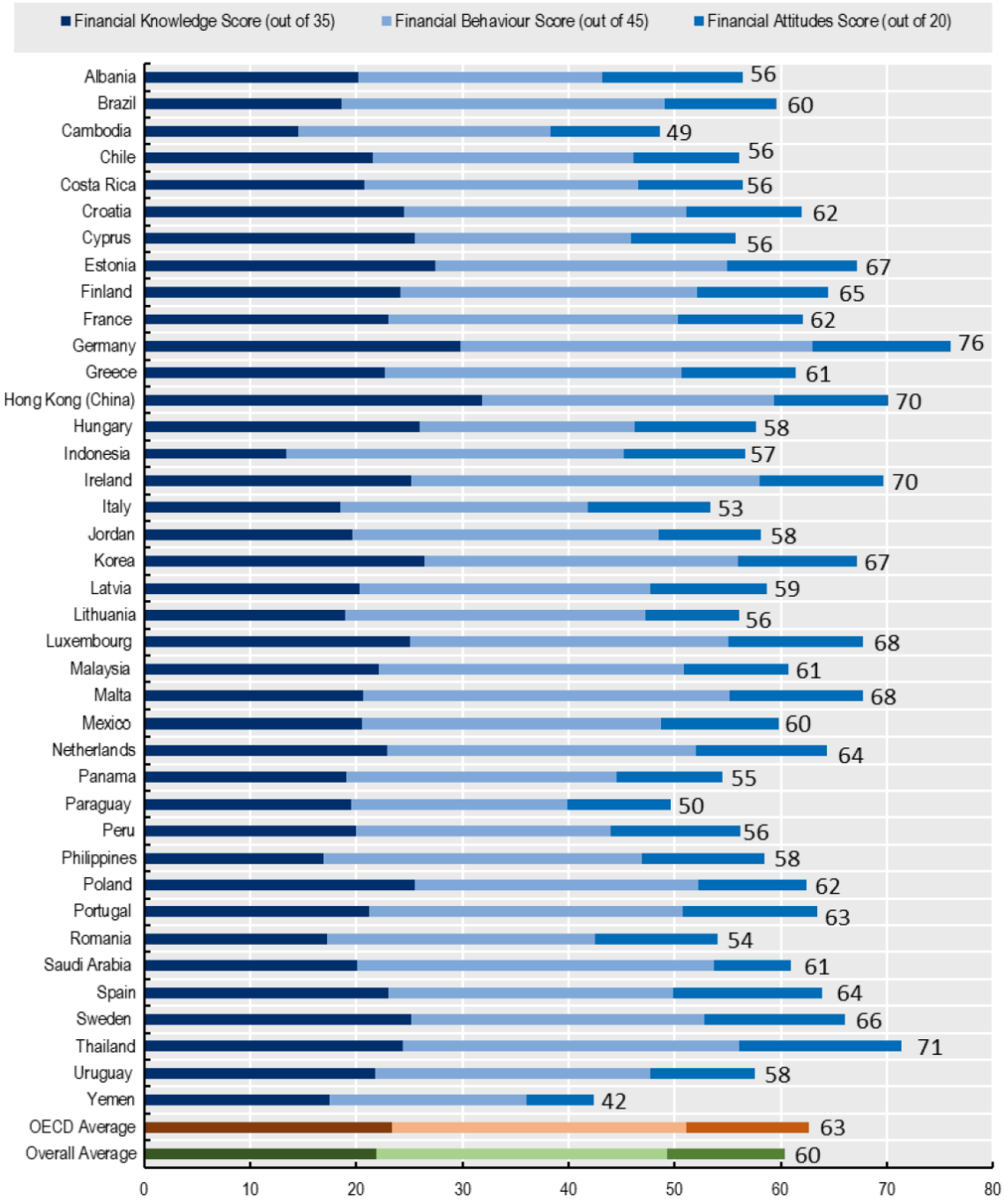

Figure 1. Overall financial literacy (OECD, 2023)

In 2023 for the first time OECD incorporated the Digital Financial Literacy score. As shown in *Figure 2*, Lithuania's Digital Financial Literacy Index is 45 while the average digital financial literacy index is higher, at 53. Compared to other Baltic countries Lithuania has the lowest score while Latvia has 46 points and Estonia has 64 points. The minimum target score on digital financial literacy is defined as scoring at least 70 points out of 100 points. Across all participating countries and economies, 29% of adults reach the minimum target score on digital financial literacy (at least 70 points out of 100). Across participating OECD countries, 34% of adults reach the minimum target score on digital financial literacy.

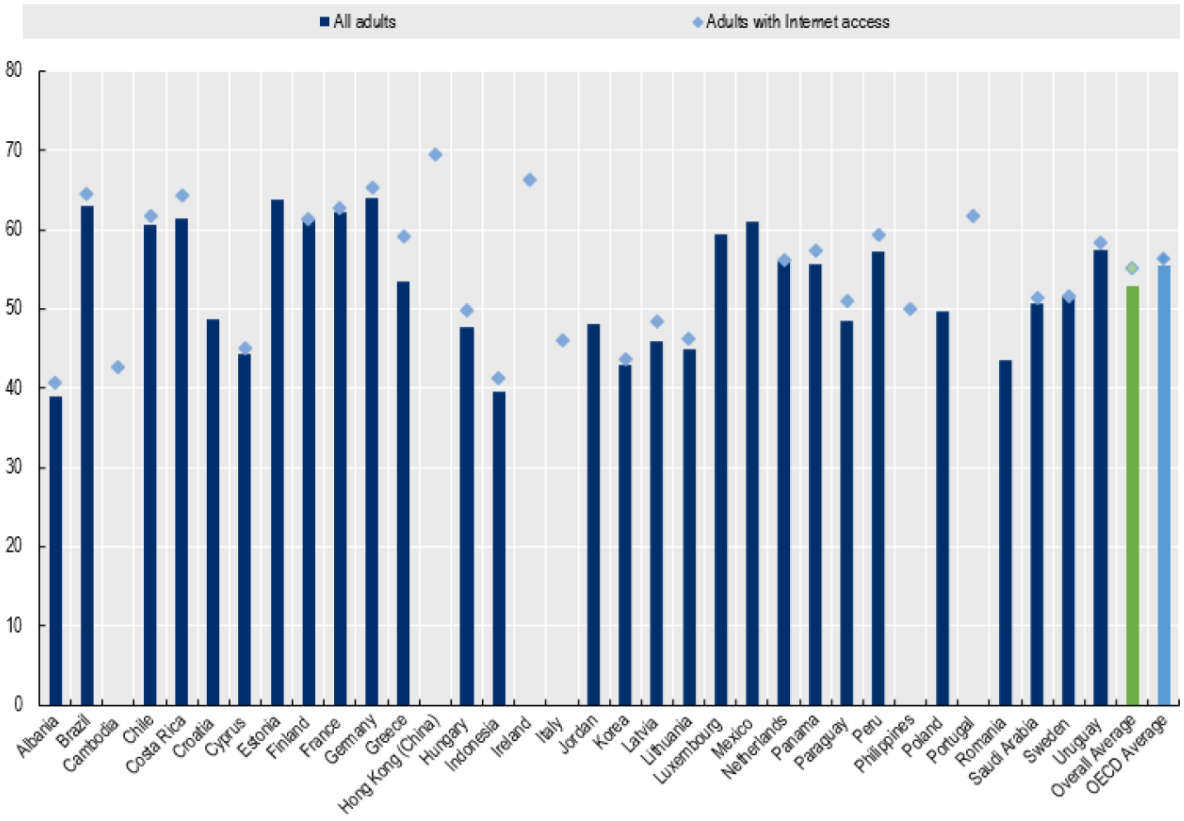

Figure 2. Digital financial literacy (OECD, 2023)

The findings of this OECD survey showcase the need to grow and improve financial literacy. The new digital financial literacy index is even lower and highlights the need for a targeted approach to improve digital financial literacy skills.

1. LITERATURE REVIEW

Digital financial literacy refers to the comprehension and proficiency individuals possess in navigating financial matters within the digital realm. It involves understanding concepts such as online banking, electronic transactions, digital currencies, and financial management tools available through technological platforms. This literacy empowers individuals to make informed decisions regarding their finances in an increasingly digitalized world.

Examining financial behavior is crucial for people, businesses, and decision-makers. By comprehending this behavior, strategies and interventions to support positive attitudes and financial well-being may be developed. These strategies and interventions can assist uncover patterns, trends, and factors that impact financial decision-making (Sabri et al., 2021). A wide range of choices, such as budgeting, borrowing, saving, investing, and spending, are included in financial behavior (Fan, 2020). Furthermore, it is impacted by a number of variables, including socioeconomic circumstances, individual values, beliefs, and attitudes (Ogunlusi & Obademi, 2021). When making financial decisions, people frequently have biases, emotions, and cognitive limitations in their mind. According to Ballis and Verousis (2022), these factors might include overconfidence, herd mentality, loss aversion, and current bias. Making better financial decisions and avoiding frequent errors can be facilitated by people and organizations being

aware of certain behavioral biases (Grable et al., 2020). In an increasingly digital world where financial transactions, services, and information are mostly conducted online, digital financial literacy becomes crucial for individuals and businesses in order to make accurate financial choices and safeguard themselves from potential risks (Lyons & Kass-Hanna, 2021). Additionally, Bucci, Calcagno and Marsiglio (2022) argued that financial literacy has a positive impact on the long-term growth if the return earned by financial sector positively relates with the investment in financial literacy. It shows financial literacy importance not also on individual or business level, but also on whole economy in general, what in turn could potentially create value in various financial forms for those who are less literate.

There is public bias towards older generation understanding of digitalized world and use of technology, because of lack of daily use of technology in their life/ acceptance. However, according to one of the Athens Journals research (2020), after analyzing groups aged from 14 to 19, was found that despite the advantages of exposure to digital devices and information, it does not directly imply that younger people will be more knowledgeable about financial literacy. Pandya's (2023) research on financial literacy among Millennials and Generation Z also underscores the need for initiatives aimed at improving financial literacy among younger generations. In terms of financial literacy among younger people, young people need to get financial education while they are still in secondary school since this setting is the atmosphere in which young people's financial literacy may be developed in the most organic manner (Ghadwan et al., 2022). Additionally, younger people, particularly those who are not above 18 years old, and aged to be in labor market are not in control of their finances, this makes them less likely seek financial knowledge concerning spending habits and more. But in general people aged 20 to 30 shows tendencies that their digital financial literacy is higher compared to older generations, this is clearly indicated by shifting consumer spending behaviors, from traditional face retail to shopping online (Koto, 2023). On the other hand, this change in shopping behavior can also be impacted by the lower financial literacy among younger generations concerning applicable business practices done, such as less transparent payment methods and sensitive data collection (Seldal & Nyhus, 2022). However, Garai-Fodor, Varga and Csiszárik-Kocsir (2022) research results identified that older people (approximately over the age of 56) have the lowest level of knowledge regarding financial literacy and digital financial solutions.

2. RESEARCH METHODOLOGY

This study's primary objective is to assess the level of digital financial literacy among different age groups separately in Lithuania. An online survey was conducted and a total of 112 responses were received.

The questionnaire consisted of a general question and three sections of digital financial literacy questions. The first question captures respondents' age information in order to differentiate between the age groups in further analysis. The first section consists of three questions related to digital financial knowledge. The second section consists of four questions related to digital financial behavior. And the third section consists of three questions related to digital financial attitudes. For each correct answer, the correspondent will receive 1 point. The survey questions were taken from the OECD survey conducted for more reliable and close results.

3. RESULTS AND ANALYSIS

Figure 3 summarizes the main descriptive statistic of the respondents by age groups. A total of 112 respondents were interviewed, respectively, across 5 different age groups, identifying the youngest and oldest categories of people. There were 24 respondents from 18-25 age group, 22 respondents from 26-30 age group and 31-40 age group, 24 respondents from 41-65 age group and 20 respondents from 66+ age group.

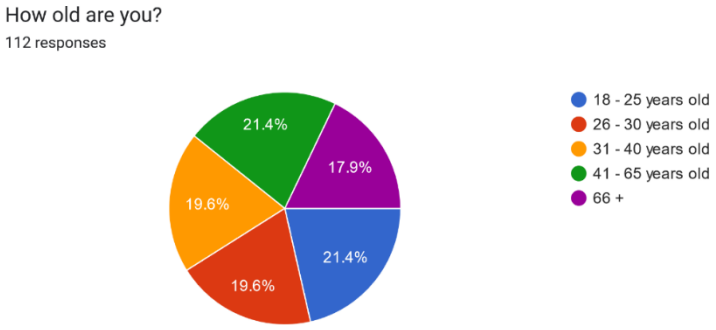

Figure 3. Age categories of respondents in the survey

Table 1 shows the questions asked in the first section of the survey. Analyzing the results of digital financial knowledge questions, that among age groups highest scoring are 26 to 30 years old group and 18-25 years old. This could be this is due to fact that they scored higher in comparison to other groups in questions related to personal data usage towards personalized commercial financial offers and cryptocurrency. Groups aged 41 and more lacked knowledge in digital signature related questions. But question related legal tenders scored higher probably due to lack of knowledge about cryptocurrency which automatically made them have negative bias towards question.

TABLE 1. Digital financial knowledge questions and answers

Age groups	A digital financial contract requires signature of a paper contract to be considered valid	The personal data that I share publicly online may be used to target me with personalized commercial or financial offers	Crypto-currencies have the same legal tender as banknotes and coins
18-25	0.58	0.58	0.83
26-30	0.73	0.77	0.73
31-40	0.68	0.36	0.55
41-65	0.54	0.29	0.42
66+	0.35	0.25	0.25
Total	**0.58**	**0.45**	**0.55**

Table 2 depicts the questions asked in the second section of the survey about digital financial behaviors first and foremost we can see that 18-25 age group scored lowest in disclosing

personal financial information, this could be due to fact that younger generations particularly "Gen Z" are more open to speak with their peers about their spending habits and finances in general, compared to other aged groups. Age groups from 18 to 30 are more likely not to share their personal bank information and on average have a tendency to change their passwords more regularly compared to others. Older age groups 41 and more are less likely to talk about their finances publicly, possibly because of less usage of social media and other internet tools. But older people are more likely to share their PIN with relatives and close friends, this could be due to unavailability to personally get their pensions from bank or in case of emergencies. Additionally, age group 66 and more scored lower in questions related to website usage, probably due to less online product buying in general.

TABLE 2. Digital financial behaviour questions and answers

Age groups	I share the passwords and PINs of my bank account with close friends	Before buying a financial product online I check if the provider is regulated in my country	I share information about my personal finances publicly online (e.g., on social media)	I regularly change the passwords on websites that I use for online shopping and personal finance
18-25	0.54	0.42	0.71	0.54
26-30	0.55	0.55	0.64	0.64
31-40	0.50	0.41	0.59	0.36
41-65	0.54	0.46	0.46	0.33
66+	0.40	0.25	0.35	0.25
Total	**0.51**	**0.42**	**0.55**	**0.43**

Table 3 shows the questions asked in the third section of the survey about digital financial attitudes. Analyzing the respondents' answers, first we clearly see age a group 66 and more being less knowledgeable about online related questions. Furthermore, group aged 18 to 25 are scored less in questions related to online shopping and website transaction, compared than other groups, this could possibly indicate that despite them paying more attention to shopping on public Wi-Fi networks they are less interested in getting familiar with online shopping terms and conditions, this could be to impulsive spending.

TABLE 3. Digital financial attitudes questions and answers

Age groups	I think that it is safe to shop online using public Wi-Fi networks	It is important to pay attention to the security of a website before making a transaction online	I think it is not important to read the terms and conditions when buying something online
18-25	0.54	0.42	0.38
26-30	0.50	0.59	0.55
31-40	0.36	0.45	0.50
41-65	0.33	0.42	0.29
66+	0.20	0.30	0.20
Total	**0.39**	**0.44**	**0.38**

Table 4 showcases the final results of the survey conducted. The 26-30 years old age group had the score of 62,27%, which is the highest score out of all the age groups. Second highest score was achieved by the 18-25 years old group, while the 31-40 years old group came in third place with the 41-65 years old group closely behind with a difference of 6,9 p. p. In the last place came the 66+ years old age group with a score of 28,00%. Overall, the score was 46,85%, which is above OECD's score only by 1,85 p. p., however the minimum target score of 70 was not reached in a single age group.

TABLE 4. Survey digital financial literacy scores across age groups

Age group	Score (out of 10)	Percentage
18 – 25 years old	5.54	55.42%
26 – 30 years old	6.23	62.27%
31 – 40 years old	4.77	47.73%
41 – 65 years old	4.08	40.83%
66 +years old	2.80	28.00%
Total	**4.69**	**46.85%**

To conclude, there were distinct differences between the age groups. This could be attributed to individuals below the age of 30 being more exposed to an abundance of information related to different digital financial products. Additionally, people under the age of 30 are entering the job market, leading to a greater necessity to follow financial news and trends.

4. CONCLUSIONS

With the growing digitalization of financial services digital financial literacy is becoming increasingly more important. Lithuania's digital financial literacy score does not meet the minimum score of 70 and only reaches 46,85%. The conducted survey shows similar results and is above the OECD's score by 1,85 p. p. Based on literature research, it has been observed that despite the advantages of exposure to digital devices and information, younger people do not necessarily have more knowledge about financial literacy. The survey results highlight that 26-

30 years old age group has the highest score and shows the most digital financial literacy skills, while the 66+ years old age group shows the lowest score and the least digital financial literacy skills. It is important to mention that the youngest age group's score was in second place. These results imply the need for further education and a targeted approach to teaching the crucial skills of digital financial literacy. Further research could focus on examining the digital financial literacy skills between people from different educational backgrounds.

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ITIL V4 METODOLOGIJOS REKOMENDACIJOMIS GRINDŽIAMAS ŠVIETIMO ĮSTAIGOS IKT INCIDENTŲ VALDYMO METODAS

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Abstraktas. Šiuo metu kibernetinėje erdvėje daugėja informacinių technologijų infrastruktūros (ITIL) pažeidimų, taip vadinamų incidentų, kurie įstaigoje sutrikdo informacinių komunikacinių technologijų (IKT) veiklos procesų įvairias grandis ir nenutrūkstamą jų darbą. Pagrindinis ITIL v4 metodologijos taikymo tikslas – padėti efektyviau valdyti IKT infrastruktūros valdymo paslaugas švietimo įstaigoje, sutelkiant dėmesį į IKT paslaugų vertės kūrimą ir jų palaikymą. Kai įvyksta IKT infrastruktūros trikdžiai, tenka ieškoti būdų ir tinkamų priemonių incidentų valdymo klausimams spręsti. Straipsnyje paliečiami tinkamos programinės įrangos pasirinkimo klausimai, kad efektyviau būtų valdomas iškilusių IKT incidentų sprendimo procesas. Nagrinėjamos Spiceworks Help Desk programinės įrangos funkcinės galimybės, kurios padeda valdyti IKT trikdžių sukeltų incidentų sprendimo atvejus. Straipsnyje nagrinėjama ITIL incidentų valdymo praktika ir IKT incidentų sprendimo būdai švietimo įstaigoje, kurie tampa vieni svarbiausių užtikrinant sąveikių sistemų sklandų ir nenutrūkstamą darbą.

Raktiniai žodžiai: ITIL v4 metodologija, incidentų valdymas, informacinės komunikacinės technologijos.

ĮVADAS

Didėjant incidentų skaičiui kibernetinėje erdvėje, iškyla sklandaus IKT darbo užtikrinimo problema švietimo įstaigoje, kurioje yra vykdomas nuoseklus ugdymo procesas. Tam reikia kad nenutrūkstamai veiktų sąveikių sistemų funkcijos, teikiamos IKT infrastruktūros paslaugos (Axelos Limited, 2019; 2020; ITIL4 Practice guide, 2023). Švietimo įstaigoje svarbu užtikrinti nenutrūkstamą IKT grandžių darbą ir efektyviai valdyti IKT paslaugas, ypač sutelkiant dėmesį į incidentų valdymo praktikas ir technologijas.

ITIL incidentais įvardinami įvairūs IKT infrastruktūros sutrikdymai ir IKT paslaugų teikimo nutraukimai tokie kaip pvz., pagrindinio įstaigos serverio darbo sutrikdymas, elektros tiekimo nutraukimas, kompiuterių tinklo pažeidimai, atskirų programinės įrangos modulių pažeidimai ir pan. bei paslaugų našumo pablogėjimas (Axelos Limited, 2021). Dažniausiai incidentų valdymas integruojamas į visą IKT paslaugų valdymo procesą (Gillingham, 2023; Darby, 2022; Dzemydienė ir kt., 2022; Kaplan, 2023). ITIL Incidentų valdymo tikslas – užtikrinti savalaikį paslaugų atstatymą į normalias darbo sąlygas, atkuriant pažeistas IKT teikimo paslaugas, kuo labiau sumažinant pažeidimo poveikį, atsirandantį dėl įvairių sutrikdytų grandžių (Dzemydienė ir kt., 2023).

Mokslinėje ir praktinėje veikloje siūlomos įvairios IKT incidentų sprendimo metodikos. Tačiau daugiausiai aspektų nagrinėjanti yra ITIL metodologija ir jos paskutinė versija ITIL v4 (Axelos Limited, 2020; ITIL 4 Practice Guide, 2023). IKT incidentų valdymo metodikos ir specialistų praktikos bando užtikrinti, kad neplanuoto paslaugos nepasiekiamumo arba pablogėjimo laikotarpiai būtų kuo trumpesni (Shepherd, 2019, Howells, 2020). Tai įgalina pasiekti du pagrindiniai veiksniai: ankstyvas incidentų nustatymas ir greitas jų normalaus veikimo atkūrimas. ITIL v4 nurodo incidentų valdymą kaip paslaugų valdymo praktiką, apibūdinančią pagrindines veiklas, įvestis, rezultatus ir dalyvaujančiųjų sprendimo procese vaidmenis

(Thirthappa, 2023; Key ITIL Concepts, 2023). Remiantis šiomis gairėmis, įstaigoms patariama susikurti incidentų valdymo procesą, atitinkantį jų konkrečius reikalavimus ir veiklos specifiką (ITIL 4 Practice Guide, 2023). Daugelis incidentų valdymo praktikų yra suskirstytos į tam tikrus etapus, kurių pagrindiniai incidento valdymo ir periodinės incidentų peržiūros etapai yra svarbūs ir kur kiekvienam atliekamam žingsniui yra sudaryta abstrakti veiksmų atlikimo seka (ITIL 4 Management Practices, 2023).

Straipsnyje pateikiami IKT incidentų valdymo rekomendaciniai pasiūlymai pagal ITIL v4 metodologiją. Siekiama sudaryti incidentų valdymo ir sprendimo algoritmą, kuris įgalintų efektyviai valdyti incidentus pagal nustatytus prioritetus. Siūlomas incidentų prioritetų nustatymo metodas, kuris integruojamas į sprendimų priėmimą, vykdant paslaugų trikdžių likvidavimą. Tyrimas apima kompiuterizuotų incidentų valdymui siūlomų sistemų analizę ir šių priemonių taikymą, sprendžiant švietimo įstaigos IKT sutrikdymo atvejus ir jų sprendimo eigos valdymą.

IKT incidentų sprendimui ir pagrindinių valdymo etapų vykdymui pasirinkta *Spiceworks Help Desk* programinė įranga, kuri yra nemokama, pasižymi lengvai valdoma sąsaja, turi automatizuotą incidento registravimą ir jų valdymą, tinklo stebėjimą, ataskaitų generavimą ir galimybę integruotis su kitomis IKT valdymo sistemomis, integruota nuotolinio prisijungimo prie vartotojo įrenginio funkcija.

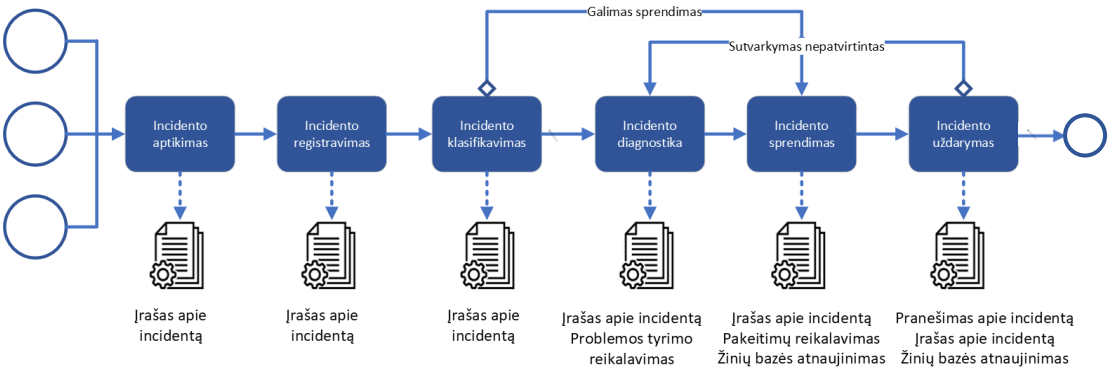
1. INCIDENTŲ VALDYMO DETALIZAVIMAS TAIKANT ITIL V4 METODOLOGIJOS REKOMENDACIJAS

Anksčiau IKT incidentai buvo aptinkami daugiausiai remiantis galutinių vartotojų ir IKT specialistų informacija. Šiuolaikinė geroji valdymo praktika siūlo aptikti ir registruoti iškart įvykus incidentams, dar prieš jiems pradedant daryti poveikį vartotojams. Šis metodas (Axelos Limited, 2021) turi daug privalumų:

- sutrumpėjusi paslaugos nepasiekiamumo arba pablogėjimo trukmė;
- aukštesnės kokybės pradiniai duomenys palaiko teisingą atsaką ir raišką incidentų sprendimui, įskaitant automatinį sprendimo būdo įtraukimą, pagal anksčiau įvykusių analogiškų atvejų sprendimą;
- kai kurie incidentai lieka nematomi vartotojams, todėl vartotojų ir klientų pasitenkinimas gerėja;
- kai kurie incidentai gali būti išspręsti prieš tai, kai jie turi įtakos sutartai paslaugų kokybei klientų, gerinant suvokiamą paslaugą ir oficialiai praneštą paslaugų kokybę;
- gali sumažėti su incidentais susijusios išlaidos.

Incidentus aptikti leidžia stebėjimo ir įvykių valdymo praktika. Tai apima įvykių priskyrimo svarbumo kategorijoms įrankius ir jų valdymo procesus, išskiriančius incidentus nuo informacinių įvykių ir įspėjimų.

Kaip ir daugelis praktikų, taip ir incidentų valdymo procesas yra susijęs su įvairiais sprendimų taikymais (Axelos Limited, 2021).



1 pav. Incidento valdymo veiksmų schema pagal ITIL v4 sudaryta pagal (Howells, 2020)

Pateikiama *1 lentelė*, kurioje nurodytos veiklos susijusios su incidentų valdymu ir išskiriamos kaip svarbiausios bei aprašytos praktikos rekomendacijose.

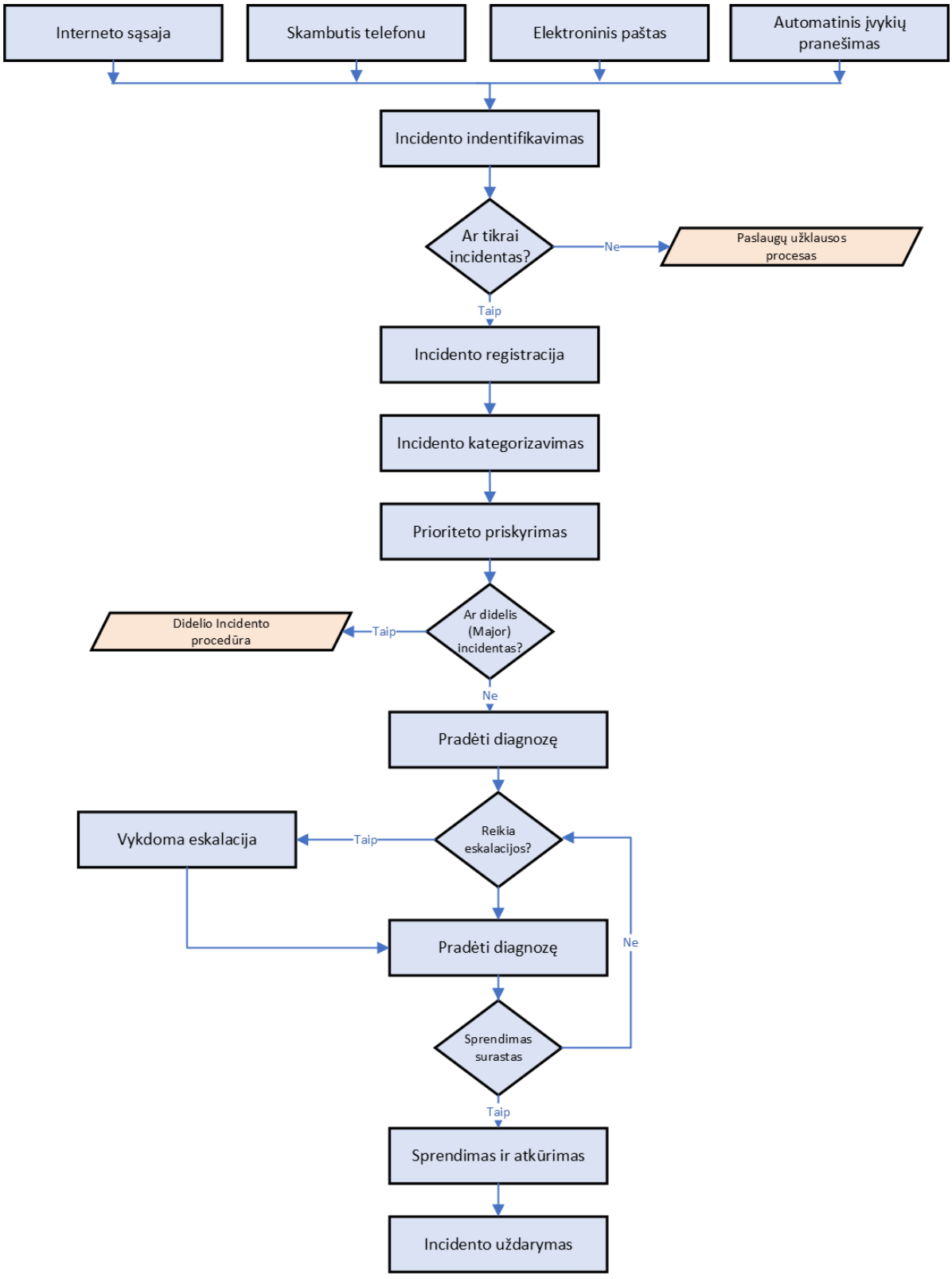
1 LENTELĖ. Skirtingos incidentų valdymo veiklos, susijusios su incidentų valdymo praktikomis

Veikla	**Susijusios praktikos**
Incidentų priežasčių tyrimas	Problemų valdymas
Bendravimas su vartotojais	Paslaugų tarnyba
Produktų ir paslaugų pakeitimų įgyvendinimas	Pakeitimų valdymas; diegimų valdymas; infrastruktūra ir platformos; projektų valdymas; išleidimo valdymas; programinės įrangos kūrimo valdymas
Technologijų, komandų ir tiekėjų veiklų stebėjimas	Stebėjimas ir įvykių valdymas
Tobulinimo iniciatyvų valdymas	Nuolatinis tobulėjimas
Paslaugų užklausų valdymas ir vykdymas	Paslaugų užklausų valdymas
Normalios veiklos atkūrimas įvykus nelaimei	Paslaugų tęstinumo valdymas

Šaltinis: (Axelos Limited, 2021)

Kadangi ITIL v4 metodika yra universali ir lanksti, tai jos rekomendacijos tik nurodo kryptį, o ne konkrečius sprendimus. Todėl ITIL v4 incidentų valdymo veiksmų schema (*1 pav.*), turi 6 žingsnius, kurie dažnai neatsako į visus iškilusius klausimus. Todėl pagal nurodytą kryptį rekomenduojama susikurti savo įstaigos poreikius atitinkančius sprendimus, veiksmų ir procesų sekas.

Kadangi ITIL v4 apibrėžia praktikas aukštesniame abstrakcijos lygmenyje, ITIL v3 apibrėžti procesai naudojami kaip operacinio lygmens procesų šablonai. Tipinis incidento valdymo veiksmų sekos algoritmas pateikiamas *2 pav.*



2 pav. ITIL incidentų sprendimo veiksmų sekos algoritmo struktūrinė schema

Algoritmas leidžia atlikti veiksmus, iškilus tam tikram incidentui ir nurodoma veiksmų seka, siekiant išspręsti incidentą. Kadangi ITIL v4 rekomenduoja procesus aprašyti pritaikant savo įstaigai, tai konkrečios organizacijos incidentų valdymo eiga gali ženkliai keistis.

Pagal ITIL rekomendacijas, užregistravus incidentą, siūloma pereiti į jo kategorizavimo etapą (*2 pav.*). Šis etapas susideda iš 2 dalių incidento kategorijos suteikimo ir prioriteto priskyrimo. Kategorijos suteikimo etape incidentai yra grupuojami pagal svarbumą ir sudėtingumą. Galima ir didesnė detalizacija, kad būtų galima lengviau juos valdyti ir analizuoti (*2 lentelė*).

Kategorizavimas padeda atskirti ir grupuoti incidentus pagal jų pobūdį, pvz., programinės įrangos klaidos, įrangos gedimai arba paslaugų sutrikimai. Svarbu nustatyti sutrikimų prioritetus, atsižvelgiant į incidento poveikį švietimo įstaigos veiklai ir jo skubumą.

Prioriteto priskyrimo etape incidentai yra analizuojami pagal poveikį ir skubumą bei jos lygius, kad būtų galima efektyviau juos valdyti ir spręsti (*2 lentelė*). Nustatant prioritetus, būtina atsižvelgti į incidento poveikį švietimo įstaigos veiklai ir jo skubumą.

2 LENTELĖ. Prioritetų priskyrimo incidentų svarbumui vertinimo kategorijos

		Poveikis įstaigos veiklos sutrikdymui			
		Kritinis	Aukštas	Vidutinis	Žemas
Skubumas	Kritinis	1	1	2	3
	Aukštas	1	2	3	3
	Vidutinis	2	3	3	4
	Žemas	3	3	4	5

Šaltinis: (Danby, 2022)

Prioritetai skirstomi pagal incidento daromą poveikį įstaigos veiklai ir pagal tai, kaip greitai reikia išspręsti incidentą. Poveikio lygis nurodo kaip stipriai paslaugos sutrikimas paveikia organizacijos veiklą, organizacijos naudotojus. Skubumas nurodo kaip incidentas paveikė pačią paslaugą, ar ji sutrikdyta visiškai ir ja visai nėra galimybės naudotis, ar paslauga galima naudotis iš dalies ir pan. Kiekviena organizacija atsižvelgiant į savo veiklą turėtų susikurti poveikio, skubos ir prioritetų aprašymus.

Dažniausiai naudojami 5 lygių prioritetai, ne išimtis ir ITIL (Danby, 2022):

Prioritetas 1 – suteikiamas, kai ITIL incidento sprendimo atsakymą galima pateikti per 10 minučių, o incidento išsprendimo trukmė gali užsitęsti iki 3 valandų.

Prioritetas 2 – suteikiamas, kai ITIL incidento sprendimo atsakymą galima pateikti per 20 minučių, o incidento išsprendimo trukmė iki 6 valandų.

Prioritetas 3 – suteikiamas, kai ITIL incidento sprendimo atsakymą galima pateikti per 1 valandą, incidento išsprendimo trukmė iki 2 darbo dienų.

Prioritetas 4 – suteikiamas, kai ITIL incidento sprendimo atsakymą galima pateikti per 5 valandas, incidento išsprendimo trukmė 5 darbo dienų.

Prioritetas 5 – suteikiamas, kai ITIL incidento sprendimo atsakymą galima pateikti per 1 dieną, incidento išsprendimo trukmė iki 2 savaičių.

Sprendžiant incidentus labai svarbu įvertinti ar incidentas gali paveikti ir kitas ITIL sritis. Incidento pasekmių šalinimo metu yra tiriama galimybė incidento išplitimui ir galimam poveikiui kitoms IKT sritims.

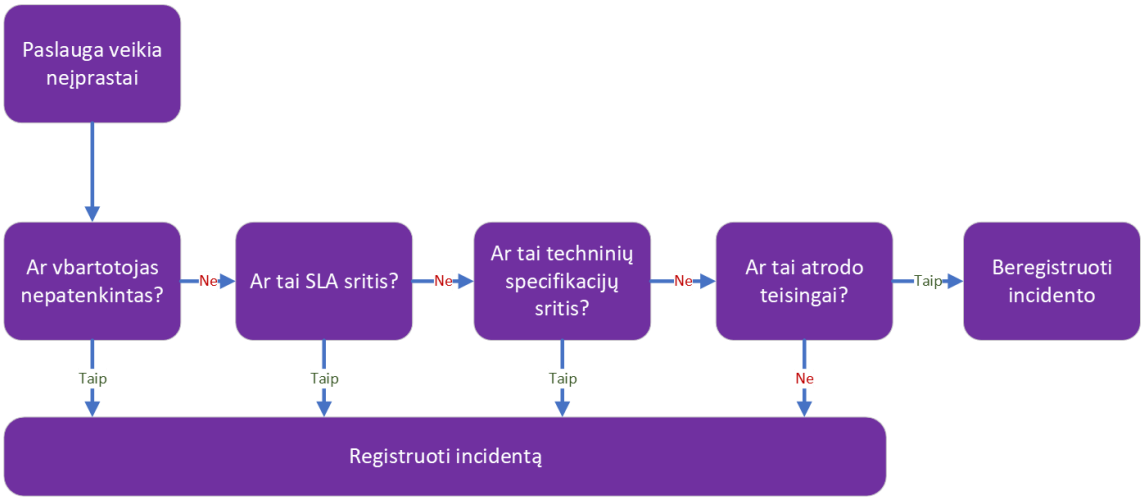
Pašalinus incidentą būtina jį dokumentuoti, t. y., aprašyti koks incidentas įvyko ir jo sprendimo metodais papildyti žinių bazę. Žinių bazėje turi būti aprašytas incidento sprendimas susijęs su incidento pasireiškimo požymiais.

2. IKT INCIDENTŲ VALDYMO PAVYZDYS TAIKANT ITIL V4 METODOLOGIJĄ ŠVIETIMO ĮSTAIGOJE

Pagal ITIL v4 metodologijos rekomendacijas svarbu tinkamai sudaryti kuo daugiau tipinių procedūrų aprėpiančią žinių bazę, kurioje aprašomi vykdymo procesai bei tam tikrų incidentų pasireiškimo atvejai ir jų sprendimo būdai. Švietimo įstaigoje reikia diegti standartizuotas kibernetinės saugos priemones ir svarbu jų laikytis. Incidento valdymo procesas laikomas pavykusiu, kurio rezultatas yra išspręstas incidentas greitu ir optimaliu būdu, minimizuojant poveikį paslaugų naudotojams. Įstaiga atsižvelgdama į savo IKT infrastruktūrą bei teikiamas paslaugas turi sukurti aiškias ir veiksmingas incidentų sprendimo procedūras.

Eksperimentinio tyrimo metu švietimo įstaigoje incidentai buvo fiksuojami taikant Help Desk sistemą. Prieš registruojant incidentus, būtina tiksliai aprašyti, kas bus laikoma incidentu. Axelos (2019) sudarė rekomendacijas, kurios įgalina incidentų atpažinimo schemą (*3 pav.*), kurioje nurodoma, kada įvykį galima registruoti kaip incidentą, o kuriuo atveju įvykis nelaikomas incidentu.

Kadangi ITIL v4 susitelkusi yra į vartotoją ir vertės kūrimą, tai beveik visi įvykiai traktuojami kaip incidentai. Švietimo įstaigoje nutarta laikytis tokio požiūrio, kad incidentu bus laikomas bet koks IKT paslaugų sutrikimas, kurio metu vartotojas susiduria su trikdžiais ir IKT paslaugų sutrikdymo nepatogumais. Incidentų atpažinimo algoritmo (*3 pav.*) schema buvo naudojama kaip pagrindinis įrankis, sprendžiant kokio tipo yra pasireiškiantys incidentai.



3 pav. Incidento atpažinimo algoritmo schema pagal (Axelos Limited, 2019)

Nustačius, kad įvykis priskiriamas incidentui, jis registruojamas Help Desk sistemoje. Incidentui valdyti reikalingas aiškus proceso aprašymas. ITIL incidentų valdymo schemoje (*4 pav.*), matosi,

kad incidento valdymas suskirstytas į tris dalis. Pirmoji dalis yra registracija Help Desk sistemoje, po to registruoti incidentai kategorizuojami ir jiems priskiriami prioritetai. Išsprendus incidentą, rengiama ataskaita ir atsakas, atsakingiems darbuotojams ir vartotojams apie užbaigtą incidento sprendimą.

Nustačius, kad tai incidentas, kurio sprendimui ir nustatytai kategorijai bei priskirtam prioritetui reikalinga specializuota pagalba, incidento valdymas perduodamas įstaigos IKT techninei pagalbai. Atlikus incidento tyrimą ir peržvelgus turimą žinių bazę, surandamas sprendimas paslaugos atkūrimui ir jei reikia papildoma žinių bazė papildoma. Jei incidento negalima išspręsti, jis perduodamas kitiems specialistams, pvz., interneto tiekėjams, įvairių registrų techninei pagalbai, e.mokyklos paskyrų administratoriams, e.dienyno administratoriams ir kt.

Kategorijos, kurių pažeidimai turi įtakos prioriteto priskyrimui, gali būti:

- Programinės įrangos gedimas;
- Tinklo gedimas;
- Spausdintuvo gedimas;
- Kompiuterio sisteminės programinės įrangos gedimas;
- Projektorių ir išmaniųjų ekranų gedimai;
- El. pašto gedimai;
- Kitos įrangos gedimai.

Incidentai turėtų būti kuo greičiau išspręsti. Tačiau įstaigoje komandų, dalyvaujančių sprendžiant incidentus, ištekliai yra riboti, dažnai jos tuo pačiu metu dalyvauja kitokio pobūdžio darbuose. Kai kuriems incidentams turėtų būti teikiama pirmenybė prieš kitus, kad būtų sumažintas neigiamas poveikis naudotojams ir optimizuotas išteklių naudojimas (Axelos Limited, 2019).

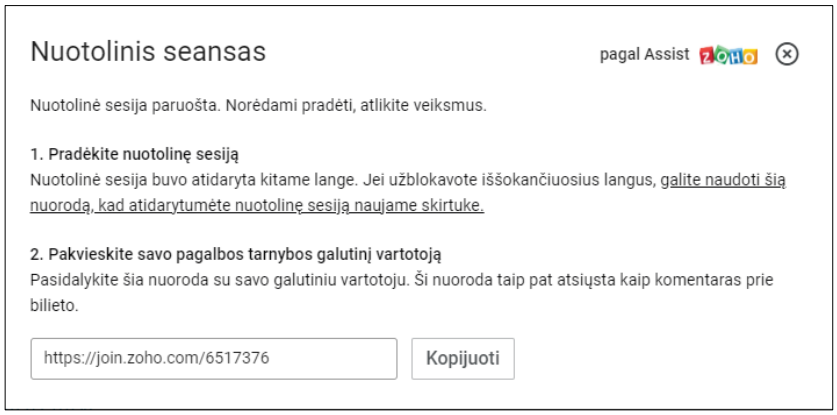
Švietimo įstaigoje rekomenduojama prioritetus suteikti pagal 3 lygius:

- Aukšto lygio – atsakymas apie IKT incidento išsprendimą galimas per 15 minučių, incidento išsprendimo laikas iki 2 valandų.
- Vidutinio lygio – atsakymas galimas per 30 minučių, incidento išsprendimo laikas iki 8 valandų.
- Žemo lygio – atsakymas galimas per 1 valandą, incidento išsprendimo laikas iki 3 dienų.

Sudarius prioriteto matricą, būtina kiekvienam lygiui nustatyti atsiliepimo ir sprendimo laiko intervalus. Įstaiga turi aiškiai numatyti kokie incidentai pagal skubumą ir poveikį priskiriami aukšto lygio, o kokie žemo lygio prioritetams. Negali būti neapibrėžtumų. Rekomenduojama incidento poveikio lygį skirstyti pagal tai, kiek vartotojų patiria incidento keliamus nepatogumus.

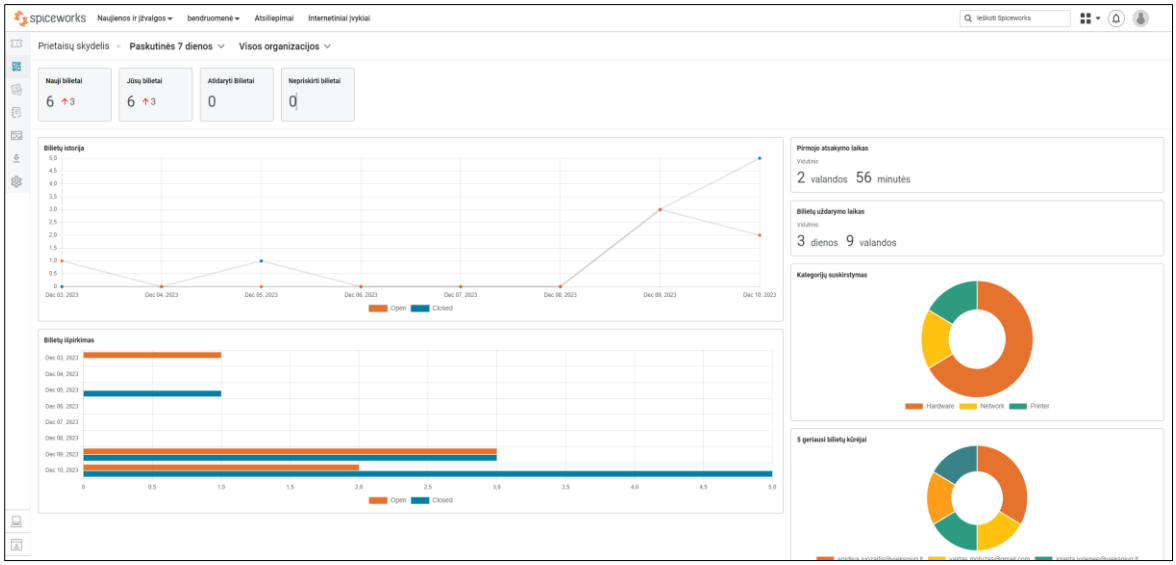
Incidentų pavyzdžiai pagal prioritetų lygį:

- Aukštas lygis – įstaigos serverio gedimas, pagrindinių tinklo komutatorių ar maršrutizatorių gedimai. Tie gedimai daro įtaką didelei darbuotojų grupei.
- Vidutinis lygis – mokymų klasės kompiuterio gedimas, Interneto problemos vienoje klasėje. Tai įrangos gedimai arba IKT paslaugų sutrikimai, kurie paveikia labai nedidelį naudotojų ratą, tačiau jų veiklai daro ženklią įtaką.
- Žemas lygis – tinklinio spausdintuvo gedimas, įstaigos bibliotekos kompiuterio gedimas. Šie gedimai nedaro didelio poveikio įstaigos mokymo procesui.



4 pav. Incidento, įvykusio nuotolinio seanso metu, nuorodos generavimo langas

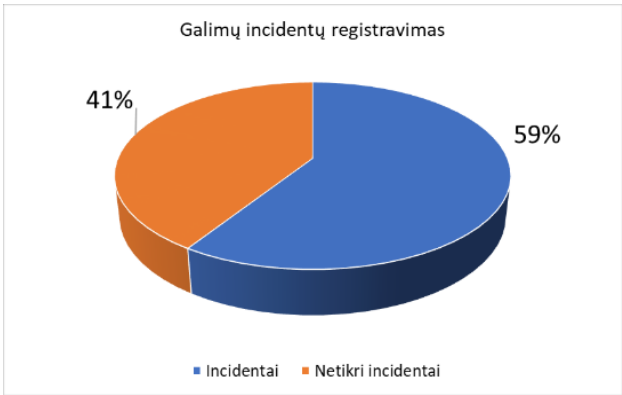
Sistema Spiceworks suteikia galimybę skirtingo pobūdžio gedimams spręsti (*5 pav.)*. Tai svarbu ne tik administruojant kelis įstaigos padalinius, bet ir kai norima testuoti naujus konfigūracijų nustatymus ar pakeitimus ir nenorima iškraipyti duomenų realiai vykstančiuose darbuose.



5 pav. Prietaisų valdymo stebėsenos skydelis Spiceworks Help Desk sistemoje

Per visą incidentų 3 mėnesių registravimo laikotarpį buvo pranešta apie 22 galimus incidentus, iš jų 18 pranešimų pateikta paskambinus telefonu, 3 pateikti elektroniniu paštu ir vienas pateiktas per incidentų registravimo portalą. Eksperimento metu paaiškėjo, kad registracija telefonu įstaigos darbuotojams yra lengviausias ir patikimas būdas.

Iš 22 gautų pranešimų apie galimus incidentus, iš jų buvo 9 netikri incidentai. Netikrą incidentą galima apibrėžti kaip negalėjimą tinkamai naudotis IKT paslaugomis dėl vartotojo netinkamai atliekamų veiksmų. *6 pav.* matyti, kad 41% iš registruojamų incidentų buvo netikri. Tokius incidentus rekomenduojama priskirti „Užklausoms dėl aptarnavimo".

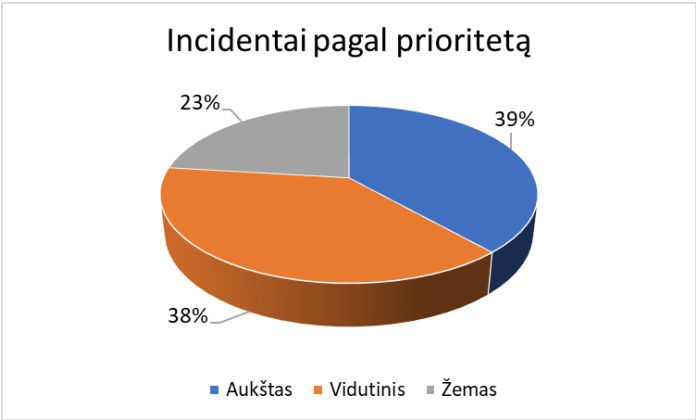


6 pav. Tikrų ir netikrų incidentų registravimo pasiskirstymas per eksperimento laikotarpį

Iš 13 registruotų incidentų, jų gedimo kategorijos pasiskirstė taip:

- 6 tinklo gedimo;
- 3 spausdintuvo gedimo;
- 2 kompiuterinės įrangos gedimo;
- 1 projektorių ir išmaniųjų ekranų gedimo;
- 1 elektroninio pašto gedimo.

Užregistruoti incidentai buvo suskirstyti pagal prioritetus: Aukšto prioriteto – 5, Vidutinio prioriteto – 5 ir Žemo prioriteto – 3. Aukšto prioriteto incidentų procentinė dalis yra nejprastai didelė, nes tinklo gedimai paveikdavo didelę vartotojų dalį, todėl incidento sprendimai turėjo būti greitai realizuojami (*7 pav.*).



7 pav. Incidentų pasiskirstymas pagal prioritetą per eksperimento laikotarpį

Incidentų valdymo metrikos yra svarbi IKT paslaugų valdymo dalis, nes jos padeda įstaigoms stebėti, kaip efektyviai tvarkomi IKT sutrikimai ir incidentai. Metrikos gali apimti įvairius aspektus, nuo incidentų skaičiaus iki jų sprendimo laiko. *3 lentelėje* yra pateiktos pagrindinės praktikos metrikos, kurios turėtų būti taikomos atsižvelgiant į įstaigos kontekstą, pvz., incidento prioriteto lygius, numatytus incidento šalinimo laikotarpius.

3 LENTELĖ. Pagrindiniai incidentų pašalinimo parametrai aptikti per 3 mėn. laikotarpį

Praktikuojami sėkmės veiksniai	**Pagrindiniai vertinimo parametrai**	**Rezultatai**
Anksti aptikti incidentus	Laikas nuo incidento įvykio iki aptikimo.	1 darbo dienos laikotarpis
	Incidentų, aptiktų stebint ir valdant įvykius, procentas	0%
Greitas ir efektyvus incidentų sprendimas	Laikas nuo incidento aptikimo iki diagnozės pradžios	Aukšto lygio < 11 min. Vidutinio lygio < 25 min. Žemo lygio < 1 val.
	Diagnozės laikas	Aukšto lygio < 15 min. Vidutinio lygio < 30 min. Žemo lygio < 45 val.
	Priskyrimo pakeitimų skaičius	2
	Laukimo laiko procentas per bendrą incidento valdymo laiką	0%
	Pirmą kartą sprendimo dažnis	77%
	Sutarto sprendimo laiko įvykdymas	100%
	Vartotojų pasitenkinimas incidento valdymu ir sprendimu	Nėra tikslių duomenų
	Incidento, kuris buvo išspręstas automatiškai, procentas	0%
	Incidentų procentas išspręsta prieš pranešant vartotojams	0%
Nuolat tobulinamas incidentų valdymas	Incidentų sprendimų procentas naudojant anksčiau nustatytus ir įrašytus sprendimus	23%
	Incidentų, išspręstų naudojant incidentų modelius procentas	15%
	Pagrindinių praktikos rodiklių tobulinimas laikui bėgant	-
	Pusiausvyra tarp incidentų sprendimo greičio ir efektyvumo metrikų	Neįvertinta

Iš pagrindinių incidentų valdymo vertinimo parametrų sąrašo seka, kad silpniausia vieta yra automatizavime. Tiek ankstyvas incidentų aptikimas, tiek automatinis jų sprendimas nėra tinkamai įtrauktas į įstaigos incidentų valdymą. Nėra aiškaus vartotojų pasitenkinimo incidento valdymu ir sprendimu, nes nėra integruotas vertinimo įrankis į incidentų valdymo pranešimus. Incidentų valdymo ir sprendimo laikai neviršija numatytų pagal prioriteto lygiams priskirtus laikus.

Pasitikrinimui, kaip pavyksta taikyti įstaigos IKT valdyme vieną iš geriųjų praktikų, yra naudojamas brandos modelis. ITIL brandos modelis apibrėžia šiuos gebėjimų lygius, taikomus bet kokiai valdymo praktikai:

1 lygis. Praktika nėra gerai organizuota; ji vykdoma kaip pradinė arba intuityvi. Retkarčiais arba iš dalies ji gali pasiekti savo tikslą vykdydama neužbaigtą veiklos rinkinį.

2 lygis. Praktika sistemingai pasiekia savo tikslą per pagrindinį veiklų, remiamų specializuotų išteklių, rinkinį.

3 lygis. Praktika yra gerai apibrėžta ir savo tikslą pasiekia organizuotai, naudojant tam skirtus išteklius ir pasikliaujant kitų praktikų, kurios yra integruotos į IKT paslaugų valdymo sistemą, įvestis.

4 lygis. Praktika savo tikslą pasiekia labai organizuotai, o jos rezultatai nuolat matuojami ir vertinami paslaugų valdymo sistemos kontekste.

5 lygis. Praktika nuolat tobulina su jos paskirtimi susijusius organizacinius gebėjimus.

Kiekvienai praktikai ITIL brandos modelis apibrėžia kiekvieno pajėgumo lygio kriterijus nuo antrojo iki penktojo lygio. Pagal šiuos kriterijus galima įvertinti praktikos gebėjimą įgyvendinti savo tikslą ir prisidėti prie įstaigos IKT paslaugų vertybių sistemos (Axelos Limited, 2019).

Svarbiausi aspektai diegiant ITIL incidentų valdymo praktiką švietimo įstaigoje pagal (Thirthappa, 2023; Thirthappa, 2023) yra:

- Naudotojų instrukcijos: Reikia suteikti aiškias instrukcijas, kaip pranešti apie incidentus ir kaip elgtis incidento atveju.
- Grįžtamasis ryšys: Būtina reguliariai rinkti grįžtamąjį ryšį iš naudotojų ir koreguoti procesus pagal gautą informaciją.
- Lankstumas: Gebėti prisitaikyti prie kintančių poreikių ir aplinkybių švietimo aplinkoje.
- Įstaigos kultūra: Atvirumo ir mokymosi vertinančioje kultūroje darbuotojai yra labiau linkę aktyviai dalyvauti incidentų valdymo procesuose, dalintis idėjomis ir mokytis iš incidentų. Kultūra skatina aktyvų požiūrį į incidentų tvarkymą, pabrėžiant mokymąsi ir tobulėjimą, o ne kaltės priskyrimą.
- Darbuotojų mokymai: Suteikia darbuotojams reikalingus įgūdžius ir žinias efektyviai reaguoti į incidentus, padeda geriau suprasti incidentų valdymo procesą. Mokymosi ir tobulėjimą skatinančioje kultūroje darbuotojai geriau pasirengę tvarkyti incidentus, tai leidžia priimti greitesnius ir efektyvesnius sprendimus.
- Vadovų ir lyderių įsitraukimas bei įsipareigojimas yra skatina teisingą ir efektyvią incidentų valdymo kultūrą. Jie gali pakviesti atvirai komunikacijai, remti mokymosi galimybes ir demonstruoti pavyzdį.

3. IŠVADOS

Iš atliktos švietimo įstaigos IKT paslaugų valdymo analizės buvo nustatytos silpnosios grandys tinkamam incidentų valdymui. Prie silpnesnių galima paminėti nenumatytas procedūras kurias reikia spręsti IKT darbuotojams, iškilus techniniams trikdžiams, nėra vykdomas gedimų registravimo ir sprendimų priėmimo procesas, darbuotojų mokymai vyksta ne sistemingai arba visai nevyksta, nėra skiriama dėmesio įstaigos IKT kultūros kūrimui.

Informacinių technologijų infrastruktūros incidentams spręsti įstaigose reikėtų taikyti IKT incidentų valdymo praktikas rekomenduojamas ITIL v4 metodologijoje, numatant konkrečius žingsnius incidentams šalinti, paskirti atsakingus asmenis ir pasirinkti tinkamus programinius įrankius incidentų valdymui bei apmokyti darbuotojus kaip reaguoti įvykus atitinkamo tipo incidentams.

Atsižvelgiant į gerosios praktikos metrikas rekomenduojama kurti žinių bazę, kurioje būtų kaupiamos žinios apie incidentų šalinimo veiksmus.

Eksperimentinis tyrimas parodė, kad dažnai sunku nustatyti laiko intervalą tarp incidento atsiradimo ir jo registravimo, nes incidentai registruojami tik tada, kai vartotojai susiduria su IKT paslaugų sutrikimais. Šiai problemai spręsti taikyta stebėjimo bei įvykių valdymo praktika, stebėjimo sistemos ir incidentų valdymo programinė įranga, kurios įgalino lengviau nustatyti incidentų tipus ir nedelsiant pradėti jų sprendimo procesą.

Remiantis atlikto tyrimo duomenimis pagal ITIL v4 metodologijos rekomendacijas, incidentų valdymą švietimo įstaigoje siūloma organizuoti pradedant incidentų registravimu, klasifikavimu, sprendimų priėmimu ir po to ataskaitų rengimu bei žinių bazės plėtimu. Reguliariai peržiūrėti ir tobulinti incidentų valdymo procesus, remiantis atliktais tyrimais ir įgyta patirtimi. Tai apima procesų, naudojamų įrankių ir metodų atnaujinimą. Skatinti bendradarbiavimą su kitomis švietimo įstaigomis ir ITIL ekspertais, dalinantis geraja patirtimi.

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STUDENTŲ RAŠTO DARBŲ ORIGINALUMO VERTINIMAS IR PRIEMONĖS KOVOJE SU NESĄŽININGUMU

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Santrauka. Studentų rašto darbų originalumo vertinimo klausimai ypač aktualūs tapo pastaraisiais metais, kai buvo pradėtos naudoti automatinio teksto generavimo sistemos. Šio straipsnio tikslas buvo išanalizuoti ar studijų darbų vertinime naudojamos originalaus teksto vertinimo sistemos gali atpažinti dirbtinio intelekto sugeneruotus tekstus. Tyrime buvo analizuojami informacinių technologijų modulio kursinio projekto darbai lietuvių ir anglų kalbomis. Šių darbų autentiškumas buvo vertinamas Moodle sistemoje integruotu įrankiu Turnitin.

Raktiniai žodžiai: Dirbtinis intelektas, intelektinis nesąžiningumas, plagiatas, automatinės teksto generavimo sistemos.

ĮVADAS

Studentų rašto darbų originalumo vertinimo klausimai ypač aktualūs tapo pastaraisiais metais, kai buvo pradėtos naudoti automatinio teksto generavimo sistemos (ATGS). Nors ATGS yra gana naujas akademinių studijų reiškinys, tačiau šios technologijos jau gana plačiai naudojamos studentų darbuose. Atsiranda rizika, panaudoti sugeneruotus tekstus nenurodant tikruosius tekstų šaltinius. Studijų procese kyla akademinio sąžiningumo bei plagiato klausimai, todėl yra ypač svarbu aptikti ir įrodyti nesąžiningumo faktą.

Šiame straipsnyje pristatomo tyrimo tikslas yra ištirti ar studentų darbų vertinimo procese naudojamos plagijavimo aptikimo sistemos gali atpažinti ne tik nuplagijuotą darbą, bet ir aptikti dirbtinio intelekto sugeneruotus tekstus.

Tyrimo objektas – modulio „Informatika 1“ pirmo kurso, universitete studijuojančių užsieniečių ir lietuvių studentų komandinio darbo projektai lietuvių ir anglų kalbomis.

Šių darbų autentiškumas buvo vertinamas Moodle sistemoje integruotu įrankiu TURNITIN.

1. LITERATŪROS APŽVALGA

Automatinės teksto generavimo sistemos (ATGS) teksto generavimui naudoja dirbtinio intelekto algoritmus. Jie dažniausiai naudoja neuroninius tinklus, kurie sugeba imituoti smegenų veiklą. Neuroninį tinklą sudaro tarpusavyje susijusių neuronų sistema, sugebanti mokytis ir vertinti informaciją iš praeities. ATGS sugeba sugeneruoti tekstą daugiau, kaip dviem šimtais kalbų, vos pateikus kelias frazes (Contentserv, 2023).

Dažniausiai Lietuvoje naudojamos automatinio teksto generavimo sistemos yra ,,ChatGPT“ ir „Bard“. Galutinė versija ,,ChatGPT“ buvo išleista 2022 m. lapkričio 30 d., o ją sukūrė OpenAI kompanija (Ortiz, 2023). Programa „Bard“ yra pasiekiama internetu per „Google“ paskyrą. Vienas iš „Bard“ privalumų ir yra tai, kad programa priklauso monolitinei kompanijai „Google“,

o ją naudoti gali visi turintys „Google“ paskyrą vartotojai. Šios ATGS yra dirbtinio intelekto pokalbių robotai, pagrįsti didelių kalbų modeliais, kurie žada skirtingas galimybes įvairiose srityse (Khademi, 2023).

Pastaruoju metu kyla daug diskusijų apie automatinio teksto generavimo sistemų, pagrįstų dirbtiniu intelektu, panaudojimo teigiamus aspektus bei grėsmes.

Kaip teigia straipsnio autoriai (Antanavičiūtė, 2023), kad automatiškai tekstą generuojanti sistema turi pranašumų, nes informacija surenkama greitai ir realiuoju laiku, kai tuo metu žmogui parašyti ilgesnį tekstą užtrunka žymiai ilgiau. Dirbtinio intelekto sistemose yra integruoti įvairūs šablonai, pagal kuriuos gali būti rašomi tinklaraščiai, elektroniniai laiškai, skelbimai, perfrazuojamos pastraipos su gramatikos pataisymu ar vertimo galimybėmis.

Be to, ATGS jau taikoma ir švietime. Šios sistemos gali būti naudojamos kaip papildoma mokymosi priemonė, padedanti besimokantiems gauti papildomą informaciją aiškinantis sunkias temas arba sprendžiant pratimus, kurie padėtų vystyti raštingumą. ATGS gali padėti atsakyti į užduotis arba paaiškinti, kaip spręsti konkrečias užduotis matematikoje, fizikoje, programavime ir kt.

Tačiau tokios dirbtinio intelekto sistemos sugeba ne vien padėti besimokantiems tobulėti, bet ir kurti kenkėjišką programinį kodą. Kaip rašoma (Pengas, 2023) tyrime, kenkėjai sukūrė kodą, kuris leidžia užgrobti asmeninę informaciją iš nutolusių duomenų bazių ir vykdyti kibernetinius įsilaužimus, todėl dirbtinio intelekto galimybės kartais kelia paniką dėl visuomenės vertybių tokių kaip sąžiningumas ar pasitikėjimas.

Nors aukštųjų mokyklų studentai savo darbuose gana intensyviai naudoja ATGS technologijas, kurios siūlo daugybę privalumų, tačiau kelia susirūpinimą klausimas dėl akademinio sąžiningumo ir plagiato. Kai kurios Lietuvos aukštosios mokyklos jau kyla į kovą su intelektualiniu nesąžiningumu (Stabingis, L., Šarlauskienė, L., Čepaitienė, N., 2014). Universitetai sutaria, kad „piktnaudžiavimas dirbtinio intelekto platformomis gali būti prilygintas akademiniam nesąžiningumui, o tai studentui gali grėsti net pašalinimu iš aukštosios mokyklos“ (Kučinskas, 2023)

Straipsnio autoriai kelia daugybę klausimų (Mills, A., Bali, M., & Eaton, L., 2023). Ar galima šiuolaikinėmis technologijomis įvertinti teksto autorystę ir nustatyti kas parašė darbą – automatinio teksto generavimo sistema ar žmogus? Kaip turėtų keistis darbų vertinimo praktika mokyme? Kaip panaudoti automatiškai tekstą generuojančias sistemas pedagogiškai?

Kiti moksliniai straipsniai apie tekstą generuojančių sistemų naudojimą studijose vertina labai įvairiai. Pavyzdžiui, autoriai (Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., ... & Heathcote, L., 2023) aptaria galimą naudą ir iššūkius naudojant ATGS, aukštajame moksle. Balansuojant tarp galimos naudos ir iššūkių, ATGS gali pagerinti studentų mokymosi patirtį. Tačiau mokyklų pedagogai ir studentai turi būti atsargūs naudodami jas akademiniais tikslais, kad būtų užtikrintas jos etiškumas, patikimas ir efektyvus naudojimas.

Straipsnyje (Firat, 2023) aptariami ATGS naudojimo pranašumai švietime. Pedagogai ir studentai vertina ATGS sistemas kaip pagalbą siekiant padidinti mokymosi efektyvumą atsakant į įprastinius klausimus. Taip išlaisvinamas laikas pedagogams susitelkiant ties aukštesnės eilės užduotimis, suteikiant studentams greitą grįžtamąjį ryšį. Tačiau yra ir galimų iššūkių, keliančių susirūpinimą dėl pateiktos informacijos tikslumo, privatumo ir duomenų

saugumo. Šie iššūkiai turi būti sprendžiami siekiant užtikrinti kad ATGS būtų veiksmingai ir saugiai naudojamos mokyme.

Straipsnių apžvalgoje (Lo, 2023) aptariama kaip ATGS gali būti naudojamos mokymui ir mokymuisi pagerinti. Ši greita 50 straipsnių apžvalga išryškino skirtingą ATGS įvairiose srityse naudą, kai ATGS dirba kaip dėstytojų asistentas ar kaip virtualus dėstytojas studentams. Tačiau ATGS naudojimas kelia įvairių rūpesčių, dėl neteisingos ar suklastotos informacijos generavimo ir jos keliamos grėsmės akademiniam sąžiningumui. Šios apžvalgos išvados ragina mokyklas ir universitetus nedelsiant imtis veiksmų, kad būtų atnaujintos akademinio sąžiningumo ir plagiato prevencijos gairės ir politika. Be to, studentai taip pat turėtų būti mokomi apie ATGS naudojimą ir apribojimus, bei galimą poveikį akademiniam sąžiningumui.

Straipsnyje (Sok, S., & Heng, K., 2023) vardijami ATGS privalumai, tokie kaip pedagoginės praktikos tobulinimas, virtualaus asmeninio mokymo siūlymas, metmenų kūrimas ir minčių šturmas. Antra vertus, ATGS naudojimas yra susijęs su akademinio sąžiningumo problemomis, nesąžiningu mokymosi vertinimu bei netikslia informacija. Straipsnyje pateikiamas rekomendacijų rinkinys, kaip efektyviai naudoti „ChatGPT" švietimo ir tyrimų tikslais.

Straipsnyje (Ismail, 2023) aptariamos kovos priemonės su plagiatu. Tam tikslui analizuojama TURNITIN plagiato aptikimo programinė įranga, kuri tarnauja kaip atgrasymo priemonė, galinti patikrinti darbų panašumą. Straipsnyje taip pat analizuojama, kaip besimokantieji reaguoja į plagiato aptikimo priemonės naudojimą jų darbams patikrinti. Nustatyta, kad apie plagijavimą supranta palyginti nedaug studentų.

2. TYRIMAS

Tyrime buvo siekiama išsiaiškinti ar studentų darbų vertinime naudojamos plagijavimo patikros sistemos gali atpažinti ne tik nuplagijuotą darbą, bet ir aptikti dirbtinio intelekto sugeneruotus tekstus.

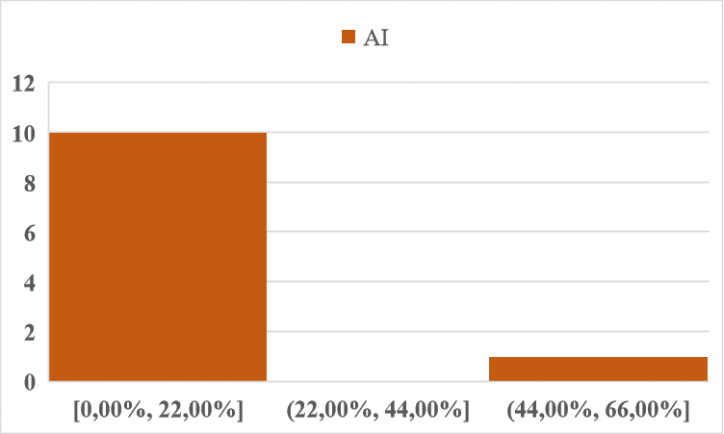
Prieš pradedant tyrimą, buvo išsiaiškinta ar studentai naudojasi dirbtinio intelekto sistemomis. Viename studentų komandos darbe buvo aprašytas tyrimas kiek studentai susipažinę ir naudojasi ChatGPT programa. Tyrimas parodė, kad tik pusė studentų naudojosi šia dirbtinio intelekto programa. Tačiau į klausimą „Ar manote, kad virtualūs asistentai taps mūsų ateitimi?", daugiau kaip du trečdaliai respondentų tiki dirbtinio intelekto galimybėmis.

Iš viso šiame straipsnyje pristatomame tyrime buvo analizuojama apie 250 studentų darbų, kurie buvo apjungti į 56 grupinius darbus (45 darbai lietuvių kalba ir 11 darbų anglų kalba). Pateikti studentų darbai, buvo įkelti į Moodle sistemą, kurioje yra integruotas TURNITIN įrankis. Siekiant įvertinti darbų plagijavimo lygį, buvo analizuojama kiek darbuose buvo panaudotos ATGS programos bei kiek procentų plagiato yra darbuose iš kitų išorinių šaltinių. Apie TURNITIN plagijavimo sistemos panaudojimą komandinių darbų vertinimui studentai buvo informuoti iš anksto.

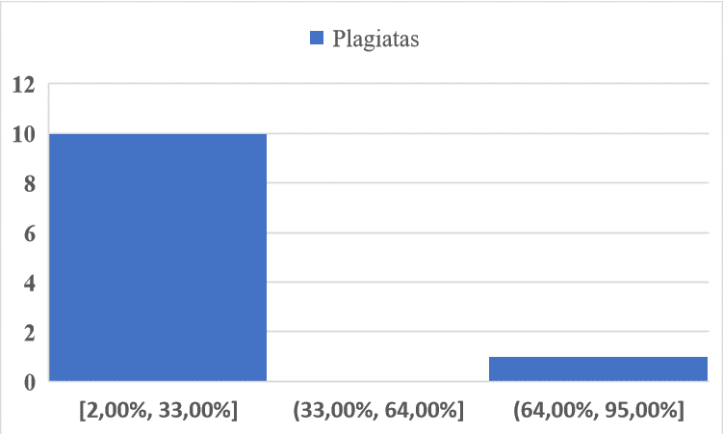
1 pav. TURNITIN sistemos darbų vertinimas

TURNITIN sistemoje (*1 pav.*) yra pateikiamas analizuojamo darbo bendrasis plagiatas (raudona spalva pažymėta rodyklė) bei dirbtinio intelekto panaudojimo procentas (mėlyna rodyklė).

Tyrimo pirmoje dalyje buvo vertinama 11 užsieniečių komandinių darbų, parašytų anglų kalba. Buvo nustatyta, kiek procentų yra sugeneruota naudojant dirbtinio intelekto sistemas bei kokią dalį sudaro bendrasis plagiatas. Iš pateiktų histogramų matyti, kad didžioji dalis sudaro nuo 0% iki 22% dirbtinio intelekto sistemų (AI) panaudojimo (*2 pav.*), o bendras plagiatas didžiausią dalį siekė nuo 2% iki 33% *(3 pav.*).

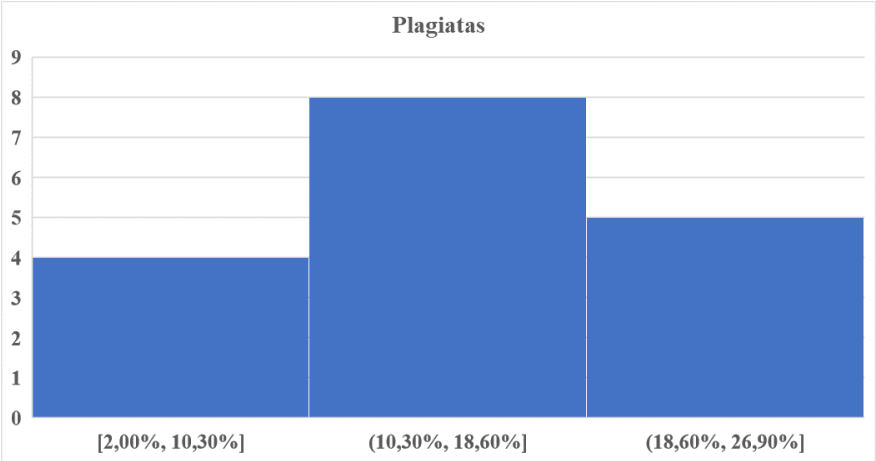


2 pav. Dirbtinio intelekto programų panaudojimo histograma



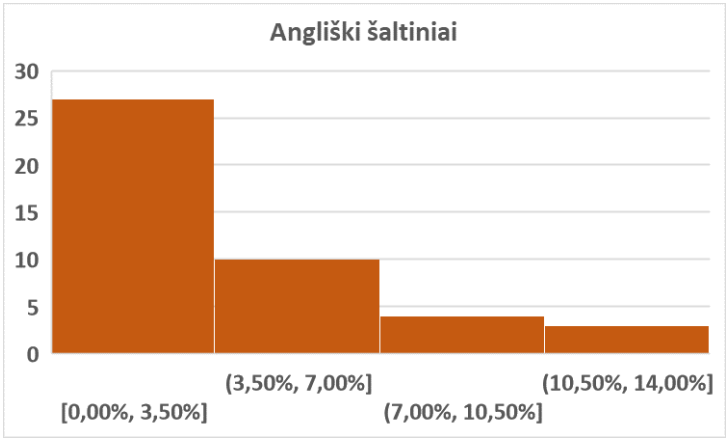
3 pav. Aptikto plagiato angliškuose darbuose pasiskirstymo histograma

Kitą tyrimo dalį sudarė 45 lietuvių studentų komandiniai darbai, parašyti lietuvių kalba. Reikia pažymėti, kad TURNITIN įrankis lietuvių kalba kursiniuose darbuose negalėjo įvertinti dirbtinio intelekto įrankių panaudojimo. Tokių galimybių TURNITIN neturi. Lietuviškuose darbuose dažniausiai aptinkamas plagiatas yra tarp 10,3 ir 18,6 procentų (*4 pav.*).



4 pav. Aptikto plagiato lietuviškuose darbuose pasiskirstymo histograma

Kadangi dirbtinio intelekto programų panaudojimo studentiškuose darbuose nebuvo galima nustatyti, tai buvo analizuojama kiek studentai naudojasi angliškais šaltiniais juos išversdami į lietuvių kalbą su automatinėmis vertyklėmis. Angliškų šaltinių panaudojimo dažnumo histograma parodė, kad dažniausiai buvo naudojamasi tarp 0 ir 3,5 procentų (*5 pav.*).



5 pav. Angliškų šaltinių panaudojimo histograma

Apibendrinant tyrimo rezultatus, buvo apskaičiuoti vidurkiai bendro plagiato panaudojimo lietuviškuose ir angliškai parašytuose darbuose. Vidurkis plagiato lietuviškuose darbuose siekė apie 14,70%, o angliškuose bendrasis plagiatas sudarė apie 15,82%.

Tyrimas parodė, kad lietuviškuose darbuose nedažnai naudojami angliški šaltiniai (tik 3,59%). To tarpu dirbtinio intelekto pasinaudojimo vidurkis angliškuose darbuose sudarė 11,09%.

3. IŠVADOS

Literatūros šaltinių apžvalga parodė, kad universitetuose reikia imtis priemonių, kad būtų suformuotos akademinio sąžiningumo ir plagiato prevencijos gairės ir politika. Be to, studentai taip pat turėtų būti mokomi apie ATGS naudojimą ir apribojimus bei galimą jo poveikį akademiniam sąžiningumui.

Tyrimo rezultatai parodė, kad studentai plagiatą praktikavo vidutiniškai vienodai tiek lietuviškuose darbuose, tiek ir angliškai parašytuose darbuose (apie 15 procentų), o dirbtinio intelekto priemonėmis angliškuose darbuose vidutiniškai naudojosi apie 10 procentų (lietuviškuose darbuose nebuvo galimybės nustatyti dirbtinio intelekto panaudojimo galimybių).

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NUOTOLINIO MOKYMO(SI) IŠŠŪKIAI IR GALIMYBĖS UGDANT MOKINIŲ MUZIKINĮ RAŠTINGUMĄ PROGIMNAZIJOJE

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Santrauka. Šiandienos mokymas neapsiriboja ugdymu fizinėje erdvėje. Pamokos keliasi ir į virtualią erdvę, vykdomos nuotoliniu būdu. Mokinių muzikinio raštingumo ugdymas taip pat galimas virtualioje erdvėje. Vis dėlto, nuotoliniu būdu ugdant muzikinį raštingumą, mokytojams kyla iššūkių, nors jie ir pastebi teigiamų nuotolinio mokymosi aspektų. Straipsnyje nagrinėjama 1–8 klasių mokinių muzikinio raštingumo samprata, muzikinio raštingumo ugdymas nuotoliniu būdu, kylantys iššūkiai ir galimybės.

Raktiniai žodžiai: nuotolinis mokymas(is), pamoka, muzikinis raštingumas.

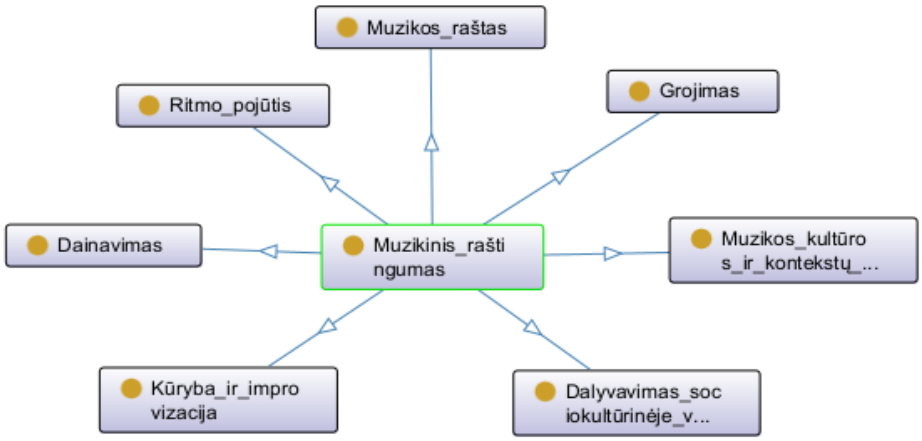
ĮVADAS

XXI amžiaus mokymas ir mokymasis nuolat keičiasi. Pamokose vis dažniau naudojamos informacinės technologijos (IT), atnaujinamos bendrojo ugdymo programos, kuriose akcentuojamos skaitmeninės kompetencijos, mokymas vyksta ne tik fizinėse klasėse, bet ir nuotoliniu būdu. Tai išties nemenkas išbandymas tiek mokytojams, tiek mokiniams. Ypatingai sudėtingas tampa muzikinis ugdymas, nes remiasi praktiniu mokymu ir betarpišku kontaktu su mokiniu. Muzikos pamokų specifika įgalina mokytis dalyką netradiciškai, įtraukiant vaikus į kūrybinius procesus, keliančius jų susidomėjimą ir motyvaciją [1]. Muzika privalo būti perduodama, apie ją turi būti kalbama bei mokoma unikaliu, asmenišku būdu – žmogus žmogui. Kai ji išgyvenama gyvai, juntami visai kitokie jausmai, muzika bei jos subtilybės suvokiamos visai kitaip nei, kad mokant tuos pačius dalykus nuotoliu [2].

Didelę įtaką mokymui nuotoliniu būdu turėjo COVID-19 pandemija. IT panaudojimui muzikiniame ugdyme nebuvo skiriama tiek dėmesio iki pandemijos [3], kiek teko skirti pandemijos metu. V. Žalys pažymi, kad XX amžiaus devintojo dešimtmečio pradžioje personalinių kompiuterių naudojimas muzikos pamokoje pasaulyje dažnai buvo vertinamas prieštaringai [4], tačiau po pandemijos IT tapo neatsiejama pamokos dalis, nepriklausomai nuo to ar ji vyksta fizinėje erdvėje, ar virtualioje. Muzikos mokytojai ir mokiniai pagaliau pasinaudojo įvairiomis skaitmeninėmis platformomis, kurios padėjo jiems mokyti ir mokytis nuotoliniu būdu. Nors pandemija lėmė naujus ugdymo iššūkius, ji taip pat suteikė naujų galimybių mokytojams būti labiau kūrybiškiems ir novatoriškiems, plėtojant idėjas ir bandant naujus būdus, kurie anksčiau nebuvo taikomi muzikiniame ugdyme [5]. Mokytojų išradingumą demonstruoja viskas – nuo žaidimų ant važiuojamosios kelio dalies iki įvairių technologijų, skirtų mokinių darbams įrašyti, dalytis, juos komentuoti, taisyti [6]. Šio straipsnio tikslas yra išanalizuoti muzikinio raštingumo sampratą bei nuotolinio mokymo(si) iššūkius ir galimybes ugdant mokinių muzikinį raštingumą progimnazijoje.

1. MUZIKINIS RAŠTINGUMAS IR JO UGDYMAS NUOTOLINIU BŪDU

Muzikinis raštingumas (MR) – itin plati sąvoka. Ją nagrinėjo daugelis mokslininkų [7][8][9][10][11][12][13][14], o muzikinio ugdymo mokslininkai MR pradėjo apibūdinti prieš kelis dešimtmečius. Pats paprasčiausias MR apibūdinimas – gebėjimas skaityti muziką [15]. Vėliau mokslininkai apibrėžimą tobulino. Dabar galima sakyti, kad MR – tai dėmesingumas, imlumas vertingai muzikai, gebėjimas klausantis nežinomos muzikos iškart pajausti istorinį stilių, žanrą, kompozitoriaus autorystę, formą, kompozicinę logiką, gebėti kūrinį visavertiškai suvokti, suprasti jo gelmę (muzikinio intelekto pasireiškimas), vertinti kultūros kontekste [16]. Taip mokinių MR ugdymas vykdomas kompleksiškai, lavinamas ritmo pojūtis, mokiniai mokomi muzikos rašto paslapčių, skambinti įvairiais muzikos instrumentais, dainuoti, komponuoti muziką, reflektuoti savo kūrybą, palyginti ją su bendraamžių, nagrinėti įvairių epochų muzikinį palikimą. Literatūroje MR daugiausia apibrėžiamas kaip muzikos raštas, grojimas, dainavimas, ritmo pojūtis, kūryba ir improvizacija, muzikos kultūros kontekstų pažinimas bei dalyvavimas sociokultūrinėje veikloje. MR samprata apibendrinta (*1 pav.*) MR ontologijoje.



1 pav. Apibendrinta muzikinio raštingumo sampratos ontologija

MR ugdymui pamokose jau taip pat pasitelkiamos IT. O COVID-19 pandemija suteikė galimybę išbandyti MR ugdymą ir nuotoliniu būdu, kurio plėtrai įtaką taip pat padarė sparti IT raida ir su tuo susiję naujos skaitmeninio amžiaus teikiamos galimybės [17]. Kaip tik todėl, mokant(is) nuotoliniu būdu, mokytojai ir mokiniai ugdosi ne tik MR, bet ir skaitmenines kompetencijas, kurių ugdymas akcentuojamas atnaujintose bendrojo ugdymo programose [18]. Mokinių skaitmeninės kompetencijos ugdymas MR ugdyme apima keletą sričių: muzikavimą, muzikos kūrimą, muzikos reiškinių ir kultūrinių kontekstų pažinimą.

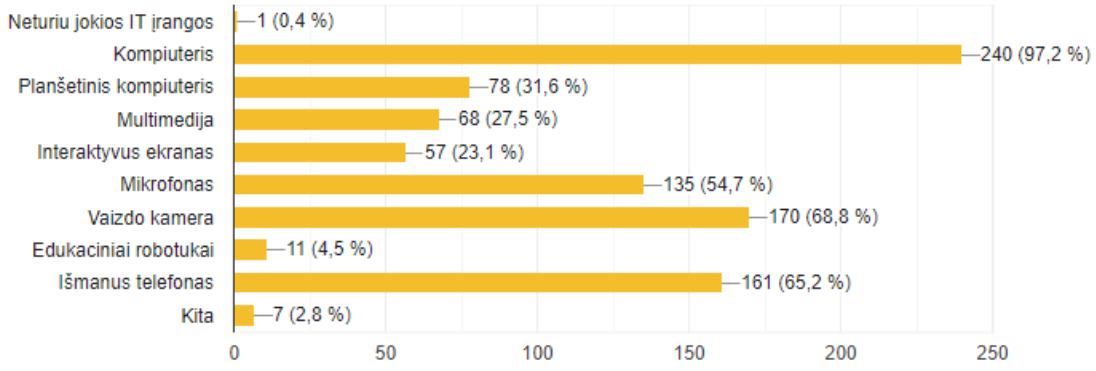
Ugdant mokinių MR nuotoliniu būdu, mokytojai pirmiausia naudojasi Švietimo portale (https://www.emokykla.lt) pateiktomis nuorodomis į skaitmeninius išteklius. Šalia atnaujintų programų pateikiamos 35 skaitmeninės mokymo priemonės. Nacionalinė švietimo agentūra, padėdama mokytojams dirbti nuotoliniu būdu, taip pat parengė ir švietimo portale pateikė skaitmeninių priemonių, tinkamų mokyti muzikos nuotoliu 1–4 ir 5–8 klasėse, sąrašą su aprašymais. Be to, mokytojai ir patys daug kuria savų ugdymo priemonių, kurios palengvina dirbant muzikos pamokose nuotoliniu būdu.

MR ugdymui nuotoliniu būdu svarbios ne tik skaitmeninės mokymo priemonės, bet ir tiesioginis bendravimas bei erdvė, kurioje būtų talpinama mokomoji medžiaga, užduotys, vyktų bendradarbiavimas. Tiesioginiam bendravimui užtikrinti reikalingos vaizdo konferencijų (VK) priemonės. Mokomajai medžiagai talpinti, bendradarbiauti – virtualioji mokymosi aplinka (VMA). Daugelį VK priemonių ir VMA mokytojai ir besimokantieji išbandė pandemijos akivaizdoje. Kiekvienas atrado ir pasirinko sau tinkamiausią, nes pasirinkimas itin svarbus MR ugdymui. Vis dėlto, muzikos mokytojams kyla tikras iššūkis, kai reikia dainuoti, ritmuoti su mokiniais, dirbant nuotoliniu būdu. Muzikos mokytojui svarbu matyti dainuojantį mokinį, svarbu, kad garsas kuo mažiau „vėluotų", kad būtų galima klausytis muzikos kartu su mokiniais. Tačiau, mokyklose dažnai nusprendžiama pasirinkti vieningą VMA ar VK priemonę, neatsižvelgiant į muzikos dalyko specifiškumą. Pavyzdžiui, ne kiekviena VMA palaiko muzikos rašto simbolius, todėl muzikos mokytojams dažnai tenka sukti galvas, kaip užrašyti muzikinius ženklus.

2. TYRIMAS APIE NUOTOLINIO MOKYMOSI IŠŠŪKIUS IR GALIMYBES UGDANT MOKINIŲ MUZIKINĮ RAŠTINGUMĄ PROGIMNAZIJOJE

Siekiant išanalizuoti iššūkius, kylančius ugdant MR progimnazijoje, ir galimybes ugdyti MR nuotoliniu būdu, atliktas tyrimas, kuriame siekta apžvelgti kuo daugiau MR požymių. Tyrime dalyvavo 247 Lietuvos mokytojai, turintys muzikos pamokas 1–8 klasėse. Tyrimui atlikti sukurta anketa iš 14 uždarų ir atvirų klausimų, o mokytojams, kurie atsakinėjo į anketos klausimus, buvo svarbu, kad būtų mokę mokinius muzikos nuotoliniu būdu. Visi tyrime dalyvavę muzikos mokytojai (100%) patvirtino, kad jiems yra tekę mokyti mokinius nuotoliniu būdu, o dalis jų (5,3%) vis dar dirba nuotoliniu būdu.

Atliekant tyrimą, mokytojų buvo klausiama, kokia IT įranga jie gali naudotis nuotolinėse muzikos pamokose. *2 pav*. matyti, kad didžioji dalis mokytojų (97,2%) naudojasi kompiuteriu, o kai kurie (68.8%) vaizdo kamera. Nemaža dalis mokytojų (65.2%) taip pat naudojasi išmaniuoju telefonu ir kitomis priemonėmis.



2 pav. IT įranga, kuria mokytojai gali naudotis pamokose

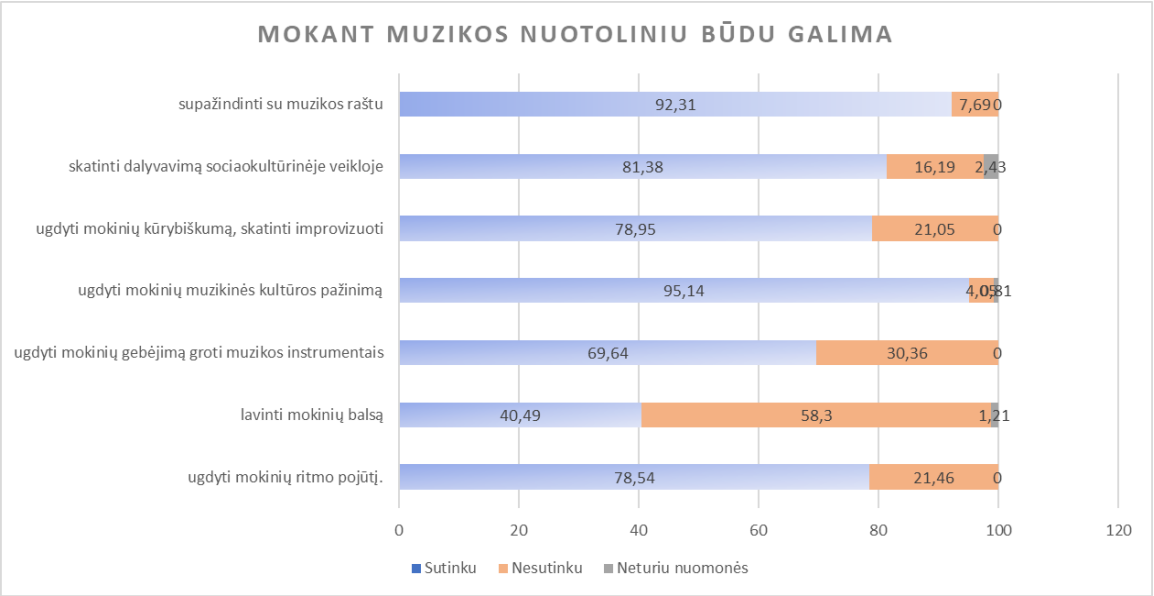
Bendravimui su mokiniais nuotoliniu būdu dauguma muzikos mokytojų renkasi „Zoom" (78,1%) ir „MS Teams" (60,3%) VK sistemas. Dalis mokytojų (24,7%) taip pat renkasi „Google Meet" VK priemonę ir nedidelė dalis (~9%) – „Skype" bei „Viber" priemones. Nedidelė dalis mokytojų (mažiau nei 3%) renkasi „Messenger" (2,8%), „BigBlueButton" (2%), ir vos keletas mokytojų –

„Discord“, „WhattsApp“, arba kitas VK priemones. VK priemonės pasirinkimas MR ugdymui labai svarbus, nes ne visų priemonių galimybės yra tinkamos. Tačiau, pasirinkimą dažniausiai lėmė mokyklos administracijos sprendimas arba nesudėtingas VK priemonės valdymas ir mokytojui, ir mokiniams.

Vis dėlto, net ir nenaudojant VK priemonių bendravimui, dirbant nuotoliniu būdu, mokytojams reikia palaikyti ryšį su mokiniais, pvz., pranešti kur pateikta mokomoji medžiaga, kokie laukia atsiskaitymai, todėl mokytojų buvo klausiama, kaip jie palaiko ryšį su mokiniais. Dažniausiai informaciją muzikos mokytojai pateikia elektroniniame dienyne. Tai nurodė beveik visi mokytojai (87,9%). Taip pat dauguma mokytojų (63,6%) informaciją pateikia mokyklos pasirinktoje VMA. Be to, net pusė mokytojų (53%) turi susikūrę „Messenger" grupes. Ir tik po vieną mokytoją (0,4%) nurodė, kad informacijai pateikti naudoja tokias priemones kaip telefonas, el. paštas, „Skype“, „Eduka“ klasę, „MS Teams“, „Telegram“, „Facebook“, „Viber“ arba perduoda informaciją tiesiogiai.

Be VK priemonių MR ugdymui svarbi ir VMA. Deja, bet dalis mokytojų (7,2%) nurodė, kad nesinaudoja jokia VMA. O tarp besinaudojančių VMA mokytojų populiariausia yra „MS Teams" (61,5%). Dalis mokytojų (32,8%) taip pat pasirinko „Google Classroom“ ir (15,8%) „Moodle". Tik nedidelė dalis mokytojų (3,6%) nurodė, kad naudoja kitą VMA, o keletas mokytojų (3) nurodė, kad kaip VMA naudoja „Discord“ priemonę.

Atliekant tyrimą, taip pat buvo siekiama išsiaiškinti mokytojų požiūrį ir MR ugdymą. Mokytojų buvo klausiama apie įvairius MR požymius, domėtasi, ar juos galima ugdyti nuotoliniu būdu, ką jie mano apie ritmo pojūčio, balso lavinimą, mokinių mokymą groti muzikos instrumentu, ar galima ugdyti mokinių muzikinės kultūros pažinimą, jų kūrybiškumą, ar įmanoma mokiniams dalyvauti sociokultūrinėje veikloje dirbant nuotoliniu būdu. *3 pav*. matyti, kad daugiau kaip pusei mokytojų (58,3%) kylą iššūkių, kuomet reikia lavinti mokinių balsą. Taip pat nemažai mokytojų (30,36%) kyla sunkumų mokant mokinius groti muzikos instrumentais. Mažiausiai iššūkių mokytojams (4,86%) kelia mokinių muzikinės kultūros pažinimo ugdymas. Taip pat beveik nekyla iššūkių muzikos mokytojams (7,69%), kai reikia juos supažindinant su muzikos raštu. Dauguma mokytojų (81,83%) mano, kad mokant nuotoliniu būdu mokiniai gali dalyvauti sociokultūrinėje veikloje, ir beveik tiek pat mokytojų (~79%) mano, kad nuotoliniu būdu galima ugdyti mokinių kūrybiškumą bei ritmo pojūtį.



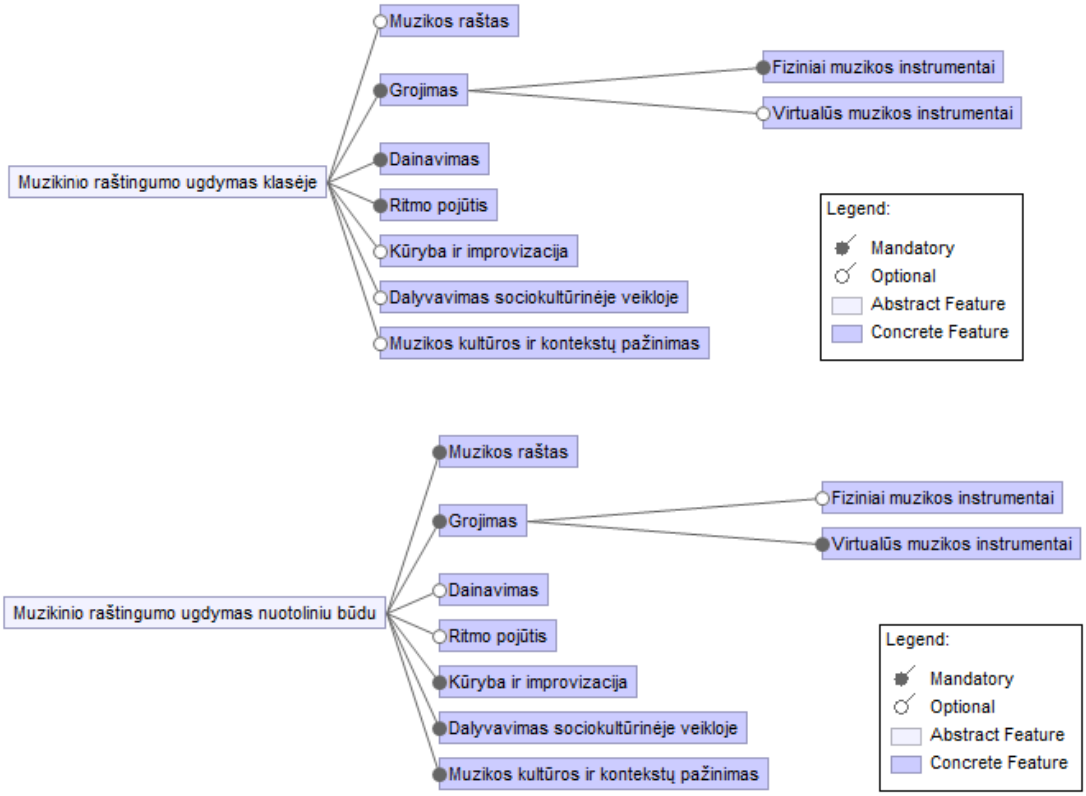
3 pav. Muzikinio raštingumo ugdymas nuotoliniu būdu

Apklausoje mokytojams buvo pateikti ir atviro tipo klausimai, kur buvo prašoma nurodyti, kokie iššūkiai kyla muzikos pamokose, kurios vyksta nuotoliniu būdu. Dažnas mokytojas nurodė, kad kildavo rūpesčių dainuojant. Niekaip nepavykdavo dainuoti sinchroniškai, nebent būdavo nutildomi visi mokinių mikrofonai. Bet tokiu būdu mokytojai negirdėdavo mokinio ir tik pagal vaizdo kameros vaizdą galėdavo spręsti, kiek pastangų įdeda mokinys, kokios nuotaikos vyrauja atliekant dainą. Mokytojai taip pat nurodė, kad dirbant nuotoliniu būdu prarandama galimybė muzikuoti ansamblyje, nes neįmanoma to padaryti sinchroniškai. Mokytojai taip pat rašė, kad pasigesdavo koncertinės veiklos, gyvų emocijų, jaudulio einant į sceną. Kai kuriems mokytojams, dirbant nuotoliniu būdu, yra iššūkis parengti mokomąją medžiagą, susikurti interaktyvių užduotėlių, testų žinioms patikrinti. O tie, kuriems tai pavyksta, nurodė, kad reikalingos begalinės laiko ir energijos sąnaudos. Mokytojai taip pat nurodo, kad daug laiko reikia ne tik užduočių kūrimui, bet ir grįžtamojo ryšio teikimui. Daug laiko reikia kol peržiūrimas kiekvienas atsiųstas darbas, prašomas komentaras ir įvertinimas darbas.

Mokytojų taip pat buvo klausiama, ar jie atrado teigiamų muzikos mokymo aspektų dirbant nuotoliniu būdu. Atsakydami į šį klausimą mokytojai džiaugėsi, kad patobulino savo skaitmenines kompetencijas, atrado daug naujų platformų, draugiškų ir padedančių kolegų. Atsakymuose mokytojai taip pat mini, kad dirbant nuotoliu jie pasiklauso kiekvieno mokinio dainavimo. O tai retai pavyksta dirbant kontaktiniu būdu, nes tuomet dažniausiai dainuojama grupėje. Mokytojai taip pat pastebėjo, kad virtuali erdvė – jauki, patogi erdvė mokiniui. Sukuriamas kitoks, asmeniškas ryšys. Galima puikiai išdėstyti grojimo instrumentu pagrindus. Taip pat, atsiskleidžia ir pačio mokytojo kūrybiškumas, prasiplečia IT panaudojimo galimybės, daugiau kuriamos metodinės medžiagos. Teigiamas aspektas yra tas, kad nuotolinis mokymas leidžia labiau pažinti mokinius, pastebėti jų kūrybiškumą ir improvizacijos galimybes. Dalis mokytojų džiaugėsi, kad dirbant nuotoliu sukurta mokomoji medžiaga lengvai pritaikoma ir dirbant kontaktiniu būdu. Mokytojai taip pat pastebėjo, kad mokant nuotoliniu būdu pastabesni buvo ir tėveliai. Mokytojams buvo malonu gauti mokinių ir tėvelių padėkas už aktyvias pamokas, įdomias užduotis.

3. SIŪLOMAS SPRENDIMAS

Remiantis literatūros šaltiniuose pateikta ir (*1 pav.*) apibendrinta MR sampratos ontologija išskirti MR požymiai, būdingi MR ugdymui. Atlikto tyrimo rezultatai parodė, kad MR ugdymas galimas tiek klasėje, tiek nuotoliniu būdu. Vis dėlto, ne kiekvienas MR požymis yra „patogus" ugdyti nuotoliniu būdu. Pavyzdžiui, dainavimas, balso lavinimas bus kokybiškesnis mokantis fizinėje erdvėje, o muzikinės kultūros pažinimas bus puikiai įgyvendinamas ir mokantis nuotoliniu būdu. Apibendrinus tyrimo rezultatus, išskirti MR požymiai, kurie tinka ugdymui klasėje ir, kurie tinka ugdymui nuotoliniu būdu. *4 pav.* pavaizduotose MR požymių diagramos privalomas požymis reiškia, kad MR požymio ugdymas tinka ugdymui pasirinktu būdu, o neprivalomas požymis – ne taip gerai tinka.



4 pav. Muzikinio raštingumo požymiai pagal ugdymo būdą

MR ugdymo pamokos šiandien dažniausiai organizuojamos tik klasėje. Vis dėlto, atlikus tyrimą, paaiškėjo, kad klasėje mokytojai ne visada turi reikiamą įrangą skaitmeninėms priemonėms panaudoti. Pavyzdžiui, klasėje mokiniai ne visada gali groti virtualiais muzikos instrumentais, kurti muziką naudojant įvairias muzikos kūrimo programas. Dėl šių priežasčių, ugdant MR, būtų naudinga bent kartais muzikos pamokas organizuoti nuotoliniu būdu. Taip būtų išnaudojamos ne tik visos MR ugdymo galimybės, bet ir mokytojai, ir mokiniai neprarastų tų įgūdžių, kuriuos įgijo mokant(is) nuotoliniu būdu COVID-19 pandemijos metu.

4. IŠVADOS

Atlikus literatūros analizę, sudaryta apibendrinta MR sampratos ontologija, kuria remiantis išskirti pagrindiniai MR požymiai, būdingi MR ugdymui, nepriklausomai nuo pasirinkto ugdymo būdo, ar klasėje, ar nuotoliniu būdu. Atliktas tyrimas parodė, daugelį MR požymių galima ugdyti nuotoliniu būdu. Tačiau ne visų MR požymių ugdymas yra patogus nuotoliniu būdu, kaip ir ne visų MR požymių ugdymas patogus klasėje. Ugdant nuotoliniu būdu yra svarbūs reikalavimai naudojamoms IT. Tačiau ne visada reikiamos priemonės yra klasėje, todėl tokių požymių kaip grojimas virtualiais muzikos instrumentais, muzikos rašto pažinimas, muzikos kūrimas, dalyvavimas sociokultūrinėje veikloje bei muzikos kultūros ir kontekstų pažinimas puikiai gali būti įgyvendinamas nuotoliniu būdu. O tokių MR požymių kaip grojimas fiziniais instrumentais, dainavimas ar ritmo pojūčio ugdymas patogesnis klasėje.

Atliktas tyrimas taip pat atskleidė, kad ne tik mokiniai, bet ir mokytojai, mokydamiesi nuotoliniu būdu, patobulino savo skaitmenines kompetencijas. Mokytojai išmoko kurti įvairias interaktyvias užduotis, talpinti mokomąją medžiagą pasirinktoje VMA, dirbti su VK priemonėmis. Kaip tik todėl, siekiant visapusiškai ugdyti MR, būtų naudinga palaikyti tiek mokytojų, tiek mokinių įgūdžius mokyti(s) nuotoliniu būdu, organizuojant nuotolines pamokas vieną ar du kartus per mėnesį.

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VIRTUALIŲJŲ MOKYMO(SI) PRIEMONIŲ TAIKYMAS PRADINUKŲ BENDRŲJŲ KOMPETENCIJŲ UGDYME

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Anotacija. Šiuolaikinėje mokykloje akcentuojamos į kompetencijų ugdymą orientuotos veiklos, daug dėmesio skiriama virtualiųjų mokymosi priemonių taikymui, mokinių bendrųjų kompetencijų ugdymui. Šio tyrimo tikslas – išanalizuoti virtualiųjų mokymosi priemonių taikymo pradinių klasių mokinių bendrųjų kompetencijų ugdyme galimybes ir problemas. Straipsnyje pristatomi literatūros analizės ir pradinio ugdymo mokytojų apklausos raštu rezultatai. Nustatyta, jog tyrime dalyvavę mokytojai, remiantis jų atsakymais, taiko virtualiąsias mokymosi priemones, tačiau susiduria su sunkumais, tarp kurių pažymėta, jog sugaištama daug laiko priemonių paieškai ir kūrimui, priemonės nesuklasifikuotos pagal ugdomus gebėjimus.

Raktiniai žodžiai: virtualiosios mokymo(si) priemonės, bendrosios kompetencijos, pradinis ugdymas.

ĮVADAS

XXI a. visuomenės virsmas į tinklaveikos visuomenę sąlygoja pokyčius ugdyme: didėja sparčiai vystomų informacinių technologijų (toliau – IT) panaudojimo galimybės, auga visuomenės lūkesčiai, kinta ugdomos kompetencijos ir kt. Mokykloje akcentuojamos į kompetencijų ugdymą orientuotos veiklos, skatinančios mąstyti, nelieka apibendrinamojo vertinimo, IT integruotos į įprastą mokytojų ir mokinių praktiką (Albano et al., 2021).

Mokymo ir mokymosi veiklas perkėlus į virtualią erdvę išplečiamos mokymosi galimybės. Virtualiųjų laboratorijų, virtualiųjų bendravimo ir bendradarbiavimo priemonių bei mokymosi aplinkų, interaktyviųjų, dirbtiniu intelektu grindžiamų ir kitų priemonių ir jų panaudojimo galimybės plačiai diskutuojamos mokslinėje literatūroje (Jannah et al., 2020; Targamadzė, 2020; Westlake, 2019 ir kt.). Šios priemonės įgalina inovatyvių metodų taikymą, ugdymo individualizavimą, diferencijavimą, suasmeninimą ir suteikia kiekvienam mokiniui vienodas galimybes patirti sėkmę (Butvilas ir kt., 2020). Vis dėlto virtualiųjų mokymosi priemonių taikymas turi būti tikslingas, priemonės tinkamai parinktos, ypač tai aktualu jaunesniojo amžiaus mokiniams. Analizuojant bendrųjų kompetencijų ugdymą pradinėse klasėse kyla klausimai: kiek pradinių klasių mokytojai taiko virtualiąsias mokymosi priemones bendrųjų kompetencijų ugdymui ir su kokiais sunkumais jie susiduria?

Šio tyrimo tikslas – išanalizuoti virtualiųjų mokymosi priemonių taikymo pradinukų bendrųjų kompetencijų ugdyme galimybes ir problemas. Tikslui pasiekti taikyti literatūros analizės, apklausos raštu, statistinės duomenų analizės metodai.

1. PRADINUKŲ BENDROSIOS KOMPETENCIJOS IR JŲ UGDYMO YPATUMAI

Mokslinėje literatūroje yra skirtingų kompetencijos apibrėžimų. McClelland (1973) kompetenciją apibrėžia kaip asmens savybę, leidžiančią geriau atlikti tam tikrą užduotį konkrečioje situacijoje ar vaidmenyje nei kitam asmeniui, dirbančiam vidutiniškai, bei pasiekti puikius rezultatus. Jucevičienė (2007) kompetenciją apibūdina kaip asmens žinias, įgūdžius,

gebėjimus, požiūrius, vertybes, kurios pasireiškia sėkmingais darbo rezultatais konkrečioje veikloje. Mokinio kompetencija, remiantis ugdymo Lietuvoje bendrosiomis programomis (2023), yra mokinio žinių, gebėjimų bei nuostatų visuma, skatinanti išsikelti tikslus ir jų siekti, mokytis visą gyvenimą, tapti aktyviu piliečiu ir įsitraukti į visuomenės gyvenimą, susirasti tinkamą darbą. Nacionalinės švietimo agentūros (toliau – NŠA) parengtame kompetencijų ir vaiko raidos apraše (2021) išskirtos septynios pradiniame, pagrindiniame ir viduriniame ugdyme tobulinamos bendrosios kompetencijos, kurios toliau aptariamos. Pradinukų skaitmeninė kompetencija – tai gebėjimas naudotis skaitmeninėmis technologijomis. Jos ugdymas glaudžiai susijęs su kitų bendrųjų kompetencijų ugdymu, kai pradiniame ugdyme taikomos virtualiosios mokymosi priemonės. *Socialinė, emocinė ir sveikos gyvensenos kompetencija* – tai „asmens savimonė ir savitvarda, socialinis sąmoningumas, tarpusavio santykių kūrimo gebėjimai, atsakingas sprendimų priėmimas ir asmens rūpinimasis fizine ir psichine sveikata" (NŠA, 2021). Remiantis Jannah et al. (2020), mokinių aktyvumui, entuziazmui, motyvacijai, mokymosi procesui ir rezultatams gali turėti teigiamos įtakos ir virtualiųjų mokymosi priemonių panaudojimas. *Komunikavimo kompetencija* – tai ne tik etiškas naudojimasis priemonėmis ir technologijomis, bet ir „gebėjimas kurti, perduoti ir suprasti žinias (faktus, požiūrius ar asmenines nuostatas)" (NŠA, 2021). Westlake (2019) teigimu, naujoji mokinių karta yra technologiškai išprususi, turi daug žinių apie socialinę žiniasklaidą, mobiliąsias technologijas, domisi strateginiais žaidimais. Laisvalaikiui skirti skaitmeniniai žaidimai, paremti naujais mokymosi metodais, yra galimybė žaidžiantiesiems įgyti žinių ir gebėjimų bei ugdyti komunikavimo kompetenciją (Westera, 2019; Nussbaumer, 2019). *Kultūrinė kompetencija* siejama su kultūrine savimone, aktyvia kultūrine raiška, kultūriniu sąmoningumu, žiniomis (NŠA, 2021). Taufik (2022) akcentuoja, kad socialinio emocinio mokymosi ir kultūrinio ugdymo integravimas į nuotolinio mokymosi platformas yra svarbus būsimai besimokančiųjų sėkmei visuomenėje, tačiau nuotolinio mokymosi mokytojai gali nežinoti mokinio kultūrinės aplinkos, jo socialinio emocinio pasaulio, kas yra svarbu, ugdant kultūrinę kompetenciją. Pradiniame ugdyme tiesioginis bendravimas išlieka, todėl virtualiųjų mokymosi priemonių taikymas yra tikslingas. *Kūrybiškumo kompetencija* pasireiškia tyrinėjant, generuojant, kuriant, vertinant asmeniškai ir kitiems reikšmingas kūrybines idėjas, produktus, problemų sprendimus (NŠA, 2021). Remiantis Ott & Pozzi (2012), skaitmeninių priemonių taikymas įgalina kūrybiškumo ugdymą. Šių autorių atlikto, trejus metus trukusio, tyrimo metu išaugo tyrime dalyvavusių mokinių kūrybiniai įgūdžiai ir nuostatos, ypač tie, kurie susiję su originalių skaitmeninių žaidimų sprendimo strategijų sugalvojimu ir įgyvendinimu. *Pilietiškumo kompetencija* – tai vertybės, nuostatos, suvokimas ir praktinio veikimo gebėjimai, įgalinantys ugdytis pilietinį tapatumą ir pilietinę galią (NŠA, 2021). Mokykloje įgyjami bendrieji ir dalykiniai gebėjimai sąlygoja mokinių sėkmingo asmeninio ir profesinio gyvenimo planavimą bei sėkmingą įsiliejimą į pilietišką visuomenę. Pilietiškumo kompetencijos ugdymui yra tinkamų virtualiųjų priemonių, dalis jų pateiktos švietimo portale *emokykla.lt*. *Pažinimo kompetencija* – tai „motyvacija ir gebėjimas pažinti save ir pasaulį, įgyjami suvokiant (perimant) žmonijos kultūrinę patirtį" (NŠA, 2021). Apimamos dalyko žinios ir gebėjimai, kritinis mąstymas, problemų sprendimo, mokėjimo mokytis gebėjimai, kurių ugdymui aktualus IT naudojimas (Elbyaly et al., 2023). Mokymosi pažinimo rezultatus ir procesą sąlygoja mokinio valios pastangos, atkaklumas, motyvacija (vidinė ir/arba išorinė), kylanti iš bendrų visuomenės poreikių.

Kompetencijomis grįsto mokymosi pagrindas yra mokymosi procesas, kai ugdomos mokinių bendrosios ir dalykinės kompetencijos, panaudojant informacines technologijas.

2. VIRTUALIŲJŲ MOKYMOSI PRIEMONIŲ PANAUDOJIMO PRADINUKŲ BENDRŲJŲ KOMPETENCIJŲ UGDYME TYRIMAS

Siekiant nustatyti, kokios virtualiosios mokymosi priemonės yra naudojamos pradinukų bendrosioms kompetencijoms ugdyti, su kokiomis problemomis susiduria mokytojai, taikydami šias priemones, kokios pagalbos reikia mokytojams, buvo atliktas tyrimas. Tuo tikslu sudarytas klausimynas, skirtas pradinių klasių mokytojams. Jame pateikta 18 klausimų (17 uždaro tipo ir 1 atviras). Klausimynas buvo įkeltas į „Google Sites" platformą ir pasidalinta nuoroda į jį.

Apklausa vykdyta nuo 2022 m. lapkričio 21 d. iki gruodžio 2 d. Iš viso apklausoje dalyvavo 25 dalyviai: 23 pradinio ugdymo mokytojai, 1 neformaliojo ugdymo mokytojas ir 1 dalyko mokytojas, dirbantis pradiniame ugdyme. Nurodytas respondentų amžius pasiskirstė taip: po 1 dalyvį pažymėjo 18–24 ir 25–35 m. amžiaus ribas, 6 dalyviai nurodė 36–45 m. intervalą, 13 dalyvių – 46–55 m. ir 4 iš jų pažymėjo 56–65 m. intervalą. Apklausoje dalyvavę mokytojai nurodė skirtingą darbo patirtį pradiniame ugdyme (mažiausia – iki 2 m., didžiausia – daugiau nei 21 m.).

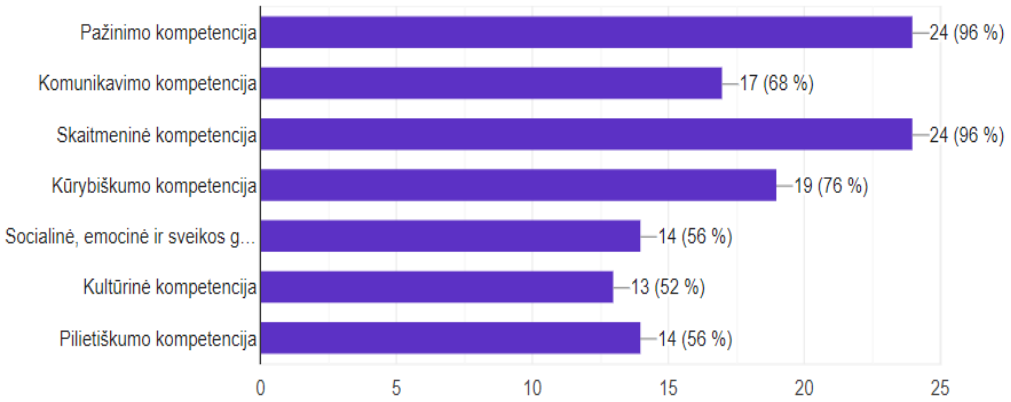
Apklausos rezultatai. Visi tyrimo dalyviai teigė, jog pradinukų ugdyme taiko virtualiąsias mokymosi priemones. Remiantis apklausos dalyvių atsakymais, naudojamos įvairios virtualios mokymosi priemonės. Paprašius nurodyti, pagal ką jie renkasi vieną ar kitą priemonę, apklausos dalyviai nurodė Youtube, Wordwall, Learning Apps, Quizizz, Kahoot ir kt. priemonių naudojimo patogumą ir paprastumą, 10 respondentų pažymėjo Kahoot funkcionalumą. Priemonių saugumą akcentavo tik pavieniai respondentai (*1 lentelė*).

1 LENTELĖ. Virtualiųjų mokymosi priemonių pasirinkimas

Virtualioji mokymosi priemonė	**Respondentų, pažymėjusių aktualią savybę, skaičius**			
	Patogu, paprasta naudoti	**Funkcionali**	**Saugi**	**Naudota, lūkesčių nepatenkino**
Quizizz	12	5	2	0
Quizlet	5	3	0	1
Wordwall	21	1	1	0
Kahoot	11	10	2	1
Youtube	22	2	1	0
Edpuzzle	4	3	2	1
H5P	3	1	1	3
Socrative	0	3	2	0
Learning Apps	12	2	2	1
StoryJumper	5	2	1	2
Book Creator	3	6	2	3
Frepy	3	3	1	2
MozaWeb	4	1	3	1

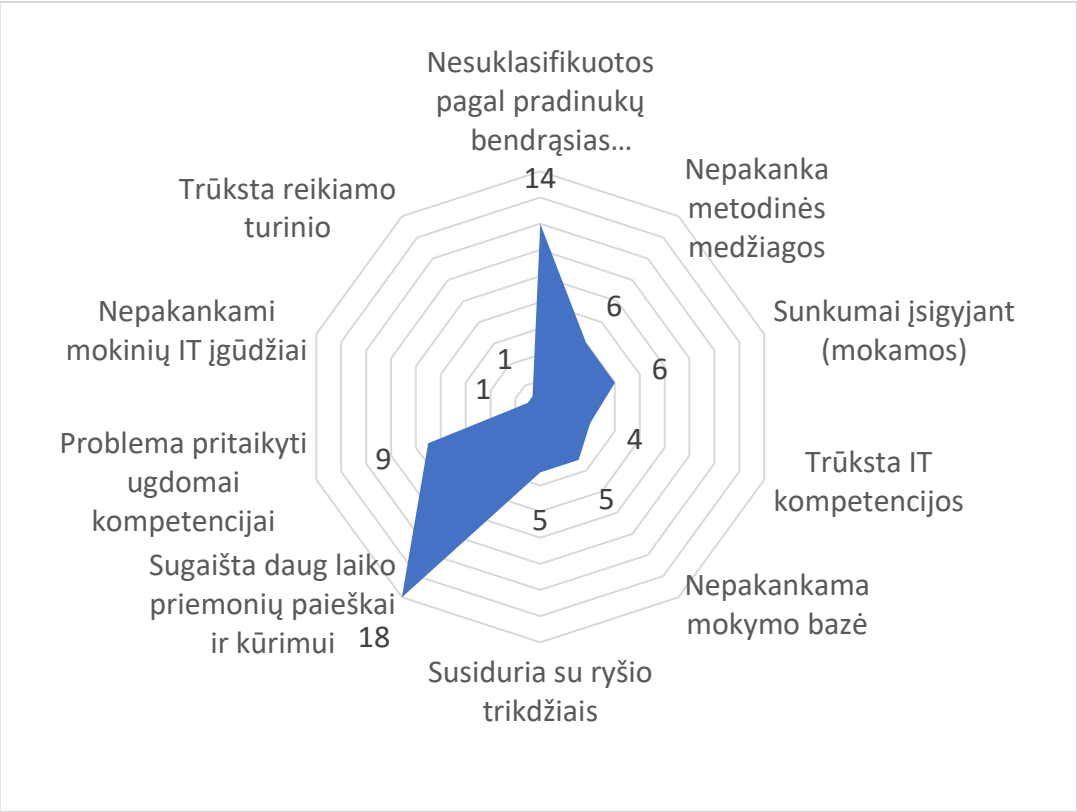
Respondentų klausta, kokiu dažnumu jie naudoja virtualiąsias mokymosi priemones pradinukų bendrųjų kompetencijų ugdymui. 11 apklausoje dalyvavusių mokytojų pažymėjo, jog tik esant poreikiui, 7 dalyviai teigė, jog tai daro dažnai ir 7 – jog visada.

Apklausos dalyvių prašyta pažymėti, kokias pradinukų bendrąsias kompetencijas dažniausiai ugdo, naudodami virtualiąsias mokymosi priemones. Daugiausia respondentų (po 24 iš 25) pažymėjo pažinimo ir skaitmeninę kompetencijas, mažiausiai (13) – kultūrinę kompetenciją (*1 pav.*).



1 pav. Apklausos dalyvių, pažymėjusių pradinukų kompetencijas, kurių ugdymui naudoja virtualiąsias mokymosi priemones, skaičius

Į klausimą, su kokiomis problemomis jie susiduria, taikydami virtualiąsias mokymosi priemones pradinukų bendrųjų kompetencijų ugdymui, 14 respondentų atsakė, kad virtualiosios priemonės nesuklasifikuotos pagal ugdomas kompetencijas. 6 apklausos dalyviai pažymėjo, kad nepakanka metodinės medžiagos, 6 nurodė, kad susiduria su sunkumais įsigyjant virtualiąsias mokymosi priemones. 4 dalyviai teigė, kad jiems trūksta IT kompetencijos, 7 respondentai pažymėjo, kad nepakankama mokymo bazė. 5 apklausti mokytojai teigė, susiduriantys su interneto trikdžiais. Net 18 respondentų kaip problemą nurodė, kad sugaišta daug laiko priemonių paieškai ir kūrimui. 9 apklaustieji pažymėjo problemą, atrenkant tinkamas virtualiąsias mokymosi priemones pradinukų bendrosioms kompetencijoms ugdyti. 1 dalyvis akcentavo, kad silpna pradinukų skaitmeninė kompetencija ir mokiniai susiduria su sunkumais prisijungiant prie virtualiųjų mokymosi priemonių, tam sugaištama daug pamokos laiko. 1 apklaustasis teigė, kad trūksta mokymosi turinio pradinukams ir mokytojui tenka priemones pritaikyti mokinių poreikiams (*2 pav.*)



2 pav. Apklausos dalyvių, pažymėjusių atitinkamas problemas, taikant virtualiąsias mokymosi priemones pradiniame ugdyme, skaičius

Atviro tipo klausimas skirtas apklausos dalyvių įžvalgoms, kaip reikėtų spręsti problemas, su kuriomis jie susiduria, taikant virtualiąsias mokymosi priemones.

Dauguma atsakymų į šį klausimą susiję su virtualiųjų mokymosi priemonių taikymo efektyvumu: *„Sukurti IT priemonių bazę"; „Supaprastinti prisijungimus vaikams, nereikalaujant el. pašto"; „Viską susisteminti"; „Būtų patogu, jei atsirastų kažkas panašaus į virtualią „biblioteką", kur būtų pristatomos visos virtualios mokymosi priemonės, jų panaudojimo galimybės...", „Daugiau priemonių lietuvių kalba, kad mokiniai galėtų jomis naudotis"* ir kt.

Kituose atsakymuose akcentuotas mokytojų kompetencijos tobulinimas: *„Dalyvauti kompetencijų tobulinimo renginiuose"; „Dauguma mokytojų nemoka anglų k., todėl tai jiems apsunkina galimybę priemones naudoti ugdomojoje veikloje"; „Būtų patogu... nuorodos, kokie seminarai ar pristatymai vyksta" ir* kt.

Du respondentų pasiūlymai susiję su techniniais ir finansiniais klausimais: *„Priemonės būtų apmokėtos mokyklos"; „Stiprinti mokymo bazę"*.

Taigi, galima teigti, kad apklausoje dalyvavę mokytojai taiko virtualiąsias mokymosi priemones pradiniame ugdyme, tačiau susiduria su sunkumais, kuriems išspręsti reikalinga pagalba, susisteminant priemones pagal ugdomas kompetencijas, pagerinant prieigą prie jų, sudarant mokymosi, kaip panaudoti virtualiąsias priemones, galimybes.

3. IŠVADOS

Šiuolaikinėje mokykloje daug dėmesio skiriama mokinių bendrųjų kompetencijų ugdymui. Pradiniame ugdyme akcentuojamos septynios bendrosios kompetencijos, kurios vėliau tobulinamos ir aukštesnėse klasėse. Tai yra skaitmeninė kompetencija, socialinė, emocinė ir sveikos gyvensenos kompetencija, komunikavimo kompetencija, kultūrinė kompetencija, kūrybiškumo kompetencija, pilietiškumo kompetencija, pažinimo kompetencija. Remiantis literatūros analize, visų šių kompetencijų ugdymui tikslinga naudoti virtualiąsias mokymosi priemones.

Siekiant nustatyti, kokios virtualiosios mokymosi priemonės yra naudojamos pradinukų bendrųjų kompetencijų ugdymui ir su kokiais sunkumais susiduriama, atlikta mokytojų, dirbančių su pradinukais, apklausa raštu. Remiantis apklausos dalyvių atsakymais, galima teigti, jog apklausoje dalyvavę mokytojai naudoja įvairias virtualiąsias mokymosi priemones pradinukų bendrosios kompetencijoms ugdyti. Apklausos dalyviai pažymėjo, jog jiems svarbu priemonių naudojimo patogumas ir paprastumas, dalis jų akcentavo funkcionalumą, pavieniai respondentai pažymėjo priemonių saugumą. Daugiausiai (po 24 iš 25) apklausos dalyvių teigė, jog taiko virtualiąsias priemones pažinimo ir skaitmeninei kompetencijoms ugdyti, mažiausiai (13 iš 25) pažymėjo kultūrinę kompetenciją. Tarp virtualiųjų priemonių taikymo sunkumų pažymėta, jog sugaištama daug laiko priemonių paieškai ir kūrimui, priemonės nėra suklasifikuotos pagal ugdomus gebėjimus. Problemoms spręsti aktualus parinktų pagal ugdomus gebėjimus virtualiųjų priemonių rinkinys ir panaudojimo rekomendacijos bei sudaryta mokymosi taikyti šias priemones galimybė.

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VIRTUALIŲ STEAM VEIKLŲ ĮGYVENDINIMO GALIMYBĖS PAMOKŲ METU

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Santrauka. Nuolat besikeičiančiame pasaulyje mokiniams svarbu įgyti gebėjimų ir kompetencijų, įgalinančių veikti skirtingose gyvenimo situacijose. Kompleksinių probleminių situacijų sprendimui aktualus holistinis pasaulio suvokimas ir priežastinių ryšių supratimas, kurių ugdymui tikslinga taikyti STEAM mokymą. Straipsnyje pristatomo tyrimo tikslas – išanalizuoti STEAM veiklų įgyvendinimo pamokų metu galimybes, panaudojant virtualiąsias mokymosi priemones. Straipsnyje apžvelgiamos STEAM veiklų įgyvendinimo galimybės, pristatomi gimnazijų mokytojų apklausos raštu rezultatai, pateikiamas virtualių STEAM veiklų įgyvendinimo pamokų metu scenarijus.

Raktiniai žodžiai: STEAM ugdymas, integruotos pamokos, projektinė veikla.

ĮVADAS

Nuolat besikeičiančiame pasaulyje mokiniams svarbu įgyti gebėjimų ir kompetencijų, įgalinančių veikti skirtingose gyvenimo situacijose, spręsti kylančias problemas, būti konkurencingam darbo rinkoje, priimti iššūkius. Mokykloje daug dėmesio skiriama dalykinių ir bendrųjų kompetencijų ugdymui, tačiau kompleksinių probleminių situacijų sprendimui reikia holistinio pasaulio suvokimo ir priežastinių ryšių supratimo.

Mokslinėje literatūroje plačiai diskutuojamas STEAM ugdymas, kaip integralus, su realiu pasauliu siejamas ugdymas, apimantis gamtos mokslų, technologijų, inžinerijos, menų ir kūrybos, matematikos disciplinas (Jacques et al. 2022; Shi et al., 2021; Li & Wong, 2020 ir kt.). STEAM ugdyme tikslinga panaudoti ir virtualias priemones. Yra įvairių virtualių laboratorijų, interaktyvių priemonių ir programėlių, yra sukurtų STEAM pamokų, kurias galima pritaikyti pagal poreikį Fadda et al., 2022; Soroko et al., 2020 ir kt.).

Lietuvoje STEAM plėtojamas per neformalųjį švietimą, organizuojant popamokines veiklas, steigiant STEAM centrus (Centrinė projektų valdymo agentūra, 2022). Tai yra patogu, nes neribojamas pamokos laikas, laisvesnis veiklų pasirinkimas, į užsiėmimus ateina tam tikra sritimi besidomintys mokiniai. Vis dėlto neformalųjį švietimą renkasi tik dalis mokinių. Taigi kyla klausimai: kaip STEAM ugdymą įgyvendinti pamokų metu, kai mokiniai mokosi skirtingus dalykus su skirtingais mokytojais ir pamokos trunka 45 min.? Kaip STEAM įgyvendinant pamokų metu panaudoti virtualiąsias mokymosi priemones?

Šio tyrimo tikslas – išanalizuoti STEAM veiklų įgyvendinimo pamokų metu galimybes, panaudojant virtualiąsias mokymosi priemones. Tikslui pasiekti taikyti literatūros analizės, apklausos raštu ir statistinės duomenų analizės metodai.

1. STEAM UGDYMO ĮGYVENDINIMO GALIMYBĖS

Analizuojant literatūrą išryškėjo STEAM ugdymui būdingos savybės: mokymas yra tarpdalykinio pobūdžio ir turinys iškeliamas į pirmą planą, mokymasis grindžiamas tyrinėjimu arba

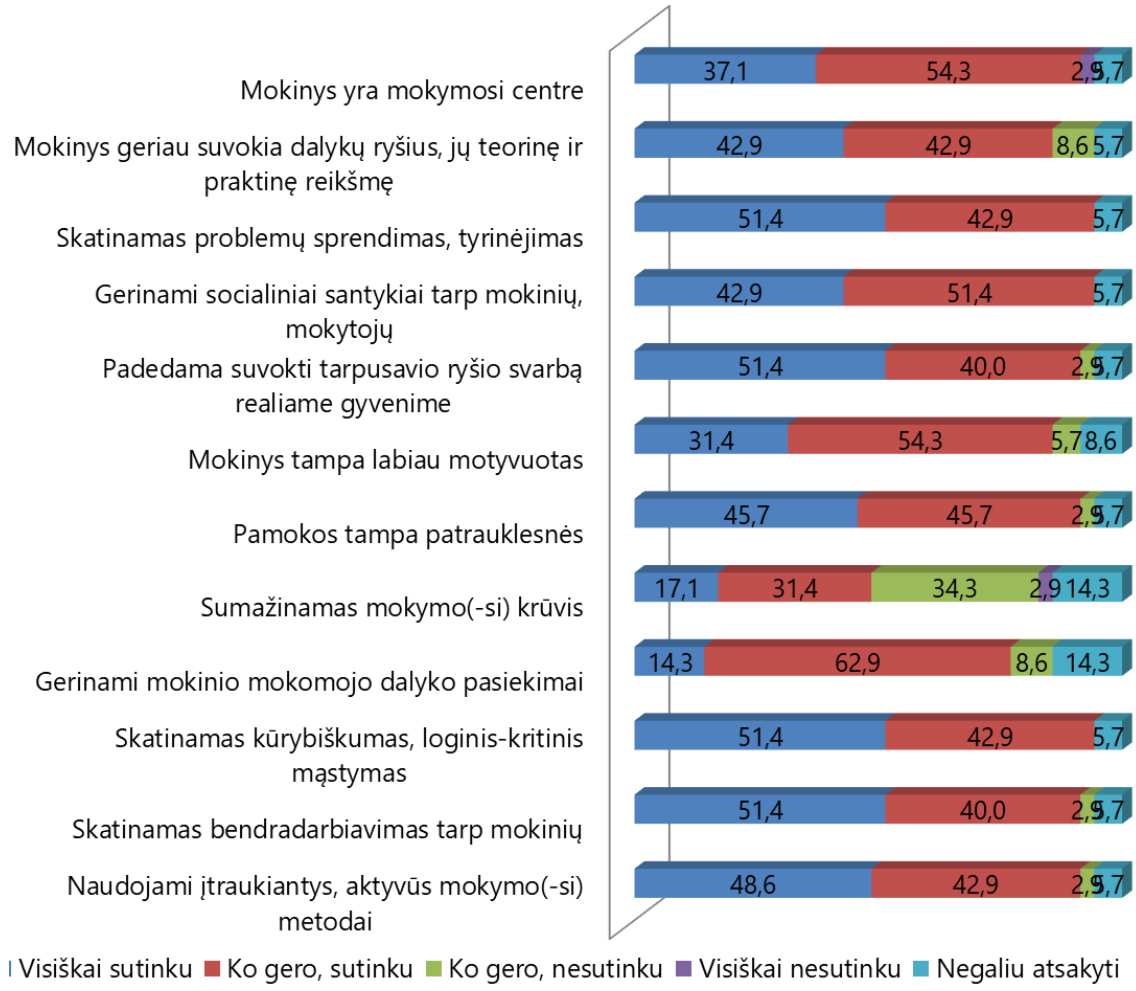
naudojamas autentiškas problemų sprendimas (Jacques et al., 2022; Shi et al., 2021 ir kt.). Jo metu įgyjami pažintiniai dalykiniai gebėjimai, ugdomas mokinių kūrybiškumas, problemų sprendimo, kritinio mąstymo gebėjimai, mokiniai naudojasi informacija ir priima sprendimus, ugdomi socialiniai gebėjimai (bendradarbiaujama tarpusavyje ir su mokytojais, įsitraukiama į bendruomeninius santykius), individualūs emociniai gebėjimai (savigarba, teigiamos emocijos, atidumas, pilietinis sąmoningumas) ir kt. (Khine & Areepattamannil, 2019; Kim & Kim, 2016). STEAM veiklos gali būti įvairios. Tai ir muziejų lankymas, eksperimentų vykdymas, interaktyvių knygų skaitymas, modeliavimas, vaizdo įrašų, įvairaus pobūdžio tekstų kūrimas ir kt. (Li & Wong, 2020). Tikslui pasiekti integruojamos įvairių dalykų žinios ir gebėjimai ir tobulėjama visapusiškai.

Kerttu et al. (2017) išskiria dalykų integracijos lygius: 1) pasirenkama bendra tema, tačiau nėra dalykuose bendrų užduočių, 2) skirtinguose dalykuose pasirenkama bendra tema, mokytojai kartu planuoja mokymosi procesą ir uždavinius, tačiau dažnai uždaviniai nėra paremti gyvenimiškomis situacijomis, 3) taikoma projektinio tipo mokymosi forma, mokiniai dažniausiai dirba grupėse, pasirenkama bendra tema, mokytojai kartu planuoja mokymosi procesą ir uždavinius, pasiekimai yra vertinami bendrai, visi projekto elementai bendrai aptariami. Sudėtingiausias yra projektinio tipo mokymosi organizavimas. Literatūros šaltiniuose (Boss & Krauss, 2018 ir kt.) išskiriami projektinės veiklos etapai: pasirengimo, planavimo, vykdymo, rezultatų apibendrinimo, pristatymo, įvertinimo. Projektinė veikla gali būti vykdoma kelias pamokas ar pamokų ciklą, todėl ją organizuojant reikia laiko pasiruošimui, nagrinėjamų temų, sprendžiamų problemų numatymui, tyrinėjimo objektų parinkimui, vertinimo proceso planavimui. Projektinę veiklą vykdant pamokų metu reikia įvertinti ir ugdomų dalykų programos reikalavimus. STEAM veiklų organizavimui tikslinga panaudoti virtualiąją mokymosi aplinką ir priemones, tačiau priemonės turi būti tinkamai parenkamos, atsižvelgiant į siekiamus tikslus, veiklų poreikį ir pobūdį bei tikslingai koordinuojamas jų taikymas (DiFrancesca & Spencer, 2022; Dung, 2020; Targamadzė, 2020 ir kt.).

2. STEAM VEIKLŲ ĮGYVENDINIMO GIMNAZIJOSE TYRIMAS

Siekiant nustatyti, kaip STEAM veiklos įgyvendinamos vyresniųjų klasių mokinių ugdyme buvo atlikta gimnazijų mokytojų apklausa raštu. Apklausos dalyviams buvo pateikti klausimynai, sudaryti iš 17 klausimų (12 – uždaro tipo, 5 – su galimybe įrašyti atsakymus). Apklausa vykdyta 2023 m. lapkričio mėn. Joje dalyvavo 35 mokytojai iš skirtingų gimnazijų (iš didžiųjų Lietuvos miestų 9 dalyviai, miestų – 18 dalyvių, miestelių – 8). 22 apklausos dalyviai pažymėjo, kad yra metodininkai, 7 – vyr. mokytojai, 4 – mokytojai ir 2 – ekspertai. Remiantis atsakymais, 7 – gamtos mokslų mokytojai, 7 – menų ir technologijų, 6 – lietuvių k., 5 – matematikos, 5 – informatikos, 3 – dorinio ugdymo ir 2 – užsienio k mokytojai.

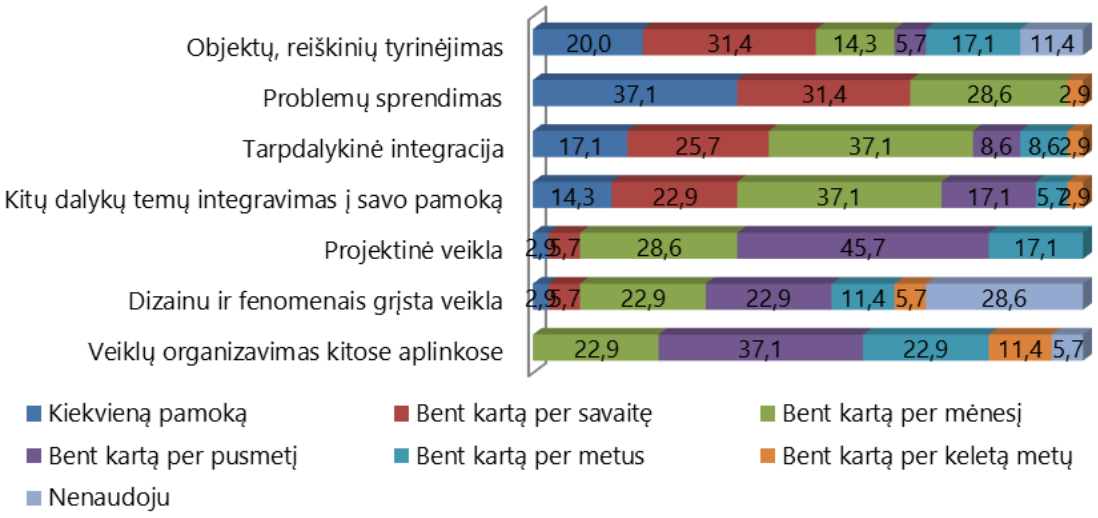
Dauguma apklausos dalyvių akcentavo STEAM veiklų naudą (*1 pav.*), tačiau tik 48,5 proc. atsakiusiųjų mokytojų sutiko, kad sumažėja mokymosi krūvis (37,2 proc. su tuo nesutiko, 14,3 proc. negalėjo atsakyti).



1 pav. Apklausos dalyvių atsakymų apie STEAM ugdymo pamokų metu naudą pasiskirstymas (procentais)

Tarp problemų, su kuriomis susiduriama įtraukiant STEAM veiklas į formalųjį ugdymą, apklausos dalyviai pažymėjo, kad pamokos yra apibrėžtos laiko trukme (su teiginiu sutiko 86 proc. dalyvių), klasėse yra didelis mokinių skaičius (sutiko 97 proc.), trūksta materialinės bazės (91 proc.), pamokos orientuotos į pasiekimų patikrinimą, pasiruošimą egzaminams (sutiko 94 proc. dalyvių). Kitos akcentuotos problemos susijusios su reikiama pagalba mokytojams: STEAM įgyvendinimo mokymų trūkumą akcentavo 77 proc. apklausos dalyvių, STEAM metodinės medžiagos trūkumą pažymėjo 77 proc. Su teiginiais, jog per mažai skatinama, sutiko 66 proc. dalyvių, jog per mažai pagalbos iš rajono, valstybės pagalbą teikiančių švietimo įstaigų, pažymėjo 68,5 proc. dalyvių. Su teiginiu, kad problema yra mokinių amžius, daugiau apklaustųjų nesutiko (ko gero nesutiko 40 proc., visiškai nesutiko 17,1 proc.) nei sutiko (visiškai sutiko 8,6 proc., ko gero sutiko 28,6 proc.).

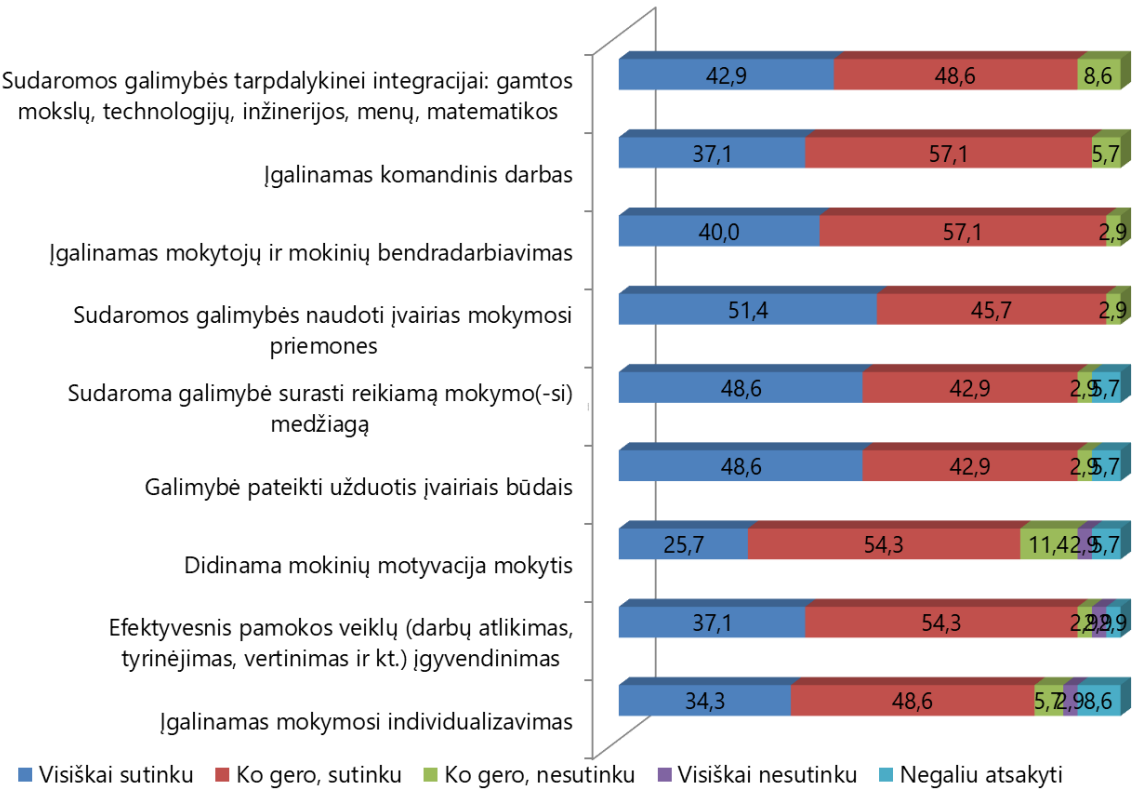
Mokytojų klausta, kokiu dažnumu taiko STEAM ugdymui aktualias veiklas. Atsakymų į šį klausimą pasiskirstymas pateiktas *2 pav*.



2 pav. Apklausos dalyvių atsakymų apie STEAM aktualių veiklų taikymo pamokų metu dažnumą pasiskirstymas (procentais)

Į klausimą, kiek pamokų per metus apklausos dalyviai integruoja su kitais dalykais, gauti tokie atsakymai: 1–2 pamokas pažymėjo 43 proc. apklaustųjų mokytojų, 3–6 pamokas – 31 proc., 7–10 pamokų – 6 proc. ir daugiau kaip 10 pamokų pažymėjo 17 proc. dalyvių. 3 proc. apklaustųjų teigė, kad neveda integruotų pamokų. Paklausus, su kiek kitų dalykų mokytojų bendradarbiaujama integruotų pamokų metu, 31 proc. respondentų atsakė, jog su 1 mokytoju, 40 proc. – jog su 2,14 proc. dalyvių pažymėjo 3 mokytojus, 3 proc. – 4,6 proc. – daugiau nei 5 mokytojus. 6 proc. apklaustųjų teigė, kad neveda integruotų pamokų su kitų dalykų mokytojais.

3 pav. pateikti apklausos dalyvių atsakymų į klausimus, susijusius su skaitmeninių technologijų taikymo pamokose nauda, pasiskirstymas. Dauguma dalyvių visiškai arba ko gero sutinka, kad technologijų panaudojimas sudaro galimybes tarpdalykinei integracijai, įgalinamas komandinis darbas, mokytojų ir mokinių bendradarbiavimas, įgalinama mokymosi priemonių įvairovė, efektyvesnis pamokos veiklų (darbų atlikimo, tyrinėjimo, vertinimo ir kt.) įgyvendinimas, įgalinamas mokymosi individualizavimas ir kita nauda (*3 pav.*).



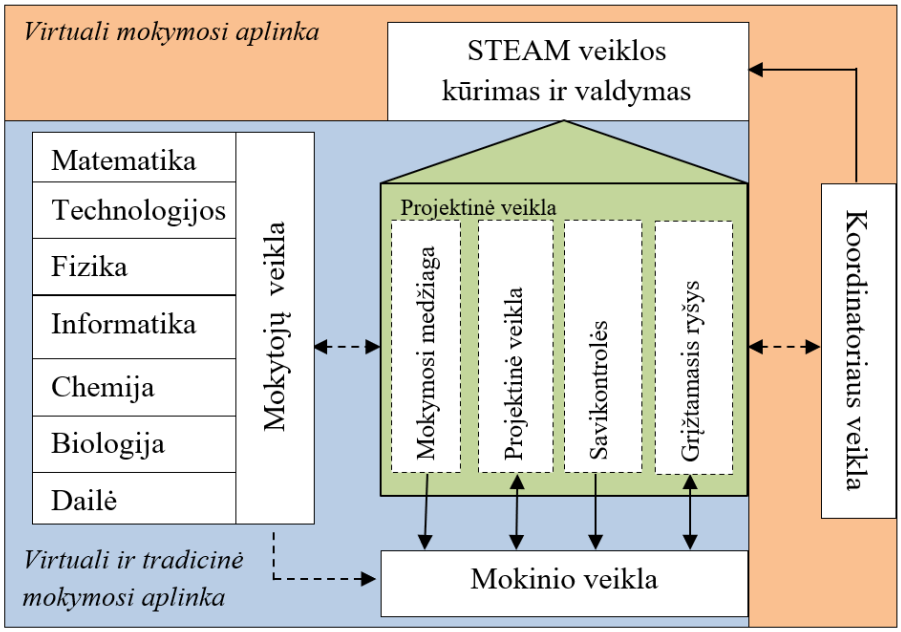
3 pav. Apklausos dalyvių atsakymų apie skaitmeninių technologijų taikymo pamokose naudą pasiskirstymas (procentais)

Apklausoje dalyvavę mokytojai pažymėjo, kad naudoja skaitmenines priemones: užduočių rengimo ir apklausų organizavimo bent kartą per mėn. (31 proc. dalyvių teigimu), ugdymo turinio rengimo bent kartą per savaitę (26 proc.), mokinių mokymosi ir pažangos stebėjimo ir vertinimo kiekvieną pamoką (40 proc.), bendravimo bent kartą per savaitę (40 proc.), atviruosius švietimo išteklius bent kartą per savaitę (37 proc.). Tačiau 51 proc. apklaustųjų teigė, nenaudojantys bendradarbiavimo priemonių, 57 proc. – tyrinėjimo.

Taigi remiantis apklausoje dalyvavusių mokytojų įžvalgomis galima teigti, kad dažniausiai tyrimo dalyviai (43 proc. visų apklaustųjų) integruoja 2–3-ų mokomųjų dalykų pamokas. 71 proc. apklaustųjų teigė, kad bendradarbiauja su 1–2 kitų dalykų mokytojais. Apklausos dalyviai pažymėjo, jog naudoja skaitmenines technologijas, tačiau jiems reikalinga pagalba įgyvendinant STEAM veiklas.

3. VIRTUALIŲ STEAM VEIKLŲ ĮGYVENDINIMO PAMOKŲ METU SCENARIJUS

Remiantis apklausos ir literatūros analizės rezultatais nustatyta, kad tikslinga parengti STEAM veiklų įgyvendinimo pamokų metu scenarijų. Siekiant išspręsti riboto pamokų laiko ir didelio mokinių klasėse skaičiaus problemas STEAM veiklos įgyvendinamos ne tik klasėse pamokų metu, bet dalis jų perkeliamos į virtualią erdvę. STEAM veiklose dalyvauja mokytojai, mokiniai ir STEAM veiklų koordinatorius, kuris atlieka ir virtualiosios mokymosi aplinkos administratoriaus funkcijas (*4 pav.*).



4 pav. STEAM veiklų įgyvendinimo schema

STEAM ugdymo pagrindas – mokomųjų dalykų integralumas, įgyvendinant projektinę veiklą. Projektinė veikla grindžiama tyrinėjimu ar/ir problemų sprendimu. STEAM veiklų koordinatorius kartu su mokomųjų dalykų mokytojais kuria bendrą projektinę veiklą: mokymosi medžiagą, užduotį, vertinimą. Koordinatorius atsižvelgdamas į mokytojų pateiktą projektinės veiklos turinį kuria STEAM veiklą, parengia virtualiąją mokymosi aplinką, įtraukia dalyvius. Jis koordinuoja mokytojų teikiamą STEAM veiklos turinį. Mokinių įgytų žinių pasitikrinimui mokytojai parengia visų mokomųjų dalykų savikontrolės užduotis. Projektinė užduotis, jos atlikimo žingsniai, mokymosi medžiaga, mokinių gauti rezultatai ir įvertinimai pateikiami virtualiojoje mokymosi aplinkoje.

Mokiniai susiskirsto arba yra paskirstomi grupėmis. Jie įsisavina mokomųjų dalykų medžiagą, reikalingą užduoties atlikimui. Projektinė veikla įgyvendinama pamokų metu klasėse, naudojant virtualiąją mokymosi aplinką. Namuose mokiniai tęsia projektinę veiklą, bendradarbiauja tarpusavy ar/ir su mokytojais, panaudojamos virtualiojoje aplinkoje numatytos priemonės. Mokytojai koordinuoja mokinių atliekamą veiklą, teikia grįžtamąjį ryšį (vertina, komentuoja atliktas užduotis). Jeigu reikia, mokytojai koreguoja projektinės veiklos turinį. Įkėlę į virtualiąją aplinką darbo rezultatus mokiniai gauna iš mokytojų grįžtamąjį ryšį. STEAM veiklos koordinatorius stebi veiklą virtualioje erdvėje, palaiko ryšį su mokytojais ir mokiniais, sprendžia virtualiosios aplinkos administravimo problemas, jeigu jos iškyla. Projektinė veikla priklausomai nuo mokomųjų dalykų temos sudėtingumo gali tęstis savaitę, dvi ar daugiau. Tiek mokytojai, tiek mokiniai teikia atsiliepimą apie STEAM veiklą ir patarimus jos tobulinimui. STEAM veiklos koordinatorius, kuris atlieka ir virtualios aplinkos administravimą, atsižvelgdamas į tai tobulina veiklą.

4. IŠVADOS

STEAM ugdymas yra tarpdalykinio pobūdžio ir apima gamtos mokslus, technologijas, inžineriją, menus ir matematiką, grindžiamas tyrinėjimu ar/ ir problemų sprendimu. Jo metu įgyjami ne tik pažintiniai dalykiniai gebėjimai, bet ir ugdomas kūrybiškumas, problemų sprendimo, kritinio mąstymo, socialiniai, emociniai ir kiti gebėjimai, įgalinamas priežastinių ryšių supratimas. Galimos įvairios STEAM veiklos, jų įgyvendinimui tinka projektinė veikla. Įgyvendinant STEAM ugdymą, reikalingas pasiruošimas, nagrinėjamų temų bei sprendžiamų problemų numatymas, tyrinėjimo objektų parinkimas, vertinimo proceso planavimas, virtualiųjų mokymosi priemonių tikslingas parinkimas ir taikymas, atliekamų veiklų koordinavimas.

Siekiant nustatyti, kaip STEAM veiklos įgyvendinamos vyresniųjų klasių mokinių ugdyme, su kokiomis problemomis susiduriama, buvo atlikta mokytojų apklausa raštu. Remiantis apklausos dalyvių atsakymais, galima teigti, kad tyrime dalyvavę mokytojai organizuoja integruotas pamokas, tačiau 77 proc. dalyvių pažymėjo metodinės medžiagos ir mokymų trūkumą, 68,5 proc. apklaustųjų teigė, jog reikalinga pagalba.

Siekiant atliepti šį poreikį parengtas STEAM veiklų įgyvendinimo pamokų metu scenarijus, kai veiklos atliekamos pamokų metu klasėse ir naudojama virtualioji mokymosi aplinka bei priemonės papildomoms veikloms ir viso proceso koordinavimui.

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