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ALTA'22

ADVANCED LEARNING TECHNOLOGIES AND APPLICATIONS. DIGITAL COMPETENCES IN EDUCATION.

Conference proceedings

International conference "Advanced Learning Technologies and Applications. Digital competences in education – ALTA'22 – aims to gather European educational actors, from policy makers to practitioners to researchers. At ALTA'22 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, 2022

Conference is organized by dr. Danguole Rutkauskiene

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OVERVIEW OF DIGITAL SKILLS IN THE CONTEXT OF THE EUROPEAN UNION AND LITHUANIA

Renata Danieliene

Vilnius University, Kaunas Faculty;
Digital Champion in Lithuania, Lithuanian National Digital Coalition

Abstract. This paper outlines the growing demand for digital skills in Europe and the challenges faced in the region due to the shortage of skilled ICT professionals and the gender gap in ICT. It also discusses the European Commission's priorities and proposes solutions to address IT skills challenges and promote digital transformation. The Digital Compass, the Digital Skills and Jobs Coalition and the National Digital Coalitions are among the initiatives presented by the European Commission to promote ICT knowledge and skills and address the shortage of ICT professionals. It also describes the measures the European Commission is proposing, how it is measuring progress and, in order to highlight the importance of skills, it has announced 2023 as the Year of Skills.
Keywords: digital skills, ICT professionals, education and training, initiatives.

1. INTRODUCTION

Digital skills have become an important part of our daily lives, as we use search engines, social networks, pay bills online, all of which require digital skills. But digital skills are not only important in our personal lives, they are also essential in the workplace. According to the European Commission, more than 90 % of jobs in Europe demand foundation competence in digital skills in addition to literacy and numeracy abilities. It also reports that around 42 % of Europeans lack basic digital skills, including 37 % of those in the labour market (EC, 2023a).

Additionally, it has been noted that Europe is experiencing a shortage of skilled ICT professionals. To properly educate young people for the digital economy and society, current systems of education and training must be modernized. A lifelong learning approach would also allow people to update their knowledge and skills or to retrain where necessary (EC, 2023b).

Another problem that is proposed to be addressed is the lack of involvement of women in ICT. Although the number of women with digital skills has slightly increased, there is still a significant gap between men and women working in ICT and graduating from STEM subjects. Only 19 % of those working in ICT are women and it is estimated that around a third of science, technology, engineering and mathematics graduates are women.

To address the above challenges, the Digital Compass has a several skills-related targets: to reach 20 million ICT professionals, equally represented by women and men, and to reach 80 % of the population with basic digital skills (DESI, 2021, EC, 2023d).

2. EUROPEAN COMMISSION PLANS AND PRIORITIES

The European Commission has set priorities and proposed solutions for 2019-2024 to address the various challenges related to IT skills and the use of IT. Six priority areas, including the European Green Deal, a Europe fit for the digital age and a stronger Europe in the world, reflect the need for

a holistic approach that addresses the social, economic and environmental challenges facing Europe and the world (EC, 2023c).

The proposed Digital Compass, with its four goals and targets, is a comprehensive framework for digital transformation that benefits citizens and businesses. The objectives on digital infrastructure, connectivity, data, computing and skills reflect the need for a robust digital infrastructure to support innovation, growth and resilience while ensuring security, privacy and sustainability (EC, 2023d).

The European Commission's focus on annual monitoring and evaluation of progress (DESI by 2030) and the facilitation of large-scale multi-stakeholder projects is crucial to ensure that the digital transformation benefits all European citizens and businesses. Promoting a people-centred digital agenda and international cooperation is also key to addressing global challenges and opportunities.

Overall, the European Commission's priorities and proposed solutions demonstrate a commitment to a sustainable, inclusive and competitive Europe that harnesses the potential of digital technologies to achieve these goals. However, achieving these goals and objectives will require cooperation and partnership between governments, businesses, civil society and citizens across Europe and beyond.

3.   EUROPEAN COMMISSION AND NATIONAL DIGITAL INITIATIVES

The EC places significant emphasis on digital skills and education, given the rapid pace of technological change and the need for citizens and businesses to adapt and integrate into the digital world, and has a number of European and calls for national initiatives to promote ICT knowledge and skills, to address the shortage of ICT professionals and to promote the effective use of digital opportunities.

3.1. European Commission's Digital Skills and Jobs Coalition and National Digital Coalitions

The Digital Skills and Jobs Coalition, launched in 2013, has successfully brought together stakeholders across Europe to promote digital skills and employment (EC, 2023b). National Digital Skills Coalitions have also been established in many EU countries to facilitate national strategies and initiatives. These coalitions cooperate in areas such as increasing industry training, skills certification, improving school and university curricula and raising awareness of ICT careers, especially among young people and women (EC, 2023e).

Each national coalition has its own goals and objectives based on national challenges, but they all share the common goal of promoting ICT knowledge and skills in the workplace and reducing the shortage of ICT professionals.

Following the example of the European Commission, the National Digital Coalition was launched in Lithuania in 2013 with the aim of increasing employment, promoting more effective use of digital opportunities, and collaborating on the implementation of the Digital Agenda for Lithuania (2014-2020 and the Digitalisation Development Programme 2021-2030). The stakeholders of the Lithuanian Coalition are following the strategic documents of the European Commission and Lithuania and adjust their objectives accordingly at certain periods. The

Lithuanian National Digital Coalition follows the example of the European Commission in pursuing the same objectives: Digital skills in education, Digital skills for labour force, Digital skills for all citizens, and additionally seeks to focus on women's participation in the field of technology, which is why an additional objective on "Women and Technology" has been set (Lithuanian National Digital Coalition, 2023).

3.2. European platform for digital skills and jobs

The European Platform for Digital Skills and Jobs, launched in 2020, is one of the latest initiatives to boost digital skills in Europe and aims to create a single platform for information and resources on digital skills and jobs in Europe. The platform brings together stakeholders from industry, education and government to share best practices, tools and training resources. The platform enables national coalitions to collaborate, share resources, increase their visibility and knowledge (EC, 2023f). The Lithuanian National Coalition is also running this project, which has linked the National Digital Coalition website to the European Digital Skills and Jobs Platform. The linking of the website to the portal allows for information sharing, i.e. the possibility to localise Lithuanian content in English and other languages of the partner countries and vice versa.

3.3. EU CodeWeek

EU Code Week is another initiative launched by the EC in 2013 to promote coding and digital literacy skills among young people and adults. The initiative has been successful in engaging millions of people across Europe in coding and digital activities (EC CodeWeek, 2023).

3.4. European Skills Agenda

The European Agenda for Skills is also an important document - a five-year plan to help individuals and businesses acquire more and better skills and use them effectively. The new European Skills Agenda builds on the ten actions of the Commission's 2016 Skills Agenda.

The Agenda sets out 12 key actions to help address the skills challenges facing Europe. These actions aim to promote skills development at all ages, support lifelong learning and increase the match between skills and labour market needs. They also aim to enhance the role of education and training in promoting social inclusion and to ensure that people have access to the digital skills they need to participate fully in the digital economy. Various funding programmes such as the European Social Fund Half (ESF+), InvestEU, European Solidarity Corps, Erasmus, European Globalisation Adjustment Fund, Digital Europe are dedicated to tackling these challenges (EC, 2023g).

3.5. Digital Education Action Plan

The Digital Education Action Plan, launched in 2018, aims to strengthen digital skills and competences in education and training systems across Europe. This plan, updated (2021-2027) on 30 September 2020, is a call for greater cooperation at European level on digital education to

address the challenges and opportunities of the COVID-19 pandemic, and to present opportunities for the education and training community (teachers, students), policy makers, academia and researchers on national, EU and international level. The plan includes a number of initiatives, including the development of a digital education platform, the promotion of digital skills in teacher education and the integration of digital skills into curricula (EC, 2023h).

3.6. Practical solutions for digital skills

The Europass platform is one of the tools developed by the EC to help individuals present their skills and qualifications clearly and transparently to potential employers or educational institutions. It includes a CV and a language passport, as well as a portfolio of documents such as diplomas, certificates. The platform allows individuals to create, store and share their documents online, making it easier to apply for jobs or further training opportunities in Europe (EC,2023i, Europass, 2023).

DigComp 2.2 is the latest version of the Citizens' Digital Competence Framework released by the European Commission in March 2021. DigComp is a theoretical model, a reference framework for digital competences, which describes the digital competences that citizens should be able to acquire in the following areas: information and data literacy, communication and collaboration, digital content creation, safety, problem solving. According to the DigComp Digital Framework, digital competences can be assessed at 8 levels for beginner, intermediate, advanced, and highly specialised (EC, DigComp 2023j).

The EC has also developed a tool called SELFIE, or Self-reflection for Effective Learning by Fostering Innovative Educational Practices, which helps schools to carry out a self-reflection on the use of digital technologies for teaching and learning. The tool allows schools to assess their current practices and identify areas for improvement in the use of digital technologies. It also provides recommendations on how to improve these areas and examples of good practice from other European schools. The SELFIE tool can help schools to adapt to the changing needs of their pupils and the demands of the digital world, and to ensure high quality digital education (EC, Education, 2023).

The European Commission also has a solution for all citizens and has developed a free test, DigSAT, based on DigComp, which anyone can use to assess their digital skills. Each skill is assessed at 8 levels, so the results of the test will help each person to better understand not only their specific skills but also the gaps in those skills. Registered users of the European Digital Skills Reference Framework can take a test, and once they have completed the test, they are provided with the results, with information to help them fill the gaps in their knowledge identified by the test (EC, DigSAT, 2023).

4. MEASURING PROGRESS IN THE DIGITAL COMPETITIVENESS OF EU MEMBER STATES

The European Commission has been using the Digital Economy and Society Index (DESI) since 2015 to measure the progress of EU Member States' digital competitiveness. It covers four main components: human capital, connectivity, digital inclusion and digital public services. DESI

reports provide quantitative data, country-specific policy insights and good practices based on indicators in these four areas.

The DESI 2022 reports, which track digital advancements in EU Member States, are mostly based on 2021 data. While Member States have made progress in their digitalization efforts during the COVID-19 timeframe, they are still unable to address the gaps in digital skills, turn SMEs into digital businesses, and put out cutting-edge 5G networks (EC, DESI, 2023k).

Lithuania, which is ranked 14th out of 27 EU Member States in the 2022 DESI report, has made progress on many indicators, but has room for improvement in human capital. In recent years, the country's progress towards catching up with the most digitised EU countries has been slower than it could have been. To make further progress in the DESI ranking, Lithuania needs to improve the digital skills of its population and invest in retraining and upskilling its workforce (EC, DESI LT, 2023).

5. EUROPEAN YEAR OF SKILLS 2023

The European Year of Skills 2023 is an initiative of the European Commission to promote the importance of skills and education for Europe's future. The main objective of the initiative is to raise the level of skills and competences of Europeans, with a particular focus on digital skills to support the transition to a green and digital economy.

The European Year of Skills 2023 will provide an opportunity for individuals, organisations and governments to come together to raise awareness of the importance of skills and to promote initiatives that foster skills development.

Through this initiative, the European Commission is contributing to the 2030 targets: to ensure that 80 % of Europeans have basic digital skills and that there are 20 million ICT professionals in the EU. It also aims to promote lifelong learning and involve more women in IT. To achieve this, the European Commission will work closely with Member States, social partners and other stakeholders to develop and implement policies and programmes to promote digital skills (EC, 2023l, 2023m).

6. CONCLUSIONS

This paper explores the significance of digital skills in the modern world and highlights the current lack of ICT professionals across Europe including another important issue is the under-representation of women in ICT.

The paper outlines the priorities of the European Commission and suggests solutions to these challenges, including the Digital Compass, a comprehensive framework for digital transformation that benefits both businesses and citizens.

To promote ICT knowledge and skills, address the shortage of ICT experts, and encourage the efficient use of digital possibilities, the European Commission has announced various European and national calls for projects.

Additionally, initiatives such as the Digital Skills and Jobs Coalition and the National Digital Skills Coalitions are mentioned as promoting ICT skills and knowledge in the workplace and tackling the shortage of ICT professionals.

A review of digital skills in the European context concludes that the necessary cooperation and partnership between governments, businesses, civil society and citizens is key to achieving a competitive, sustainable and inclusive Europe that exploits the potential of digital technologies.

REFERENCES

1. EC. [European Commission]. (2023a). Digital skills. https://digital-strategy.ec.europa.eu/en/policies/digital-skills.
2. EC. (2023b). Digital skills and jobs coalition. https://digital-strategy.ec.europa.eu/ga/policies/digital-skills-coalition.
3. DESI. (2021). DESI 2021 Women in Digital Scoreboard. https://digital-skills-jobs.europa.eu/en/inspiration/research/desi-2021-women-digital-scoreboard.
4. EC. (2023c). 6 Commission priorities for 2019-24. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024_en.
5. EC. (2023d). Europe's Digital Decade: digital targets for 2030. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en
6. EC. (2023e). National coalitions for digital skills and jobs. https://digital-strategy.ec.europa.eu/en/policies/national-coalitions
7. EC. (2023f). Digital Skills and Jobs Platform. https://digital-skills-jobs.europa.eu/en
8. Lietuvos Nacionalinė skaitmeninė koalicija. (2023). www.skaitmeninekoalicija.lt
9. EC CodeWeek. (2023). https://codeweek.eu
10. EC. (2023g). European Skills Agenda. https://ec.europa.eu/social/main.jsp?catId=1223&langId=en
11. EC. (2023h). Digital Education Action Plan (2021-2027). https://education.ec.europa.eu/focus-topics/digital-education/action-plan
12. EC. (2023i). Europass. https://ec.europa.eu/social/main.jsp?langId=en&catId=1266
13. Europass. (2023). https://www.europass.lt
14. EC, DigComp. (2023j). DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes. https://publications.jrc.ec.europa.eu/repository/handle/JRC128415
15. EC, Education. (2023). SELFIE. https://education.ec.europa.eu/lt/selfie
16. EC, DigSAT. (2023). Test your digital skills. https://digital-skills-jobs.europa.eu/digitalskills/screen/home?referrer=dsjp
17. EC, DESI. (2023k). The Digital Economy and Society Index (DESI). https://digital-strategy.ec.europa.eu/en/policies/desi
18. EC, DESI LT. (2023). Lithuania in the Digital Economy and Society Index. https://digital-strategy.ec.europa.eu/en/policies/desi-lithuania
19. EC. (2023l). European Year of Skills 2023. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-year-skills-2023_en
20. EC. (2023m). Commission kick-starts work on the European Year of Skills. https://ec.europa.eu/social/main.jsp?langId=en&catId=89&newsId=10431&furtherNews=yes

HIGHER EDUCATION ORGANIZATIONS AND 21ST CENTURY SKILLS

Sabri Barış AYKURT[1] and Prof. Dr. Hasan Arslan[2]

[1] *Phd student (Educational Administration and Supervision), Canakkale Onsekiz Mart University, Türkiye*
[2] *Department of Educational Administration and Supervision, Faculty of Education, Canakkale Onsekiz Mart University, Türkiye*

Abstract. It is known that schools and universities are the most important formal environment in which individuals acquire the knowledge and skills they need. Therefore, schools and universities should strive to prepare students for society in the best way possible. It is accepted that the responsibility of providing students with the skills conceptualized as 21st century skills is among the duties of educational organizations. It is stated that the responsibility of gaining 21st century skills to individuals is not only in primary and secondary education schools, but universities, which are higher education organizations, should take responsibility.
Keywords: 21st Century Skills, Higher Education, Teacher Education.

1.   INTRODUCTION

The primary purpose and focus of education is to transform students, who are raw materials for educational organizations, into individuals needed for society, to prepare them for social life, to adapt them to society, and to provide them with the knowledge and skills they need in order to achieve this goal (Trilling & Fadel, 2009). It is stated that along with technological, political and economic developments, the knowledge and skill qualities that individuals should have should also change and develop (Cansoy, 2018). It is seen that in order for science to develop, it is not enough to just give information to the student at all levels of education, and it is necessary to gain skills such as making sense of the information gained, where it will be used and how it will be associated with other information obtained (Kivunja, 2014).

Economic, technological and political developments that affect individuals and the education system also affect business life in the society. The academic knowledge that students acquire from schools and universities will not be sufficient in the 21st century business life, it is stated that besides academic and theoretical knowledge, various skills should be gained to students (Olori, 2019; Kozma, 2009). In all business organizations, employees are expected to have various skills such as problem solving, evaluating the obtained information, critical thinking, motivation, productivity, and cooperation, which are conceptualized as 21st century skills, as well as theoretical and practical information about their jobs (Ananiadou & Claro, 2009). Employees with 21st century skills are considered to be more beneficial than other employees in the organization (Ghafar, 2020).

2.   21st CENTURY SKILLS

Along with the rapid and radical changes all over the world, individuals need new skills and competencies (Scales, 2015). Competencies that enable individuals to perform complex

tasks, thinking and communication are called 21st century skills (Anagün et al., 2016, p.163). It is stated that individuals who do not acquire 21st century skills cannot contribute positively to the society they live in and cannot fully fulfill their responsibilities.

Organization such as The Partnership for 21st Century Skills (P21), The Organization for Economic Co-operation and Development (OECD), European Union (EU), United Nations Educational, Scientific and Cultural Organization (UNESCO) and American Association of School Librarians (AASL) organizations and researchers have defined 21st century skills that should be acquired by educational organizations to students. The similarities and differences between 21st century skills defined by international organizations are presented in Table 1:

TABLE 1. SIMILARITY AND DIFFERENCES OF 21st CENTURY SKILLS DEFINED BY INTERNATIONAL ORGANIZATIONS (VOOGT & ROBLIN, 2010)

Mentioned in the definitions of all international organizations	Mentioned in the definitions of most international organizations	Mentioned in the definitions of a single international organization
- Teamwork - Communication - Digital literacy - Citizenship	- Creativity - Critical thinking - Problem solving	- Learning to learn - Self-direction - Planning - Flexibility

The 21st century skills determined by the researchers vary. In general, creativity, innovation, critical thinking, problem solving, decision making, learning, metacognition, communication, collaboration (teamwork), information literacy, communication technology literacy, citizenship, life and career, personal and social responsibility, motivation cultural awareness leadership resilience, determination, initiative and entrepreneurial skills are the 21st century skills that researchers focus on (Lai & Viering, 2012; Saavedra & Opfer, 2012; Wagner, 2008; Trilling & Fadel, 2009; Pheeaphan, 2013).

It is stated that 21st century skills have two dimensions (Figure 1):
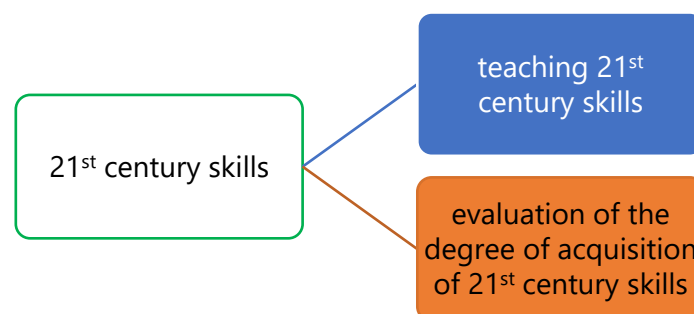
Figure 1. Dimensions of 21st century skills (Voogt & Roblin, 2010)

Teaching 21st century skills and evaluating the degree of acquisition of skills by students are the responsibility of education system administrators and educational organizations of countries. It is stated that countries with developed education systems put more emphasis on developing the skills, knowledge and attitudes necessary for students to be successful in

the 21ˢᵗ century and add them to their education policy guides (Saavedra & Opfer, 2012). It is stated that international exams (PISA, TIMSS...) can be used as important tools in evaluating the degree of attainment of 21ˢᵗ century skills by students.

3.   HIGHER EDUCATION AND 21ST CENTURY SKILLS RELATIONSHIP

From the beginning of the 2000s it has been accepted that the educational organizations preparing individuals into society should make students acquire the skills conceptualized as the 21ˢᵗ century skills. It is argued that the responsibility of providing students with the 21ˢᵗ century skills that the 21ˢᵗ century business world expects from employees is not only in primary and secondary education schools (Anagün, et al., 2016), but universities, which are higher education organizations, should take responsibility (Pheeraphan, 2013; Kivunja, 2014; Andrade, 2016; Ghafar, 2020). It is stated that it is important for students to learn 21ˢᵗ century skills and develop them as behaviors in order for the economic and social development of countries to continue (Carmo, 2017). In order for university graduates to be successful in their professional lives, they need to be equipped with academic knowledge and skills as well as learn and acquire the skills required by the 21ˢᵗ century (Ju et al., 2017). It is stated that universities have an encouraging catalyst role to develop the 21ˢᵗ century skills that higher education graduates should have, which will ensure the economic development of countries (Ghafar, 2020).

Individuals who equip students with knowledge and skills at every stage of education are teachers (Parkay, 2020) and the reflection of teachers in universities is faculty members who are also teachers. It is stated that the faculty members who train the teachers of the future should make the students acquire 21ˢᵗ century skills in the teacher training programs of the universities in order to transfer them to the next generations (Anagün, et al., 2016). For this reason, how to train prospective teachers is an issue that should be given great importance (Erten, 2019, p.43). It is stated that teacher candidates who will gain 21ˢᵗ century skills to students should be equipped with the same skills (Yalçın, 2019). In order for teachers to equip students with 21ˢᵗ century skills, it is accepted that teachers must have 21ˢᵗ century skills (Shukla, 2014). In order for students to acquire 21ˢᵗ century skills as behavior, it is stated that all educational organizations should have an appropriate structure, education programs and curricula should be prepared in a way that supports the teaching of 21ˢᵗ century skills, and all educators should be selfless (Serdyukov, 2017).

4.   CONCLUSIONS

With the change in every field, expectations from students who graduate from educational organizations also have been changing. It is considered that with the change in their environment, the expectations of the students from the education process they go through will also change. In this context, educational organizations are responsible for equipping students with the skills necessary to be successful in business life (Kivunja, 2015). For this reason, it is stated that education systems should evolve to meet the expectations of individuals (Carmo, 2020).

It is argued that the higher education systems of countries should improve their existing education systems and transform into an education model that provides students with 21st century skills (Colvin, 2015). The academic content of universities should be prepared in a way that will adapt students to global competition and technological developments, and should be constantly renewed in order to gain 21st century skills (Erten, 2019, p.60). It comes to the forefront that university faculty members should integrate 21st century skills into their education programs and provide 21st century skills to all students, especially prospective teachers (Salpeter, 2008).

It is accepted as a phenomenon that should be known by teachers that 21st century skills that should be made into behavior by students cannot be acquired with traditional education methods (Andrade, 2016). Universities need to adopt teaching models that will teach students 21st century skills and enable students to make 21st century skills a behavior. In order to create an education system that focuses on 21st century skills, it is stated that teachers should not only focus on practices aimed at improving their professional knowledge capacity, but also improve their professional skills (Saavedra & Opfer, 2012).

REFERENCES

1. Trilling, B. & Fadel, C. (2009). 21st century skills: Learning for life in our times. Jossey-Bass: San Francisco.
2. Cansoy, R. (2018). Uluslararası çerçevelere göre 21. yüzyıl becerileri ve eğitim sisteminde kazandırılması. İnsan ve Toplum Bilimleri Araştırmaları Dergisi, 7, 3112-3134.
3. Kivunja, C. (2014). Innovative pedagogies in higher education to become effective teachers of 21st century skills: unpacking the learning and innovations skills domain of the new learning paradigm. International Journal of Higher Education, 3, 37-48.
4. Olori, A. L. (2019). Teachers' utilization of instructional skills in the 21st century classroom. International Journal of Educational Research, 6(2), 15-24.
5. Kozma, R. (2009). "Assessing and teaching 21st century skills.". F. Scheuermann & J. Björnsson (ed.). in: The Transition to Computer-Based Assessment. (pp. 13-23). European Commission Joint Research Centre: Italy.
6. Ananiadou, K., & Claro, M. (2009). 21st century skills and competences for new millennium learners in OECD countries. OECD education working papers, 41. Retrieved: February 22, 2023, 218525261154.pdf.
7. Ghafar, A. (2020). Convergence between 21st century skills and entrepreneurship education in higher education institutes. International Journal of Higher Education, 9, 218-229.
8. Scales, P. (2015). Yaşam Boyu Öğrenme ve Öğretim. K. Ülkü (trans). Ankara: Palme Yayıncılık.
9. Anagün, Ş. S., Atalay, N., KILIÇ, Z., & YAŞAR, S. (2016). Öğretmen adaylarına yönelik 21. yüzyıl becerileri yeterlilik algıları ölçeğinin geliştirilmesi: Geçerlik ve güvenirlik çalışması. Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 40, 160-175.

10. Voogt, J., & Roblin, N. P. (2010). 21st century skills discussion paper. University of Twente.

11. Lai, E. R. & Viering, M. (2012). Assessing 21st Century Skills: Integrating Research Findings. National Council on Measurement in Education, Retrieved: February 18, 2023, (9) Assessing 21st century skills: Integrating research findings | Marco Vieira - Academia.edu.

12. Saavedra, A. R. & Opfer, V. D. (2012). Teaching and learning 21st century skills: Lessons from the learning sciences. A Global Cities Education Network Report. New York, Asia Society, 10.

13. Wagner, T. (2008). Rigor redefined. Educational leadership, 66, 20-24.

14. Pheeraphan, N. (2013). Enhancement of the 21st century skills for Thai higher education by integration of ICT in classroom. Procedia-Social and Behavioral Sciences, 103, 365-373.

15. Andrade, M. S. (2016). Curricular eements for learner success-21st century skills. Journal of Education and Training Studies, 4, 143-149.

16. Carmo, M. (2017). Education and New Developments. InScience Press: Lisbon.

17. Ju, R., Buldakova, N. V., Sorokoumova, S. N., Sergeeva, M. G., Galushkin, A. A., Soloviev, A. A., & Kryukova, N. I. (2017). Foresight methods in pedagogical design of university learning environment. Eurasia Journal of Mathematics, Science and Technology Education, 13, 5281-5293.

18. Parkay, F. W. (2020). Becoming A Teacher. Pearson Education: Boston.

19. Erten, P. (2019). Ögretmen adaylarının 21. yuzyıl becerileri yeterlilik algıları ve bu becerilerin kazandırılmasına yönelik görüşleri. Milli Egitim Dergisi, 49, 33-64.

20. Yalçın, S. (2019). Öğretmen adaylarının 21. yy. becerilerini ölçmek için kullanabilecekleri araçlar hakkında farkındalıkları ve yeterlik algıları. Bolu Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 19, 383-398.

21. Shukla, S. (2014). Teaching competency, professional commitment and job satisfaction-a study of primary school teachers. Journal of Research & Method in Education, 4, 44-64.

22. Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it?. Journal of research in innovative teaching & learning, 10, 4-33.

WHAT INFLUENCES COLLABORATIVE INNOVATION IN UNIVERSITY ALLIANCES? A SOCIAL NETWORK ANALYSIS

Yujie XUE[1] and Chang ZHU[1]

[1]Vrije Universiteit Brussel, Belgium

Abstract. Considering the fierce competition brought by the internationalization of higher education, international cooperation by university alliances has an important impact on the development of both universities and countries. This paper explored the factors influencing the international cooperation and innovation of university alliances through a review of the literature and with the help of social network analysis. It was found that the impact factors include policy support, market demand, financial support, knowledge sharing and transfer, willingness to cooperate, legal and regulatory frameworks, etc. These factors are linked, among which the key factors that have a strong influence on other factors are knowledge sharing and transfer, financial support, innovation resource input.
Keywords: University alliance, internationalization of higher education, cooperation and innovation, social network analysis.

1.   INTRODUCTION

Nowadays, society is facing many challenges, and along with the rapid development of internationalization, the exchanges between higher education institutions are getting closer and closer. At the same time, competition among universities is becoming increasingly fierce, and cooperation can help bring together experts from different fields and can facilitate the sharing of knowledge, resources and expertise (Gunn & Mintrom, 2013; Maassen et al., 2022). Strengthening regional cooperation has become an important initiative for universities to cope with global competition. Based on this situation, a loose alliance formed by a group of two or more universities or academic institutions that cooperate at regional, national or international levels for a specific goal or mission through agreements or alliances is a university alliance (Harrison et al., 2016; Patterson, 2001).

Many countries have started to build university alliances to promote the development of higher education (Faccin et al., 2022). For example, to further improve the global competitiveness of European higher education and to build a more unified education system, the European Commission has launched the European University Alliance project and has funded the creation of 44 alliances involving some 340 higher education institutions in 31 countries and regions. These alliances together form a large network of alliance cooperation and are one of the flagship initiatives of the European Education Area to achieve a framework for cross-border educational cooperation. In the United States, the Ivy League, consisting of such prestigious universities as the University of Pennsylvania, Harvard University, Yale University, Columbia and others, is extremely internationally influential. In addition, there is also the International Alliance of Research Universities (formed by the Australian National University, Swiss Federal Institute of Technology, National University of Singapore, Peking University, Cambridge University, etc.). The C9 League is a representative alliance of Chinese universities, including Peking University, Tsinghua University, Zhejiang University, Fudan University, and Shanghai Jiao Tong University.

In recent years, there has been a lot of research on university alliances. University alliances can improve research and innovation, help universities address complex challenges that require multidisciplinary approaches, share resources to address funding and resource constraints, promote collaboration among academic institutions, and expand networks of partners, thereby enhancing the universities' own research and teaching capacity and improving their reputation (Vukasovic & Stensaker, 2018; Wang et al., 2022; West, 2014). Researchers have explored the benefits and challenges of alliance formation from multiple perspectives (Deiaco & Melin, 2006; Solvason et al., 2018), however, there is a lack of research that focuses in depth on the details of the university alliance collaboration process, thus this study focuses on collaborative innovation in international university alliances to fill the gap in this area.

Based on this, the research question of this study is as follows:

What factors will university alliances be influenced when they engage in international collaborative innovation?

2. RESEARCH METHODOLOGY AND DESIGN

This study used the social network analysis method, utilizing this quantitative analysis method to study social relationships and structures, and to explore and analyze the interaction patterns and rules of subjects in the relational network (Cross et al., 2002). It means that the university alliance is regarded as a network organization with the participation of several innovative subjects, and the impact factors of international cooperative innovation are regarded as network nodes, and the interconnection between the elements is defined as the connection or edge of the network. Then, the centrality analysis and the tool Gephi were used to analyze the factors influencing the development of international collaborative innovation by university alliances, and thus to build a complex social network of impact factors.

The detailed research design is divided into 3 parts. The first step was that the authors obtained 41 relevant documents by searching the topics "cooperation and innovation", "internationalization" and "higher education" in the core database of web of science. Then, by analyzing these literatures, the factors that have an impact on international collaborative innovation in the field of higher education with a focus on university alliances were identified and summarized. The second step was to adapt and code the identified impact factors by using the model of team development stages proposed by Tuckman (1965), in the context of the university alliance field. The five stages are Forming, Storming, Norming, Performing, and Adjourning, as shown in Table 1. In the third step, the relationship between the factors was analyzed by three researchers. If there was a direct effect between two factors, the relationship was marked as 1, and if not, it was marked as 0. The final adjacency matrix shown in Table 2 was used as the data for the next step of Social Network Analysis.

TABLE 1.   INDICATOR SYSTEM OF FACTORS INFLUENCING INTERNATIONAL COOPERATION AND INNOVATION BY UNIVERSITY ALLIANCES

Team Development Stage	Specific indicators/impact factors	Code
Forming	Domestic and international political situation.	A1;
	Economic development of the country.	A2;
	Policy support.	A3;
	Market demand.	A4;
Storming	Willingness to cooperate.	A5;
	Culture of innovation in the institution.	A6;
	Awareness and support of leaders.	A7;
	Cross-organizational communication capability.	A8;
Norming	Strategic vision.	A9;
	Innovation resource input.	A10;
	Financial support.	A11;
	Benefit distribution mechanism.	A12
Performing	Knowledge sharing and transfer.	A13;
	Administrative capability.	A14;
	Risk management.	A15;
	Trust level.	A16;
Adjourning	Partnership quality and experience.	A17;
	Legal and regulatory framework.	A18;
	Motivating collaboration.	A19;
	Alliance structure.	A20;

TABLE 2.   ADJACENCY MATRIX OF FACTORS INFLUENCING INNOVATION IN INTERNATIONAL COOPERATION BY UNIVERSITY ALLIANCES

Code	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
A1		1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	1	1	0	0
A2	1		1	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0
A3	1	1		1	1	1	0	0	1	1	1	0	1	0	0	0	0	1	1	0
A4	1	1	1		1	0	1	0	1	1	1	1	1	1	0	0	1	0	1	1
A5	1	0	1	1		1	1	1	0	0	1	1	0	1	1	1	1	1	1	1
A6	1	0	1	0	1		1	1	0	1	1	0	1	1	1	0	0	0	1	0
A7	0	0	0	1	1	1		1	0	1	1	0	1	1	1	1	1	0	1	0
A8	0	0	0	0	1	1	1		0	0	0	1	1	1	1	1	1	0	1	1
A9	1	0	1	1	0	0	0	0		1	1	1	1	1	0	1	0	1	1	1
A10	1	1	1	1	0	1	1	0	1		1	1	1	1	1	1	1	1	1	1
A11	1	1	1	1	1	1	1	0	1	1		1	1	1	1	1	1	1	1	1
A12	0	1	0	1	1	0	0	1	1	1	1		1	1	1	1	0	1	1	1
A13	0	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1
A14	0	0	0	1	0	1	1	1	1	1	1	1	1		1	1	1	1	1	1
A15	0	0	0	1	1	1	1	1	0	1	1	1	1	1		1	1	1	0	1
A16	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1		1	1	0	1
A17	1	0	0	0	1	0	1	1	0	1	1	0	1	1	1	1		1	1	1
A18	1	0	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1		0	1
A19	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0		0
A20	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	

3.   ANALYSIS AND RESULTS

In this study, the two main quantifiers used are degree centrality and betweenness centrality. The degree centrality is used to indicate the location of the node in the network, and the larger the value, the more it is located at the core of the network and has more "power" (Zhang & Luo, 2017). From the adjacency matrix in Table 2, a network model of the

factors influencing the international cooperation and innovation of university alliances can be generated in Gephi, as shown in Fig. 1. Each circle node represents an impact factor, and the size of the circle is determined by the degree centrality, the larger the circle is, the more the factor is at the core of the network. It can be seen that in this network model, A13, A11, A10, A5, A14, A4, A12, A18, and A15 are the factors nodes that interact frequently with other nodes and have direct influence on other factors, which are important factors impacting the collaborative innovation of university alliance.
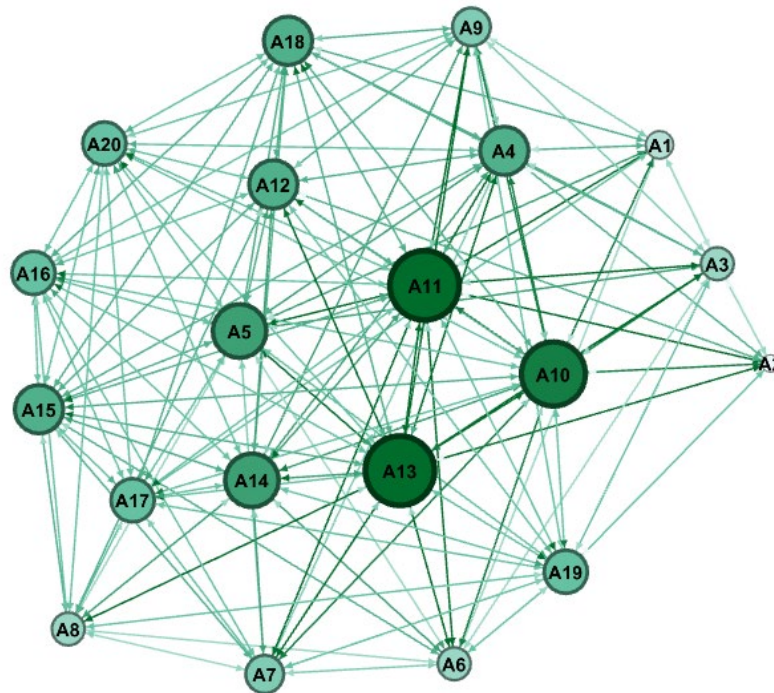
Figure 1. The network model of factors influencing university alliances to conduct international cooperation and innovation

Unlike the degree of centrality, the degree of betweenness centrality of a point is a measure of the degree to which the point is an "agent" of other points. Obviously, the higher the value of betweenness centrality is, the more influence factors it controls in the social network, and the stronger its ability to control resources (Das et al., 2018). The results of betweenness centrality can be calculated as shown in Table 3 (due to space limitation, only the top 7 betweenness centrality data are listed in Table 3). A13, A11 and A10 are the hubs of other factor nodes, which are in the important position in the network and have a greater ability to control resources.

By combining the results of the above two analyses and taking the intersection of the factor analyses under the two indicators, the identified most important key impact factors for university alliances to carry out collaborative innovation are knowledge sharing and transfer, financial support, and innovation resource input.

TABLE 3.   DATA OF INTERMEDIATE CENTRALITY

Code	Impact factor	Betweenness centrality
A13	Knowledge sharing and transfer	6.577
A11	Financial support	6.499
A10	Innovation Resource Input	6.107
A5	Willingness to cooperate	4.622
A19	Motivating collaboration	3.525
A4	Market demand	3.493
A12	Benefit distribution mechanism	3.159

4.   CONCLUSIONS

The above analysis results revealed that there are 20 factors that impact the development of international cooperation and innovation in university alliances, which are: the national and international political situation, economic development of the country, policy support, market demand, willingness to cooperate, culture of innovation in the institution, awareness and support of leaders, cross-organizational communication capabilities, strategic vision, innovation resource investment, financial support, benefit sharing mechanisms, knowledge sharing and transfer, administrative capacity, risk management, trust level, partnership quality and experience, legal and regulatory framework, motivating collaboration, alliance structure. These factors are linked, and changes in one factor will lead to changes in other impact factors. The key factors such as knowledge sharing and transfer, financial support, investment in innovation resources play a strong role in the other factors.

Knowledge sharing and transfer both have high point degree centrality and betweenness centrality in this network, which indicates that while this factor is at the core of the network, it can also influence other influencing factors to a great extent. Knowledge sharing and transfer is the basis for resource complementation and collaborative innovation among the participants of university alliances, and is a necessary process for collaborative innovation as a mediating factor that affects all nodes of the collaborative innovation network. Financial support is the guarantee for the normal operation of university consortia, thus by strengthening financial support and solving the financial constraints of the participating partners, knowledge sharing and transfer can be promoted and the output effect of collaborative innovation can be enhanced. Innovation resource input, as a key influencing factor, illustrates that in the process of cooperative innovation carried out by university alliances, each participating entity maximizes the advantages of university alliances and integrates resources, then promoting its own innovation output and enhancing its strength and reputation.

In summary, international cooperation and innovation by university alliances is a meaningful form of cooperation. To promote university alliances for international collaborative innovation, it is necessary to strengthen financial support, improve resource investment, and promote knowledge sharing and transfer in order to promote the

development of university alliances and the deepening of international collaborative innovation.

REFERENCES

1. Gunn, A., & Mintrom, M. (2013). Global university alliances and the creation of collaborative advantage. Journal of Higher Education Policy and Management, 35(2), 179–192.
2. Maassen, P., Stensaker, B., & Rosso, A. (2022). The European university alliances—an examination of organizational potentials and perils. Higher Education, 1. https://doi.org/10.1007/s10734-022-00951-4
3. Harrison, J., Smith, D. P., & Kinton, C. (2016). New institutional geographies of higher education: The rise of transregional university alliances. Environment and Planning A, 48(5), 910–936.
4. Patterson, G. (2001). Playing the alliance game in higher education. Perspectives: Policy & Practice in Higher Education, 5(1), 6–11.
5. Faccin, K., Thomas, E., & Kretschmer, C. (2022). University dynamic capabilities to boost innovation ecosystems: The case of a university alliance in Brazil. In Universities and Regional Engagement (pp. 41–57). Routledge.
6. Vukasovic, M., & Stensaker, B. (2018). University alliances in the Europe of knowledge: Positions, agendas and practices in policy processes. European Educational Research Journal, 17(3), 349–364.
7. Wang, T., Pan, S.-C., Zhu, X.-Y., & Liao, B. (2022). Research on the influence of innovation ability on the level of university scientific research: A case study of the nine-university alliance in china. Emerging Markets Finance and Trade, 58(1), 134–144.
8. West, J. (2014). Open innovation: Learning from alliance research. Open Innovation through Strategic Alliances: Approaches for Product, Technology, and Business Model Creation, 1–15.
9. Cros R, Borgatti SP, Parker A (2002) Making invisible work visible: Using social network analysis to support strategic collaboration. California management review 44:25–46.
10. Tuckman, B. W. (1965). Developmental sequence in small groups. Psychological Bulletin, 63(6), 384.
11. Zhang, J., & Luo, Y. (2017). Degree centrality, betweenness centrality, and closeness centrality in social network. 2017 2nd International Conference on Modelling, Simulation and Applied Mathematics (MSAM2017), 300–303.
12. Das, K., Samanta, S., & Pal, M. (2018). Study on centrality measures in social networks: a survey. Social Network Analysis and Mining, 8, 1–11.

ELECTRONIC VISUAL AIDS FACILITATING THE FOREIGN LANGUAGE TEACHING AND LEARNING FOR SPECIFIC PURPOSE

Dileta Jatautaite[1], Vaiva Zuzeviciute[2]

[1]*Vilnius University Business School, Lithuania,*
[2]*Mykolas Romeris University, Public Security Academy, Lithuania*

Abstract. English has been established as a lingua franca in the Global world. Consequently, employers require from their employees' high standards of English communication skills, knowledge and competences which can be achieved by implementing visual aids facilitating the language teaching and learning for specific purpose. Visual aids are supposed to intensify and raise the quality of teaching and learning of students in the classroom. Moreover, many universities have managed to use the COVID-19 pandemic as an opportunity for modernization foreign language programs, curriculum content and helped modernize the way of work and study for the better. This shift in studying languages has encouraged education to implement advanced electronic use practices in language methodology. The article scrutinizes the views of students and teachers on implementing new electronic technologies such as visual aids in learning a foreign language for specific purpose. Implementing new technologies such as visual aids into the language learning and teaching environment, specifically for a new generation of students there is no longer a problem as they are technology savvy. What concerns teaching the foreign language for specific purpose, it is significant to be aware of what to teach and how to teach it. According to the analysis of the findings, using el.visual aids improve mainly communicative skills competencies: the learners learn a significant number of lexis, improve pronunciation, enunciation, clarity, pace, projection, and other speaking sub – skills.

Keywords: electronic visual aids, communication, teaching, language learning, foreign language for specific purpose.

1.   INTRODUCTION

Today's world of globalization and technology is evolving so fast that it is sometimes hard to pursue this process. Moreover, you are forced to adapt and keep with this pace otherwise you will be forced to go swiftly after "a nonstop *train moving* at the *speed* of light for the rest of your life". Time and place of residence have taken on a completely different meaning due to new technologies, for example, it does not matter any longer where your workplace is or what nationality you are; you can work efficiently and effectively remotely using the latest electronic tools and means from any corner of the world and any time zone. Due to these circumstances, there is no denying the way the students study languages has changed, but in many ways, it has changed for the better. For example, many universities have managed to use the COVID-19 pandemic as an opportunity for change and helped change the way of work and study for the better too. This shift in studying languages has encouraged education to implement advance electronic use practices in language methodology. All who are involved in language teaching and learning process have been forced into a crash course on modern technology, and the result is that more than ever students and teachers have the skills and knowledge to work more effectively and successfully with new technologies.

Thus, the **aim** of the article is to analyze the implementation of electronic visual aids mitigating the foreign language teaching and learning of the foreign language for specific purpose.

The **object** of the research – electronic visual aids simplifying the teaching and learning of a foreign language for specific purpose.

The **objectives** of the research are based on three questions such as:

Are electronic visual aids useful for learning a foreign language for specific purpose?

Can el.visual aids help motivate and intensify the students' learning a foreign language for specific purpose?

How useful el.visual aids are for enhancing the learning a foreign language for specific purpose?

Research methods: comparative analysis of scientific literature, systematization of empirical studies on corporate social responsibility analysis and synthesis of research on corporate social responsibility, content analysis and descriptive analysis techniques, and a questionnaire.

2. ELECTRONIC VISUAL AIDS IN A CONTEMPORARY CLASS: OVERVIEW OF SOURCES

Many language teachers and students would never have had the opportunity or reason to become so clued up on modern technologies if it hadn't been for Coronavirus. These days many language courses are provided entirely online by universities which have become extremely popular among tech-savvy generation students. It means, if modern universities continue using only traditional teaching strategies with the same set of teaching materials, they would definitely side track. In other words, the modern language teaching and learning paradigm has shifted on another level of pedagogics due to implementation of new technologies into the classroom. Moreover, during this unprecedented pandemic time, students and teachers have embraced new skills and developed new behaviors which have improved the way they operate and process in the classroom.

However, there is still a problem of attaining good foreign language skills, knowledge, and competencies that needs to be addressed. In addition, there is a demand to learn the language as quickly as possible with a good language command otherwise you will turn to an unlucky wretch: no job in any multinational business company, or work as a lawyer or an officer. The world has shrunk so much that it is no longer enough to speak one language. English has become a lingua franca in the Global world (the term lingua franca is defined as a language systematically used to make communication possible between people without the use of their first language). Consequently, employers require from their employees' high standards of English communication skills, knowledge and competencies. In terms of career prospects speaking another language has become an undeniable plus on the resume, and **several studies** show a direct correlation between the importance of the first salary and the ability to speak a foreign language. For example, the Equal Employment Opportunity Commission (EEOC) "views rules requiring employees to speak English at all times at work as a burdensome condition of employment" (shrm.org). Moreover, The EEOC asserts the importance of restricting employees' ability to speak their native language though it can cause the "atmosphere of inferiority, isolation, and intimidation based on national origin" (shrm.org). It means that in an age of borderless communication and travel, it seems almost

aberrant to be limited to the usage of one language only. Though, besides the English there are many other languages that belong to a group of foreign languages for a specific purpose, for example, Russian, German, French and many others that are not the native language of a learner. The second foreign language distinction was introduced in the 1950s by Howatt (1984). Klein, for example, states that "foreign language' is used to denote a language acquired in a milieu where it is normally not in use" (1986: 19). However, English is the most studied foreign language in the world, with 1.5 billion foreign language learners.

Implementing new technologies such as visual aids into the language learning and teaching environment, in particular for Generation Z and Millennials there is no longer a problem as they are technology savvy (Jatautaite and Kazimianec, 2019). The Pew Research Center established official cutoff point for the end of the Millennial generation. They officially define Millennials as those who are born between 1981 and 1996. Millennials are described as the ones who are essentially used to taking the advantage of social media and consistently using connection to the internet. Hence, the people who are born in the late 90s cannot imagine their lives without the use of electronic tools. Pew states that the generation that comes after Millennials is named as the post-Millennial generation or Generation Z. (Loria, 2018)

There are numerous studies on the effect of using visual aids based on electronic devices (Dalali and Mwila, 2022; Lopez, 2022; Martiniello et. al., 2022). For example, Lopez explains visual aids as items "of illustrative matter, including, but not limited to a film, slide, graph, chart, or model, designed to supplement written or spoken information so that it can be understood more easily" (2022). Furthermore, Waite states that electronic devices are supposed to mitigate the students immerse to different social and cultural environment and to improve communicative competencies by using authentic, contextual, and cultural materials (2006). According to Jatautaite and Kazimianec (2019) technology assisted visual aids in the learning and teaching curriculum engage learners in communicative activities in a much more effective way. Visual aids help to better focus attention on the content to be learned and remember the concepts they have just learned, providing associative learning by linking the concept to the visual representation (Stancampiano, 2013). Moreover, visuals aids benefit the learners better store verbal information in the brain than verbals (Antonova et. al., 2019). Besides, visual aids have the capacity to engage learners and help teachers clarify difficult concepts (Nitu et. al., 2017). Sanchez (1996) states that the virtual presence lowers the affective filter and fosters role playing, as there is less apprehension and less embarrassment. Quecan (2021) states that visual aids enhance the motivation of language learners. Ahmed (2018) declares that visual aids increase students' involvement and interaction. For example, Montoya (2017) conducted research with 41 students who became more involved in language learning process and better promoted with understanding and attention of this process. Modern visual tools comprise multimedia pedagogical tools which range in simple static characters that provide information to complex and dynamic animated three-dimensional agents that narrate information while gesturing (Castro-Alonso et.al., 2021).

Moreover, visual (electronic) aids are available in many forms such as pictures, photographs, drawings, flashcards, wall charts, pictures stories, maps, and movies – even

readily accessible objects brought to the classroom ranging from a bottle opener to small toys" (Allen, 1983; quoted in Atas, 2019). Visual aids that by sight and sound increase learning process are instructional aids used in the classroom to encourage teaching (Shabiralyani, et. al., 2015). What concerns the research of this article, it deals mainly with visual aids such as "electronic textbooks and materials, smartphones, tablets and internet extensions, computers, smartboards, TVs and projectors" (Ünal, 2022). This explanation of visual aids best suits the research problem due to the advancements in technology since the number of visual aids has increased and diversified.

3. THE IMPORTANCE OF COMPREHENSIVE CHARACTERIZATION OF THE FOREIGN LANGUAGE FOR SPECIFIC PURPOSE

The necessity to learn a foreign language other than the native language for specific purpose is based on the concept of "language teaching for specific purpose". Dudley-Evans and St. John (1998) provide a comprehensive characterization of the foreign language for specific purpose as language teaching designed to meet the specific needs of the learners through employing effective teaching methodologies and teaching activities. This concept is based on the focusing of personal language needs on specific goals. In this respect, the teaching of a specific purpose language, unlike the teaching of a general language, focuses on a specific area, the boundaries of which are determined by the needs of the learner. Moreover, this concept is based on the importance of being aware of what and how to teach it. In this regard, objectives, content and teaching context are determined by focusing on the specific goals of the learner (Hutchinson and Waters, 1987: 18-19). For example, teaching language for specific purpose to business management students is mainly focused on developing writing skills, to the military is centered on speaking and listening skills or basically communicative approach. In terms of teaching law enforcement students, it depends upon the purpose of the course whether they need written and verbal communication skills. On the written side, law enforcement officers must be able to communicate the details, for example, of a crime scene or report clearly and thoroughly in international and local organizations. On the verbal side, they must communicate positively with a diversity nationality and culture people and populations they work with. For this reason, the foreign language for specific purpose focuses mainly on the use of language rather than teaching grammar and language structures (Farmati et. al., 2022). This meets the current state of methodological science and the rapid development of business, military, and law enforcement community with advanced level of a second foreign language knowledge (English for Specific Purpose). In a nutshell, language teaching for specific purpose is defined as an approach that aims to meet the academic and vocational needs of learners and is student-centered, multi-disciplinary and an effective combination of theory and practice (Anthony, 2018). For this purpose, teachers and learners have wide opportunities to use specifically technology supported visual aids in communicative language learning and teaching process. While traditional approaches focus on learning the language itself, according to the communicative approach, the use of language as a means of communication is more important than its rules. Therefore, communicative competence is

one of the main aims in communicative approach. The communicative competence of teaching and learning the foreign language for specific purpose is "the ability to function in a truly communicative setting" (Savignon, 1972: 8). Grammar is important but in communicative approach the learner should also use communication strategies and be aware of the features of discourse and sociolinguistic rules of appropriacy (Savignon, 2017). Though, Mart concludes that the rules of both language use and grammar play an important role in gaining communicative competence (2017). Communicative competence has four main components such as linguistic competence, sociolinguistic competence, discourse competence and strategic competence. In other words, foreign language teaching and learning the foreign language for specific purpose should be based as Van den Branden (2006) words that "there should be a close link between the tasks performed by learners in the language classroom and in the outside world" (p. 6), which is authentic learning. Thus, in teaching and learning a foreign language for specific purpose, the teachers incorporate in their practice technological (electronical) equipment or any digital device in designing curriculum, instruction, and learning (Garofalo & Farenga, 2021).

4. THE RESEARCH ON THE ATTITUDE OF ELECTRONIC VISUAL AIDS FACILITATING THE FOREIGN LANGUAGE TEACHING AND LEARNING FOR SPECIFIC PURPOSE

The research aim was to examine the attitude of students to foreign languages learning for specific purpose via visual aids, if they mitigate them in learning the language for specific purpose and if the use of them motivates students faster and effective learning. The students were asked 16 questions to answer. In addition, the teachers were also asked to answer the question if they are motivated in preparation for the teaching process and if in their opinion, they find visual aids beneficial in teaching the foreign language for specific purpose.

In this study, the population of the research consisted of 26 language teachers of English, Russian, German and French and 150 students from three Lithuanian universities (Military Academy of Lithuania, Vilnius University Business School, and Mykolas Romeris University). Besides the English language other languages were chose for the reason that they are also considered as a second foreign language for a specific purpose. For example, in the research 5 students of French, 12 students of Russian, 4 students of German and 129 students of English participated. All the respondents studied the second foreign language for specific purpose from B1 to B2 (English) and from A1 to B2 (French, Russian and German) according to the Common European Framework of Reference for Languages (CEFR) which is an international standard for describing language ability. The foreign language for a specific purpose was the main common characteristic of the population that participated in the research. Fraenkel and Warren in their studies define the population as a complete set of individuals (subjects or events) having common characteristics in which the researcher is interested (2002).

The questionnaire comprised closed ended questions of quantitative and open-ended questions of qualitative research methods. Open-ended questions allowed the researchers to take a holistic and comprehensive look at the issue. In other words, the respondents were supposed to provide more options and opinions, giving the data more diversity than only

with a closed question. In fact, the questionnaire was used to measure various parameters which showed the impact of visual aids in enhancing the teaching and learning process of the foreign language for specific purpose the students. The research data collection was conducted from March 07, 2020, to December 10, 2021. MS Excel and SPSS 22.0 software were used to analyze the data obtained within the scope of the research. Content analysis and descriptive analysis techniques were adopted in the analysis of the data. In this direction, the answers given by the students to the question about the most used visual aids in the lessons were analyzed by content analysis; the other questions were analyzed by descriptive analysis. The analysis of the advantages of this method application was presented in the research as well as the requirements for authentic visual materials were applied for pedagogical purpose. The authors of the research asserted the importance of implementation of these methods by saving learning and acquisition time by increasing learning process of the second foreign language for specific purpose. The collected data were evaluated through the percentage distribution. The responding rate was 65.52 %. The percentage distribution was given as the data analysis showed that 97 % of the students and 86 % teachers who agree that visual aids help in motivating them for teaching and learning the language; for specific purpose; only 3 % of students and 14 % teachers disagree. The data analysis showed that the 75 % of the students and teachers agree that the visual aids help in clarification of the content under research but there was 25 % of students who disagree with this question. According to collected data 98 % of the students and 87 % teachers agree that visual aids increase the number of learned vocabulary and functions. 92 % students and 89 % teachers state the visual aids help them in the saving both teachers and students' time in preparing for the lessons. 97 % of the students and 89 % teachers agree that visual aids save the time in preparing home assignments.

The collected data showed that 91 % of the teachers and 99 % students agreeing that el.visual aids helped avoiding dullness in the classroom. According to collected data 92 % of the teachers and 98 % students agree that through visual aids the direct experience increased to observe linguistic functions and structures. The above data show that the main variables impact positively the enhancement of learning through visual aids.

The correlation analysis shows that the correlations between variable is as follows, the variable has correlation significant at 0.01 levels with each other. The results of correlation and regression analysis support the research hypothesis i.e., the factors have a significant and positive relation with dependent variable enhancing learning and teaching process in all population groups.

5. CONCLUSIONS

From this research following conclusions have been drawn:
- The research concluded that using visuals aids as a teaching method stimulates and improves learning environment in a classroom.
- Effective use of visual aids substitutes monotonous learning environments.
- Students develop and increase personal understanding of the areas of learning when they experience a successful and pleasant learning in the classroom.

- Students find el.visual aids sessions useful and relevant when it has direct relation to the course content.
- The present research gave insights on students' faster learning of linguistic functions, pronunciation, perception, and opinions on the use of visual aids and resources.
- Using authentic video through el.visual aids in the language classroom can be quite challenging for the learners.
- It reduces boredom in the classroom for authentic linguistic content and the subject matter are brought to life that allow students to make important connections with the world outside the classroom. For example, authentic materials of el.visual aids help the students better comprehend the context, assume expectations, use code switching, jargon and speech intelligibility.
- The data analysis showed that majority of students and teachers agree that visual aids help their foreign language teaching and learning motivation.
- According to the analysis of the findings using visual aids improve mainly communicative skills and competencies: the learners learn a significant number of lexis number, improve clarity, pace, projection, and other speaking sub – skills.
- It is important to redirect teachers' opinions, perceptions, experiences, failures, and success while implementing el.visual aids.
- As a response to globalization and Covid-19 Pandemic, language teachers are forced to reconsider the ways teaching and learning of the foreign language for specific purpose are organized so that to promote appropriate pedagogical flexibility, creativity in classrooms through communicative approach.

REFERENCES

1. Allen, V. F. (1983). Techniques in vocabulary teaching. Oxford: Oxford University Press.
2. Ahmed, A. O. A. (2018). EFL Teachers' and Students' Approaches in Using Teaching Aids: A case Study. Arab World English Journal (AWEJ) Special Issue on CALL, (4).
3. Antonova, I., Snezhko, Z. & Anohina, Y. (2019). The Way We Teach Medical French Using Authentic Audio-Visual Aids For Exchange Of Experience. Journal for the Education of Gifted Young Scientists, 7(4), 953-965. https://doi.org/10.17478/jegys.621922.
4. Castro-Alonso, J. C., Wong, R. M., Adesope, O. O. et al. (2021). Effectiveness of multimedia pedagogical agents predicted by diverse theories: a meta-analysis. Educational Psychology Review. https://doi-org.am.enformation.ro/10.1007/s10648-020-09587-1.
5. Dalali, B. G., & Mwila, D. P. M. (2022). Effects of Visual Aids in Enhancing Teaching and Learning Process in Public Secondary Schools in Ilemela Municipality, Tanzania. Journal of Research Innovation and Implications in Education, 6(1), 379–390. https://www.researchgate.net/publication/359710707_Effects_of_Visual_Aid s_in_Enhancing_Teaching_and_Learning_Process_in_Public_Secondary_Sc hools_in_Ilemela_Municipality_Tanzania.

6. Dudley-Evans T,St John M J.Developments in English for Specific Purpose:A Multi-Disciplinary Approach[M].Cambridge:Cambridge University Press,1998.

7. Fraenkel FJ, Warren NE. How to Design and Evaluate Research in Education. 4th ed. New York: McGraw-Hill; 2002.

8. Garofalo, S. G., & Farenga, S. F. (2021). Cognition and spatial concept formation: Comparing non-digital and digital instruction using three-dimensional models in science. Technology, Knowledge, and Learning, 26(1), 231-241.

9. Klein, W. (1986). *Second Language Acquisition*. Cambridge: Cambridge University Press.

10. Hutchinson, T., & Waters, A. (1987). English for specific purpose. Cambridge University Press.

11. Jatautaitė, D., & Kazimianec, J. (2021). The Importance of Developing Foreign Language Competences for Military Cadets. Šiuolaikinės Visuomenės Ugdymo Veiksniai, 6, 249-273.

12. Loria K. MAR 19, 2018, 20:30 IST https://www.businessinsider.in/.

13. López, Y. (2022). The Influence of Visual Aids in High School ELL and General Education Social Studies Classrooms (Doctoral dissertation). Kean University.

14. Martiniello, N., Eisenbarth, W., Lehane, C., Johnson, A. & Wittich, W. (2022). Exploring the Use of Smartphones and Tablets Among People with Visual Impairments: Are Mainstream Devices Replacing the Use of Traditional Visual Aids?. Assistive Technology, 34(1), 34-45, DOI: 10.1080/10400435.2019.1682084.

15. Nitu, K. S. & Dahiya, H. (2017). Audiovisual aids: An essential tool for teaching. International Journal of Nursing Education, 9(1), 64-66. https://doi.org/10.5958/0974-9357.2017.00012.

16. Quecan, L. (2021). "Visual Aids Make a Big Impact on ESL Students: A Guidebook for ESL Teachers". Master's Projects and Capstones. 1157. https://repository.usfca.edu/capstone/1157.

17. Sanchez, B. (1996). MOOving to a new frontier in language teaching. In M. Warschauer (Ed.), Telecollaboration in foreign language learning (pp. 145-164). Honolulu: University of Hawai'i, Second Language Teaching and Curriculum Center.

18. Stancampiano, J. (2013, March 1). Benefits of Visual Facilitation in the classroom. Retrieved from https://www.trainingindustry.com/contentdevelopment/articles/the-benefits-of-visual-facilitation-in-the-classroom.as.

19. Savignon, S. J. (1972). Communicative Competence: An Experiment in Foreign-Language Teaching. Center for Curriculum Development.

20. Savignon, S. J. (2017). Communicative competence. In John I. Liontas (ed.), The TESOL Encyclopedia of English Language Teaching, 1–7. Hoboken, NJ: Wiley. 10.1002/9781118784235.eelt0047.

21. Ünal, K. (2022). A study on the effect of visual and auditory tools in foreign language teaching. Journal of Research in Social Sciences and Language, 2(2),108-117. https://doi.org/10.20375/0000-000f-7453-1.

22. Van den Branden, K. (2006). Introduction: Task-based language teaching in a nutshell. In K. V. d. Branden (Ed.), Task-based language education from theory to practice (pp. 1-16). Cambridge, UK: Cambridge University Press.

THE DIGITAL REALITY OF THE POLISH VIRTUAL UNIVERSITY. LOCAL AND INTERNATIONAL DEVELOPMENT PATHS

Ewa Komorowska-Jędrzejczak, Lidia Mirowska and Ewa Szczawińska

University of Humanities and Economics in Lodz, Poland

Abstract: In the example of Polish Virtual University, we show the possibilities offered by e-learning. We look at e-learning from the perspective of an academic teacher, a methodologist of distance learning and a teacher training in digital teaching. Using technologies in education often requires updating one's knowledge and methodological skills. Over the 20 years of the PUW's existence, the digital reality has changed as technology has advanced, new methodological solutions have been implemented and society has adapted to digital learning in a very specific way. We want to show how our reality has changed over time and how international cooperation has impacted it.
Keywords: education, hybrid learning, international cooperation.

1. INTRODUCTION

This article presents the Polish Virtual University (PUW) – an internal department of the University of Humanities and Economics (polish Akademia Humanistyczno-Ekonomiczna **–** AHE) in Łódź established in 2002, is responsible for distance learning. It is shown how the model of education using distance learning methods and techniques was evaluated and what the pandemic has changed. We presented what PUW actually offers for their teachers and students in terms of developing digital competencies and how these competencies are developed through study programs and the work of academic staff. It also focused on local and international development paths – collaborative activities with the International Projects Department of the University of Humanities and Economics in Łódź.

2. ABOUT THE POLISH VIRTUAL UNIVERSITY

Digitisation has many definitions. Concerning society, it refers to the spread of the ability or habit of using digital technology and computers in various areas of life (Digitisation, n.d.). For PUW, it is understood as the intentional and competent use of a distance learning platform (www.platforma.ahe.lodz.pl) and the improvement of own ICT competencies, both among administration, teaching staff and students. More than 20 years of PUW's existence is the result of the digital revolution, i.e. the establishment of a completely new structure within the university. Today, both in education and in the economy as a whole, there is talk of digital transformation. According to experts, the expression 'digital transformation' is a change in the way organizations operate through the use of digital technologies and data, as well as a change in the mindset of people (Mieczkowski, 2022). In this aspect, PUW can also be analyzed in terms of change, as the technologies and tools used at the start of the university platform have been changing to adapt to new requirements. In the case of PUW, it should be mentioned that digitization is more than technology. There is an importance placed on the development of digital competencies, defined as the ability to use digital technologies consciously and responsibly for learning, work, information literacy,

communication, collaboration, problem-solving, critical thinking, the ability to create digital content, digital hygiene or ethical online behavior. The symbol of the PUW is the butterfly, referring on the one hand to the freedom of online study (study when you want, from where you want), and on the other hand to the tradition of e-learning, dating from the "flying universities" established around 250 years ago. On 20 March 1728, a stenography teacher, Caleb Phillips, posted an advertisement in The Boston Gazette for a correspondence course: "anyone across the country who desires to learn this art may, by receiving a few sent lessons a week, be as perfectly taught as the inhabitants of Boston". The initiative was enthusiastically received (Kołodziejczak, 2018).

Figure 1. Butterfly, PUW logotype (own collection)

As noted above, the PUW is a unit of the University of Humanities and Economics in Łódź, and despite the virtuality of the PUW[1], it is based in Łódź, in the post-factory buildings owned by Ferdinand Goldner.

Figure 2. Building of the University of Humanities and Economics in Lodz, 1905 Rewolucji Street (own collection)

During 30 years of operation, AHE has educated around 87,000 graduates in 24 undergraduate and postgraduate faculties, over 80 specializations and over 80 postgraduate courses. AHE offers six faculties in Łódź and six branches, as shown in the picture below.

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[1] In a colloquial sense, the word virtual means something that does not exist in the real world, but in an artificially created reality called "virtual reality" – in: *Virtual reality and its applications* (2010).

Figure 3. AHE and its branches in Poland (own collection)

The Polish Virtual University was founded in 2002. It is the oldest e-learning university in Central Europe. It promotes modern learning methods and creates a unique center of competence in the methodology, technology and organisation of e-education. Preparing studies in the online format requires building an interdisciplinary team, combining competencies from such fields as computer science, andragogy, teaching methodology, graphic design, editing, management, etc. The team supports academic teachers in the area of e-learning. This team supports academic teachers in the areas of distance learning methodology, the development of educational materials or, last but not least, information technology. It also supports students by organising courses to prepare them for online studies and technical assistance. The team includes, for example, quality coordinators for distance learning and a webmaster. The team is available to teachers and students 7 days a week at designated times, both at the email address (pomoc@ahe.lodz.pl) and on mobile phones. It is characterised by accessibility, openness, flexibility and readiness to help and solve problems.

The history of the PUW in a pill (selected issues):

− **2000** – The first online courses were created at Maria Curie-Skłodowska University in Lublin. On 23.01.2002, The School of Humanities and Economics in Łódź and the Marie Curie-Skłodowska University signed an agreement on the realisation of a joint venture called the Polish Virtual University (PUW). It aimed to create a platform enabling both universities to conduct their studies and training via the Internet.

− **2002** – The School of Humanities and Economics in Łódź (now: AHE) decided to use the jointly created PUW platform and start courses and studies via the Internet. The first online studies were launched at the AHE in October 2002 in two faculties: management and marketing and computer science. A summary of around 250 students took up these courses. The online classes were held on the R5 Generation e-learning platform from the Finnish company R5 Vision. In addition to access to the platform with teaching materials, PUW students also received a CD with a multimedia coursebook.

− **2004** – In Bronisławowo near Łódź, the 1st International On-line Academy Conference is taking place, organised by the Polish Virtual University and the AHE in Łódź.

− **2005** − First graduation defences and first diplomas leave the virtual walls of PUW. More than 30 people have received their bachelor's degrees.

− **2005** − An innovative project-based learning method has been introduced, which involves students solving specific problems based on their knowledge, skills and social and personal competencies (*The "shortcut" project method*, n.d.).

− **2010** − A Centre for Postgraduate Studies was launched, with courses posted on a distance-learning platform.

− **2009** − The AHE in Łódź, based on the experience of the PUW, implements at all full-time and part-time faculties the support of teaching via a distance learning platform, allowing them to get to know the possibilities offered by academic e-learning.

− **2011** − PUW implemented a modern solution e-learning platform Moodle, which replaced R5 Generation. Moodle (Modular Object-Oriented Dynamic Learning Environment) is a digital learning environment accessible via a web browser. It is free software, adapted in terms of functions and graphics to the PUW's needs.

− **2017** − PUW implements ClickMeeting, using the new tool to organise webinars for students, teaching Polish to foreign language students and lecturer meetings for PUW.

− **2020** − Pandemic time and a test for the PUW online learning platform. Around 3000 subjects are transferred to the platform within four(!) days. Full-time and part-time students can easily continue their studies under PUW support and become "virtual". From this simple point of view, all subjects, not only of PUW students, are permanently on the platform ("full-time" and "part-time" − as assisted areas, for e.g. correspondence, materials, tests). Currently, the PUW team looks after every semester on the platform:

- 5000 subjects,
- 500 teachers,
- 5000 students.

PUW students come not only from Poland but also from Europe and the world, as the map below shows. The age of the students ranges from 19–55 years. They are very often professionals, mothers with children or people who want to pursue their passions. Often, students are people with disabilities, as the tools and methods of the platform allow excluded people to access learning freely. Studying online remotely on PUW makes it possible to combine work and family responsibilities with studying.

Figure 4. Who is the online students at present? (own research)

3. HOW DO WE WORK, HOW DO WE TRAIN OTHERS AND OURSELVES?

3.1. Working

Activities on the PUW learning platform take place in subjects - virtual classrooms. All teaching materials prepared both by the didactics (theoretical texts, presentations, illustrations, examples, case studies, links to websites, etc.). and additional materials, designed by the PUW methodologist in the PUW Library, are placed there. This is a library of e-learning resources that is an integral component of the platform. These are scripts and resource sets from all additional courses available to all students and all teachers. The didactics and students accessing these learning resources benefit from the content contained within one or more materials. The possibility to use such rich knowledge resources unquestionably allows for the comprehensive competence development of students. The didactics individually chooses the method of verification of students' learning progress based on the principles known in didactics concerning didactic evaluation measurement. The criteria for evaluating students learning using distance learning methods and techniques are the same as the system for evaluating student work in traditional teaching. The work on the distance learning platform is structured around the activities in which the student must engage to obtain credit for the online classes. These activities depend on the learning objectives set and the expected learning outcomes. They can be individual assignments, tests, group projects, activities on forms, essays and many others. Contact with the didactics is possible via the platform's internal mailbox. Webinars can be organised using BigBlueButton and Clickmeeting – unless otherwise decided by the d didactics, they are recorded and archived in the subjects.

3.2. Training sessions

Technology is constantly evolving and opening up more and more opportunities. For example, the amount of marketing technology available on the market between 2011 and 2020 increased by 33 %. The number of applications, functionalities and new opportunities for their use has also increased. On the one hand, therefore, we have the continuous development of technology, and on the other, the necessity or need to use these advances. It is, however, impossible and economically unjustified to constantly replace and implement new solutions (*13 facts about digital transformation…*, 2020). The Moodle platform is of course updated, we look for new IT tools (such as Reader – a program for reading content) or we adapt the view of the platform to users (dark/light mode). There is a necessity and a requirement of the current times when many education sectors in post-pandemic times have access to a similar set of software. But tools without humans mean not much, which is why we are determined to improve the competence of their use, both by the PUW team and by teachers and students. Training is provided in Polish, English and Ukrainian. We support with standard, project-based and on-demand training.

3.3. Training for teaching staff

The Polish Virtual University has a staff of academic teachers prepared to teach using distance learning methods and techniques. Classes on the platform are lectured by both full-time and contract staff. Without exception, all teaching staff has to complete a training course in the methodology of e-learning before they can work with students online. There are two training areas available to teachers:

– **The platform course (theoretical part)** – in this area, didacticians are assigned the role of students; under the supervision of an e-learning methodologist, they learn about the course materials and solve tasks. The didactics are required to log in to the area systematically every day (if possible). Communication takes place in asynchronous mode.

– **Platform course (practical part)** – in this area, didacticians are assigned the role of didactician. This area is designed to help new teachers with the practical use of all the tools and activities on the platform so that they can start working in the subject without fear. Communication takes place in asynchronous mode.

Training in e-learning methodologies is also provided in the form of webinars. These take place throughout the academic year. They often take the form of individual consultations at the request of the teachers. The PUW team also trains didactics face-to-face if required. During the academic year, especially at the beginning of the semester, additional training sessions are organised to provide teachers with an introduction to online working methodology and other aspects of e-learning to develop the skills of the academic staff. Archived training courses are available as videos on the platform, in the training area, for all teaching staff. For example, in the winter semester 22/23, the PUW team invited teaching staff to the following training courses:

– Where to start with e-learning?
– ClickMeeting without secrets.
– BigBlueButton – an online classroom tool.
– Introducing Open Educational Resources.
– Getting closer to the session, how to create test activities on the platform.
– Passed, graded and what's next? Express training in completing protocols.

We train, among others: on the following topics:

– basic and advanced methodologies,
– webinars in education,
– m-learning and ICT in education,
– writing scripts for online courses,
– podcast and videocast for academic teaching,
– public speaking.

In addition, the teaching staff has access to training materials, whether in the form of guides, FAQs or videos, throughout their time on the platform.

Usually, after the summer semester we survey the training needs of the teaching staff and ask them to evaluate the level and usefulness of the training provided so far.

3.4. Student training

Before starting their studies on the e-Learning Platform, students take part in online training to prepare them for their role as e-students. Under the expert guidance of the e-Learning Quality Coordinator, students – in addition to practising their proficiency in using the tools available on the Platform – also learn about the working rules applicable to online classes. They join the course equipped with knowledge of, among other things, synchronous and asynchronous communication, the need to work systematically, their responsibilities and those of an academic teacher. They learn about the resources of the PUW Library and other e-materials provided by the University. They interact with the instructor through forums/mail on the platform. The course is not assessed.

Students are also provided with an interactive Tutorial – training material that they can use at any time (go to: https://www.platforma.ahe.lodz.pl).

3.5. AHE Integrated Development Programme

The Integrated Development Programme (IDP) of AHE in Łódź is one of the projects undertaken by the university to increase the competitiveness and development of AHE services in Łódź by improving digital competencies of students, teachers and staff. Among other things, the program includes the creation of modern multimedia training courses implemented on a distance learning platform and the development of a digital library on the platform. Funds for the AHE Integrated Development Programme come, among others, from the project 'Comprehensive Development of the University – University of Humanities and Economics in Łódź, co-financed by the European Union under the European Social Fund. Below is a screenshot from the online learning platform showing one of the courses implemented as part of the Integrated Development Programme of the AHE in Łódź.
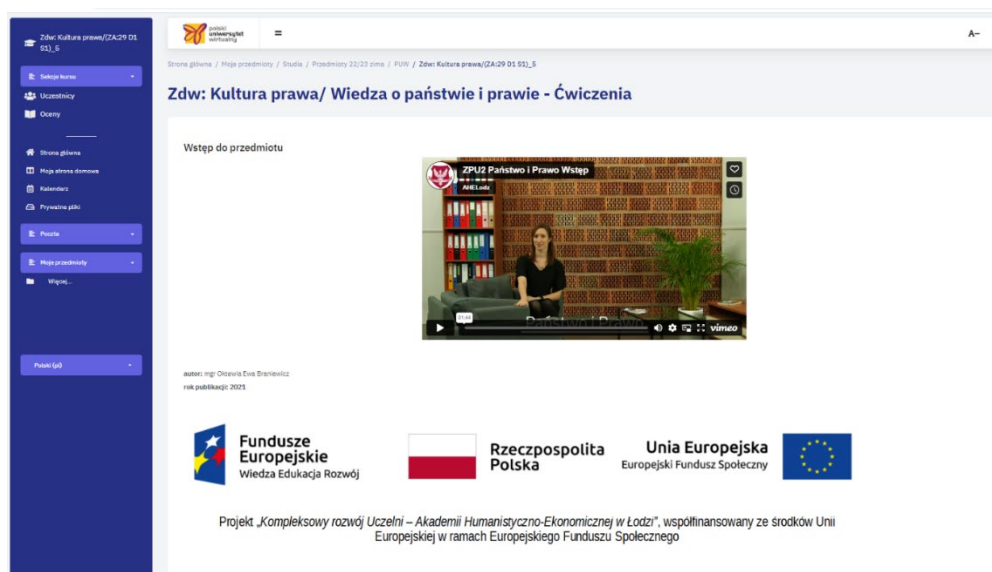

Figure 5. IDP: Example of a course (own collection)

3.6. How do we develop and learn?

The administrative staff of the Polish Virtual University, to improve their qualifications and offer the highest standard of service to teachers and students, as well as to keep up to date with the latest trends in e-learning, participate in the most important industry meetings and scientific conferences devoted to distance education and modern digitisation tools. PUW employees participate in conferences and meetings both as speakers and listeners, for example at the Polish MoodleMoot – a forum for the exchange of experience for teachers, lecturers and trainers using the Moodle platform, work on international projects on e-learning and obtain certificates for distance education methodologists. The Polish Virtual University is also the organiser of a nationwide academic conference, 'Academy On-line', which is a way to '[...] exchange opinions and experiences on the achievements of e-learning, methodology of remote learning, creation of interesting teaching resources, the effectiveness of e-courses, didactic preparation of lecturers, as well as enable broadening of knowledge and development of competences in many areas related to remote teaching'. On 20 October 2022, the 7th edition of the conference was held under the theme "Enter the game. Who's playing e-learning?" devoted primarily to the issue of gamification in e-learning: the use of video games and interactive didactic games in remote learning, gamification of e-courses and VR and AR, i.e. ways of augmenting reality with the latest technologies, and a focus on the ludic nature of e-learning in a broader sense. The conference will culminate in a post-conference publication in 2023 in the form of an e-book and the implementation of recordings of the most interesting speeches of the speakers into a digital library on a remote learning platform.

Figure 6. Uranium ears – poster for the film presented at the conference and the invitation to the 7th Online Academy Conference: Enter the game. Who plays the e-learning game (own collection)

4. NOT ONLY LOCALLY, BUT ALSO INTERNATIONALLY

The International Projects Department of the AHE in Łódź implements projects in partnership with foreign institutions (multilateral cooperation projects and mobility projects under the Erasmus+ programme). The main tasks of the Department include the creation of training and educational projects, the development of the scientific and didactic potential of the university, the promotion of the university internationally and cooperation with foreign partners and the business community. These activities are aimed at developing and implementing innovative teaching and management methods, promoting and educating in the field of creativity, as well as developing the staff and expanding the educational offer of AHE.

Figure 7. International Projects Department at the University of Humanities and Economics in Łódź (own collection)

An example of the activities of the International Projects Department at AHE is the coordination of the Erasmus+ programme under Action 1: Learning Mobility, which includes student mobility to complete part of their studies at a foreign university or to complete an internship in a foreign company, and staff mobility to teach students at a foreign university (teaching staff) and for training purposes (administrative staff). An important element of the scientific and didactic development of the AHE academic staff are also multilateral cooperation projects, the results of which are implemented on the distance learning platform in the PUW library as open educational resources for all users: both teachers and students.

Recently completed multilateral cooperation projects coordinated by the department include: "E-SCAPE Education for Social Change based on active pedagogy and experiential learning", "Street Culture for the Regions", "Contemporary Teaching and Learning Techniques in Distance Education" or "e365 Entrepreneurship in 365 Days".

Figure 8. Examples of international projects under Erasmus+ (own collection)

In summary, thanks to the activities of the International Projects Department, the University of Humanities and Economics in Łódź:

– participated in more than 200 projects co-financed by the European Union (Erasmus+, Lifelong Learning, Europe for Citizens and other international programmes), implemented in partnership with institutions from abroad,

– continuously develops cooperation with foreign institutions in the framework of staff and student exchange,

– currently cooperates with nearly 50 universities and institutions from abroad in the framework of Erasmus+ mobility programme for staff and students.

The University of Humanities and Economics in Łódź cooperates with the National Agency for Academic Exchange (NAWA), which "[...] works towards the internationalisation of Polish science by supporting and stimulating international research cooperation and academic exchange. The Agency strives to strengthen scientific excellence, internationalise Polish universities and scientific institutions, and promote Poland – its language and culture in order to build the image of a country offering interesting educational and research opportunities." The Agency's funding offer includes programmes for researchers, institutions, students and programmes to promote the Polish language abroad. AHE's cooperation with NAWA has resulted, among other things, in an international scientific conference on 'Linguoculturology in glottodidactics and linguistic research' in 2022 and a visit by AHE representatives to an educational fair and a meeting with Polish youth in New York at the Consulate General of the Republic of Poland also in 2022.

Figure 9. NAWA project – education fair and meeting with Polish youth in New York at the Consulate General of the Republic of Poland in New York. November 2022 (own collection)

5.   CONCLUSIONS

The digital reality of PUW is a long-term process, emerging, learning, developing, optimising and meeting the evaluative needs of students, educators and, most of all, new times, because technology is constantly changing. It is always a process that does not really have an end date, because new trends, tools or technical solutions are practically constantly changing. As demonstrated, the University of Humanities and Economics in Lodz successfully exploits opportunities for the development of its teaching and administrative staff and students through their own initiatives and involvement in international projects. Participation in European initiatives, internationalisation of scientific results and transfer of best practices from international partners contribute to constant development of AHE's educational offer and increase the quality of teaching.

REFERENCES

1. Digitisation (n.d.). In *Great Dictionary of Polish Language PWN*. https://wsjp.pl/haslo/podglad/64931/cyfryzacja.
2. Mieczkowski, P. (Ed.). (2022). *The state of digitisation in Poland compared to the region*. Foundation DigitalPoland, Warsaw.
3. Kołodziejczak, A. (2018). *The history of e-learning, or how it used to be*. https://www.e-learning.pl/ewiedza/historia-e-learningu-czyli-jak-to-kiedys-bywalo.
4. *Virtual reality and its applications* (2010). https://m.ciop.pl/CIOPPortalWAR/appmanager/ciop/mobi?_nfpb=true&_pageLabel=P39200118761482245057910&html_tresc_root_id=300006409&html_tresc_id=300006402&html_klucz=300004753&html_klucz_spis=.
5. *The "shortcut" project method* (n.d.). https://www.ahe.lodz.pl/sites/default/files/pliki_wpisow/do_pobrania/1703/przewodnik_po_metodzie_projektow.pdf.
6. *13 facts about digital transformation... or everything you wanted to know about digital transformation but were afraid to ask* (2020). DigitalShapers, Warsaw.

MATCHING OBJECTIVE AND SUBJECTIVE DATA IN THE EVALUATION OF LECTURES AND EDUCATIONAL CONTENT

Giovanni Toffoli[1] , Stefano Lariccia[2] and Mariarosaria Manco[1]

[1] *LINK srl, Roma, Italy*
[2] *Sapienza - Università di Roma, Italy*

Abstract. We present some approaches and tools for evaluating the quality of teaching and learning processes, which we are applying inside WE-COLLAB, an Erasmus+ project involving six large and medium-sized European universities. A thread of activity concerns the interpretation, in terms of cognitive and emotional states, of data collected with neuro-physiological sensors during a live lecture or the reading of a text; another, the use of tools for textual analysis of lesson transcripts and reference material. Additional tools support the subjective evaluation of the quality of live lectures and of educational material. A challenge is to put in relation data collected in so heterogeneous ways among them and with data collected by tracking online activity carried out through learning platforms.

Keywords: open education, collaborative learning, learning analytics, educational neuroscience, text analysis.

1. INTRODUCTION

WE-COLLAB is the name of an Erasmus+ project bringing together, besides a couple of SMEs, six large and medium-sized European universities (We-collab Consortium, 2023) (European Commission, 2023). The teams involved are active in different disciplines; some of them had recently cooperated in a bigger European project, Up2University, aimed at building a digital learning ecosystem (NGDLE is the acronym of its proper name) empowering teachers and students to develop the digital skills required by the 21st century Internet society.

Up2University focused the building of a consistent core of a large open-ended infrastructure to be experimented systematically in large-scale pilots, together with a set of pedagogical guidelines. In it, substantial attention was devoted to the role of learning analytics (LA) methods and tools (Montanari, 2020); for example, most components of the NGDLE infrastructure are able to share traces of the user activity by sending records of them as xAPI statements to a common repository, the so-called Learning Record Store (LRS) (ADL Initiative, 2023).

WE-COLLAB draws much from the experience gained in Up2University, but, also in connection with the need to cope with the restrictions related to Covid-19 pandemic, started with a focus on the experimentation of a limited set of innovative techniques allowing to raise the quality of teaching and learning even in emergency situations. Those techniques were chosen based also on the competences and the research priorities of the partners; besides general approaches to the analysis of learning-related data, they include the exploitation of research results on neuro-physiological sensors, the application of natural language processing (NLP) methods and linguistic resources, the coordinated use of mobile apps and web-based learning platforms.

In WE-COLLAB, we also have a special interest in learner-centered learning: ideally, the objectives and the implementation of innovation are transparent to all stakeholders; in particular, the tools introduced and the data collected on each teacher and learner should be available to the teacher or learner herself; in the case of the learner, the availability of learning-related data and of tools supporting their interpretation could result in some form of self-regulated learning (SRL).

2. THE COLLABORATIVE LEARNING PLATFORM

The WE-COLLAB platform is a virtual and customized deployment of CommonSpaces (CS). This is not a Learning Management System (LMS) since it is not intended to fully support the administration of a school class and the teaching of a course in a formal setting. We can identify it as Collaborative Learning Platform: it can complement the teaching of a regular course by facilitating the work of small groups of students carrying out the tasks assigned to them, host fully autonomous projects and their members in non-formal learning activities, support mentoring activities, aso (Lariccia, 2016).

In the following, the terms CommonSpaces and CS, unless otherwise specified, will refer to both CS in general and the WE-COLLAB platform.

2.1. CommonSpaces as organizer of user spaces

The core of CS is a hierarchy of Communities and Projects, which are activity spaces shared among Members; Communities have Administrators which control membership and roles; Projects are working spaces for learning by searching and by doing, in collaboration with peers. Both have dedicated document repositories and social tools. Each user has also a private space which she can treat as a sandbox.

2.2. CommonSpaces as hands-on collaboration environment

The core activities inside Projects are:
- searching educational resources on the web and in the CS repository, by using a rich set of metadata in the latter case;
- cataloging OERs or creating new ones, and add appropriate metadata;
- building Learning Paths (LP) as organized set of modules (called "Nodes"); each of these refers to an OER or includes a document, or is an HTML page edited in line with a rich-text editor; members can contribute nodes to a LP created by another member;
- playing LPs; commenting and evaluating OERs/LPs created by others.

OERs and LPs are subject to a simple publication workflow.

2.3. CommonSpaces as integration platform

CS can communicate with other "experience providers", but its main integration capabilities concern documents and data. Shared Folders in Communities and Projects

contain documents of many different formats and links to online documents such as those of Google Workspace. The same documents can be attached to OERs and nodes of LPs.

CS is able to visualize in read-only mode Jupyter Notebooks (Project Jupyter 2023), stored with the .ipynb extension, .zip archives containing SCORM learning objects complete of their Manifest file, aso, and to process .spacy files containing parsed text documents and corpora.

Most important, besides feeding an xAPI learning record store (LRS) with traces of user activity, CS is also able to fetch and interpret xAPI statements sent by other "experience providers", such as Jupyter hubs, Moodle instances, possibly equipped with an H5P plugin, and mobile apps; thus, it can facilitate the analysis of learning-related data from multiple sources for Learning Analytics (LA).

3. AUTOMATIC SUPPORT TO QUALITY EVALUATION

CS can provide a contribution to the evaluation of educational content and of teaching and learning processes in a few distinct ways, including the collection and analysis of learning-related data and a repertoire of text-analysis functions.

3.1. Recording an activity stream

We saw above that CS supports the xAPI protocol. It also exploits it: it tracks learning activities in the form of an "activity stream" and converts that stream in xAPI format when interfacing an LRS. The data collected can be used, for example, to analyze the patterns of collaborations of Project members active in building a Learning Path.

3.2. Text analysis and content evaluation

Recently, multilingual text-analysis functionality has been added to CS, on top of spaCy, a state-of-art natural language processing (NLP) Python library, using statistical language models trained with machine learning techniques (Explosion, 2023). It can be used for content evaluation, even if we plan to experiment it in a wider range of tasks:

- content creators could get an estimate of a text's readability, based on indicators of syntactic complexity, lexicon level, and text cohesion;
- teachers and educational managers could be interested to evaluate educational materials in order to assess the suitability of a text for a target audience or an educational goal;
- a teacher could use the same indicators to assess the writing ability of a student in terms of lexicon richness and syntax mastery;
- a learner could use a few functions to better understand a text, for example for guessing the meaning of an unknown word.

Here below we just list a few of the available functions:

- Dependency parsing - a colored graph visualizes the grammatical structure of each sentence, highlighting related words and the type of the relations between them, according to the UD standard (de Marneffe, 2021);
- Keywords in Context - lists of lemmas sorted by number of occurrences; each is shown as a line including a token derived from the lemma, plus N tokens at its left and N tokens at its right;
- Words Lists by part-of-speech (POS) - sorted lists are produced based on word frequencies and/or CEFR vocabulary levels (Council of Europe, 2023);
- Noun chunks and Named Entities (result of NER);
- Text Readability - values represent raw text features (mainly of statistical type) and the output of various empirical formulas approximating human assessment of readability and complexity;
- Text Cohesion - global and local text cohesion scores are computed on the basis of the lexicon shared among contiguous paragraphs or of similarity measures derived from the statistical language models.

4. SUPPORT TO SUBJECTIVE EVALUATION

4.1. The Student Feedback App

WE-COLLAB addresses challenges that often characterize poorly designed distant teaching, such as 'Zoom fatigue', higher levels of distractibility and information overload. We developed an interactive mobile app for providing voluntary, real-time feedback to the teacher during online lectures - more in general feedback to the speaker by an attendee of a synchronous event - with the mediation of an extension of the CommonSpaces platform.

The repertoire of the attendee reactions currently includes nine types of messages, being sent by pressing virtual keys labeled: Slower, Pause, Go on, Louder, Repeat, Explain, Recap, (need) Context, (need) Example. The reaction types above follow the style of the four "persistent reactions" allowed by the Zoom platform (Yes, No, Slow down, and Speed up); that is, they are mostly performative expressions. By comparison, the Wooclap application only allows to say "I'm confused", although it supports alternative forms of feedback (Wooclap, 2023).

The interaction screens of the Student Feedback App host also a chat; the mobile app is backed by a server-side application, whose UI visualizes the students' feedback and allows participation in the chat by means of an Event Dashboard. The feedback messages are forwarded to the LRS as xAPI statements, so that they can be processed also at a later time.

As mentioned in the introduction, another thread of activity in WE-COLLAB concerns the application to the educational context of special sensors that two partners already experimented in other training contexts, to move towards Multimodal Learning Analytics (MLA); more specifically they are able to record neurophysiological data representative of three mental aspects important for learning (Simonetti, 2023):

- attention, measured by means of ocular movements and recorded through screen-based eye tracker;
- cognitive effort, measured by means of brain activity and recorded through electroencephalography (EEG);
- emotional engagement, measured by means of galvanic skin response (GSR) and recorded through a dedicated bracelet.

In a few experimentation settings, it will be possible to submit to these tests students attending live lectures and providing also subjective feedback by means of the Student Feedback App. This will allow, although off-line, to put in relation and hopefully cross-validate explicit but subjective responses with objective data needing an interpretation.

4.2. Rating educational content

Another field in which we plan to put in relation data coming from very different sources is the evaluation of the educational content.

In CS, registered users can rate the quality of OERs (rating the LPs is planned too) and view a list of previous evaluations for each of them. The evaluation form requires to write a short review text and to grade the OER with an overall score, on five levels (poor, fair, good, very good, excellent). It is also possible to assign specific scores to the following facets of the OER quality:
- technical quality; e.g. quality of audio, video, presentation, etc.;
- communicative quality; e.g. message immediacy and clarity;
- cognitive quality; e.g. originality and creativity;
- scientific quality; e.g. scientific validity of content and methodologies, critical awareness, interdisciplinarity.

On the other hand, with the text-analysis functions briefly mentioned above, we can get a lot of data summarizing certain objective features of the textual content and estimating other characteristics identified through less formalized definitions. Even in this case we plan to compare those objective or automatically computed data with the human rating.

5. DISCUSSION

We are aware that the experiments presented in this paper can appear quite ambitious for an Erasmus+ project. In fact, they complement pilots based on more established LA methodology.

The major problem we anticipate in cross-validating the evaluation of a live lecture lies in the fact that, while the aspects to be extracted from neurophysiological data are mental states, the explicit feedback messages, for practical reasons, are basically of performative nature; for example, the Pause message may or may not reflect cognitive overload, the Context message may or may not reflect some confusion state. Probably, the repertoire of the attendee reactions can be trimmed and refined, but it cannot be completely overturned if the experimentation is to take place in a fairly natural situation, where feedback is exploited

in real-time by the lecturer, or a lecturer's assistant, to improve and adapt content and presentation.

As to the correlation between text features derived from automatic text-analysis and the rating performed through crowdsourcing, the difficulty of comparing heterogeneous data is compounded by the limited reliability of the data themselves. For example, the literature addressing correlation between the readability or the complexity of a text, as perceived by human subjects, and as quantified by more or less objective measures, in general shows a rather loose match and often focus only on the level of agreement between estimates provided by different algorithms. On the other hand, the users doing the OERs' rating do not represent, inside our project, a good statistic sample and usually we do not know whether their judgement is really based on hands-on experience or only on the account of the metadata contained in the catalog entries.

6. CONCLUSIONS

As stated in the introduction, the WE-COLLAB project hasn't as a target an overall solution to the needs of distant learning, but the experimentation of a few innovative techniques. In this paper we briefly presented some objectives of such experimentation and a few limitations already recognized.

As the project activity goes on, we will report on results and on further issues being met. In any case, we think that it is useful to have an experimentation scheme ready, in order to be able to early exploit the expected progresses of the individual technologies, with a view to a continuation in subsequent projects, hopefully with greater computational resources and more extensive samples of educational materials and of learning settings.

REFERENCES

1. ADL Initiative (2023). Experience API (xAPI) Standard. Advanced Distributed Learning (ADL) Initiative. Retrieved January 24, 2023, from https://adlnet.gov/projects/xapi/.
2. Council of Europe (2023). Common european framework of reference for languages: Learning, teaching, assessment (CEFR). Retrieved January 24, 2023, from https://www.coe.int/en/web/common-european-framework-reference-languages/.
3. de Marneffe, M. C., Manning, C. D., Nivre, J., Zeman, D. (2021). Universal Dependencies. In Computational Linguistics 47(2), 255–308. DOI: 10.1162/coli_a_00402.
4. Explosion (2023). Spacy - Industrial-strength Natural Language Processing in Python. Retrieved January 24, 2023, from https://spacy.io/.
5. European Commission (2023). Erasmus+ - EU programme for education, training, youth and sport. Retrieved January 24, 2023, from https://erasmus-plus.ec.europa.eu/.
6. Lariccia, S., Ritella, G., Montanari, M., Cesareni, D., Toffoli, G. (2016). CommonSpaces: an approach to web learning based on OERs, mentoring and collaborative learning. 2nd International Conference on Higher Education Advances, HEAd'16, 326-333. DOI:10.4995/HEAd16.2016.2733.

7. Montanari, M., Barth, I., Lariccia, S., Pantazatos, D., Martinez De Carnero, F., Sansone, N., Toffoli, G. (2020). Using learning analytics in a next generation digital learning environment to transition from face-to-face to remote learning during the coronavirus crisis. 13th annual International Conference of Education, Research and Innovation, 9-10 November, 2020. ICERI2020 Proceedings, 6257-6265. DOI:10.21125/iceri.2020.1345.

8. Project Jupyter (2023). Project Jupyter. Retrieved January 24, 2023, from https://jupyter.org/.

9. Simonetti, I., Tamborra, L., Giorgi, A., Ronca, V., Vozzi, A., Aricò, ... , Di Flumeri, G. (2023). Neurophysiological Evaluation of Students' Experience during Remote and Face-to-Face Lessons: A Case Study at Driving School. Brain Sci. 2023, 13, 95. DOI:10.3390/brainsci13010095.

10. We-collab Consortium (2023). The WE-COLLAB Project website and collaboration platform. Retrieved January 24, 2023, from https://www.we-collab.eu/.

11. Wooclap (2023). Create interactive presentations with Wooclap. Retrieved January 24, 2023, from https://www.wooclap.com/.

USING 3D PRINTING TECHNOLOGY TO DEVELOP MEMORY EXERCISES IN ORDER TO TACKLE INDIVIDUALS WITH ALZHEIMER'S DISEASE AND DEMENTIA

Danguole Rutkauskiene[1], Greta Volodzkaite[2]

[1]Kaunas University of Technology, Lithuania
[2]Baltic Education Technology Institute, Lithuania

Abstract. This paper examines the use of three - dimentional (3D) printing technology and STL files in healthcare interventions for individuals with Alzheimer's disease and dementia. 3D printing allows for the customization of cognitive exercises, tailored to the specific needs of patients. The development of STL files, which are the standard format used for 3D printing, is a challenging but essential aspect of this process. Recent studies have demonstrated the potential of 3D printing technology in improving cognitive function and memory recall in patients with Alzheimer's disease and dementia. However, ethical considerations must also be considered when utilizing this technology in healthcare interventions. Overall, this paper highlights the promise and challenges associated with 3D printing and STL files in addressing the needs of patients with Alzheimer's disease and dementia.
Keywords: *3D printing, STL, healthcare, Alzheimer, dementia.*

1. INTRODUCTION

In recent years, there has been growing interest in the use of technology to develop new interventions and therapies for individuals with Alzheimer's disease and dementia. One promising technology that has gained increasing attention in this field is 3D printing. 3D printing, also known as additive manufacturing, is a process of creating physical objects from a digital model by layering materials, such as plastic or metal, one on top of the other. This technology has revolutionized many industries, including healthcare, where it is being used to develop new medical devices, implants, and prosthetics (Bortoleto, M. A el.al, 2020).

In the context of Alzheimer's disease and dementia, 3D printing technology offers a unique opportunity to develop new interventions and therapies that are tailored to the specific needs of affected individuals. By creating physical objects that are designed to stimulate cognitive function and memory, researchers may be able to improve the quality of life of individuals (Cichocki, M., & Buczek, M. 2020) with these conditions and help them to maintain their independence for longer.

3D printing has been demonstrated to boost cognitive function and memory in Alzheimer's and dementia patients. Sánchez-Rodríguez et al. (2020) discovered that dementia patients' cognitive performance and memory recall improved when they utilized 3D-printed reproductions of familiar objects as memory aids. Tu et al. (2020) used 3D printing to create an Alzheimer's memory game. Matching 3D-printed objects with their photographs improved cognitive performance and memory recall in participants. Liu et al. (2021) used 3D printing to develop personalized memory aides for Alzheimer's patients. The memory aids—3D-printed copies of familiar objects and customized photo albums— improved cognitive function and quality of life for participants. These researches imply that 3D printing technology could improve cognitive function and quality of life for Alzheimer's

and dementia patients. However, further study is needed to determine the long-term efficacy of 3D printing interventions and develop standardized methods for creating and performing memory workouts utilizing 3D printing technology.

Finally, 3D printing can help construct memory workouts for Alzheimer's and dementia patients. This technology allows for personalized therapies that improve cognitive performance and memory recall in recent research (Hwang, S et.al, 2021). 3D printing is a promising new way to treat Alzheimer's disease and dementia, which are becoming more common. To fully utilize 3D printing technology for cognitive therapies, various hurdles must be addressed.

2. CHALLENGES OF 3D PRINTING TECHNOLOGY FOR COGNITIVE INTERVENTIONS

Three-dimensional (3D) printing technology has emerged as a promising tool for the development of customized cognitive interventions for individuals with Alzheimer's disease and dementia. This technology enables the creation of personalized and interactive memory exercises, which can be tailored to the specific needs and abilities of affected individuals (Iqbal, F et.al, 2020). However, despite the potential benefits of 3D printing technology for cognitive interventions, there are also several challenges that need to be addressed in order to ensure their effectiveness, safety, and accessibility. This chapter will explore the challenges of 3D printing technology for cognitive interventions in Alzheimer's disease and dementia, and provide recommendations for addressing these challenges. Challenges of 3D Printing Technology for Cognitive Interventions (Kalnins, A. et al., 2021):

1. Standardizing Protocols. 3D printing technology for cognitive interventions faces a lack of established guidelines for designing and performing memory tasks (Kleidermacher, D. N. et.al, 2021). Intervention quality, safety, and efficacy can vary widely among settings and populations. Researchers and healthcare professionals must standardize 3D printing techniques for memory workouts to solve this issue. These guidelines should include cognitive deficiencies and demands of impacted individuals, 3D printing safety and ethics, and intervention feasibility and scalability (Konstantinidis, E. I et.al, 2020).

2. 2. Accessibility. Accessibility and cost are further issues with 3D printing for cognitive therapies. 3D printing is becoming more affordable, but it still takes specialized knowledge and equipment. This limits 3D printing technology for individuals and healthcare practitioners, especially in low-resource areas (Lai, W. H. et al., 2020). To address this issue, cost-effective, user-friendly 3D printing technology must be developed Little research. 3D printing technology may help cognitive therapies, however, there is little data on its efficacy and safety (Park, S. Y. et al., 2020). This makes it hard to assess the pros and cons of employing 3D printing for cognitive therapies in Alzheimer's and dementia. Further research is needed to assess the efficacy, safety, and feasibility of 3D printing technology for cognitive therapies and provide best practices and protocols for creating and executing them.

3. 3. Safety and Ethics. 3D printing cognitive therapies present ethical and safety issues (Lee, E. B. et.al., 2020). 3D printing interventions may confuse, distress, or frustrate afflicted individuals if not properly developed or implemented. 3D printing interventions may exploit or abuse personal data, raising privacy and confidentiality risks. Researchers and healthcare practitioners must guarantee that 3D printing treatments are safe, ethical, and responsible and follow data privacy and security standards to address these concerns (Mihai, F. D. et al, 2020).

4. Little research. 3D printing technology may help cognitive therapies, however, there is little data on its efficacy and safety (Park, S. Y. et al., 2020). This makes it hard to assess the pros and cons of employing 3D printing for cognitive therapies in Alzheimer's and dementia. Further research is needed to assess the efficacy, safety, and feasibility of 3D printing technology for cognitive therapies and provide best practices and protocols for creating and executing them.

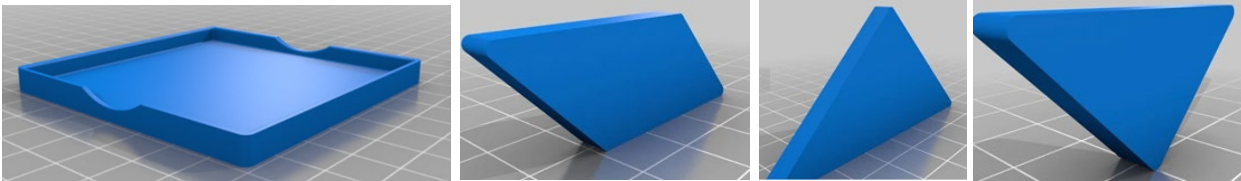## 3. DEVELOPMENT OF THE 3D EXERCISES AND STL FILES CREATION

Activities in the mild and moderate phases of dementia are needed to slow down the development of memory loss, problem-solving, time and space orientation, and stimulating social contacts. Some general instructions to take in mind when we are developing exercises for people with dementia and Alzheimer's are:

1. The games must be in accordance with the personal history of the patient, as well as in which phase of the development of the disease is the person with dementia.

2. An interview must be conducted with the relatives of the patient and with the patient herself/himself. The purpose of the interview is to choose together what type of activities are useful for the individual depending on personal history, preferred activities, and disease progression.

3. The 3D didactical exercises are divided into two main indicators: Method of application - individual or in a group of 2 to 6 people; What basic skills do they recall and retain - concentration, attention, math skills, planning and dexterity, memory, memories;

4. In individual games there is a facilitator who presents the task, and the person with dementia performs it independently or with the help of the facilitator (or the patient's relative). They are suitable in a family environment and in individual care.

5. Group games are suitable for care homes for old people and daycare centers for people with dementia. Here, again the facilitator presents the exercise, but the actions are carried out in a group of 2 to 6 people.

6. The role of the facilitator is to start the exercise, to explain the rules (if one of the participants does not remember them from childhood), and to help with the task.

3.1. Template for the development of the exercises

The definition of the exercise consists of three parts which are described below:
- The first part refers to the generic aspects of the exercise to be defined: name, name of the model, to which kind of cognitive area is related, and so on.
- In the second part, it is specified how the model can be used with people with Alzheimer's and dementia, which are the main benefits on them.
- The third part covers the technical specifications of the model.

General information	
Exercise name:	Tangram
Which cognitive area is it related to?	Memory, psychomotor skills, visual-motor coordination, spatial orientation, formation of abstract ideas, attention, visual memory, and logical thinking concentration.
Description of the exercise:	3D printing of the pieces of a conventional tangram game which is a dissection puzzle consisting of seven flat polygons, called tans, which are put together to form shapes, for that the subject has to create different figures or just solve the tangram (forming the square). It is possible to compose all kinds of schematic and basic figures and forms, as also numbers and letters. It will be said or shown a specific figure (or even object) and the subject will try to form it with the different pieces of the tangram. If the figure is shown initially, it will be covered before starting the task. It could be used in every stage of dementia, but considering the difficulty.
3D model	
A written description of the 3D model:	
Different pieces compose the classic tangram. Possibility of printing them in different colors, so it is easier to identify pieces and make puzzles. Usually, a tangram has 7 pieces: 2 large right triangles; 1 medium right triangle; 2 small right triangles; 1 square; 1 parallelogram. Please be as detailed as possible in describing shapes, colors, and technicians.	
Graphic Definition of the 3D Model. (Insert technical or hand-free sketch. Use as many pages as necessary.	

> Additional materials for a better description: On this page, you can insert pictures, links with additional information, and videos. For each of the documents that we insert in this section, the sources must be provided.

4. CONCLUSION

In conclusion, the use of 3D printing technology for the development of memory exercises and interventions presents unique opportunities and challenges. One of the major challenges faced in the development of 3D exercises is the need for expertise in both 3D printing and cognitive science. While 3D printing technology offers a wide range of possibilities in terms of customization and individualized interventions, the creation of 3D models and STL files requires a high level of technical skill and expertise. This is particularly true when developing interventions that target specific cognitive functions, as these require a deep understanding of the underlying cognitive processes. Overall, the development of 3D exercises and STL file creation for cognitive interventions represents an exciting and rapidly evolving area of research. While there are certainly challenges associated with the use of 3D printing technology in this context, the potential benefits in terms of improved cognitive function and quality of life for individuals with Alzheimer's disease and dementia are significant. As such, continued research and development in this area are critical for advancing our understanding of the potential of 3D printing technology in cognitive interventions and for improving the lives of those affected by these devastating conditions.

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REFERENCES

1. Bortoleto, M. A., de Macedo, L. D., & Valentini, D. F. (2020). Use of 3D Printing in Rehabilitation: Overview and Perspectives. Journal of Healthcare Engineering, 2020.
2. Cichocki, M., & Buczek, M. (2020). Application of 3D printing technology in the therapy of cognitive disorders in the elderly. Clinical Interventions in Aging, 15, 707-715.
3. Hwang, S., Lee, J., Lee, J., & Kim, Y. (2021). 3D Printing-based Patient-Specific Memory Intervention for Patients with Alzheimer's Disease. International Journal of Precision Engineering and Manufacturing-Green Technology, 8(2), 481-490.
4. Iqbal, F., Ali, S., Iqbal, S., & Hussain, S. (2020). 3D printing and its applications in Alzheimer's disease. Journal of Alzheimer's Disease Reports, 4(1), 153-159.
5. Kalnins, A., Henzen-Logmans, S., Cidota, M. A., & Friedrich, C. M. (2021). A 3D printed memory board game for persons with dementia: A feasibility study. Geriatric Nursing, 42(3), 798-803.
6. Kleidermacher, D. N., Kirschner, K. L., Stone, T., Karel, M. J., & Gallagher-Thompson, D. (2021). 3D printing and assistive technology for individuals with dementia: A scoping review. Gerontechnology, 20, 1-15.
7. Konstantinidis, E. I., Billis, A. S., & Mouzakidis, C. A. (2020). Exergaming and rehabilitation: A review on alternative therapeutic interventions for people with neurological disorders. Journal of Healthcare Engineering, 2020, 1-20.
8. Lai, W. H., Luo, X. Y., Lai, Y. M., Xu, Y. H., & Qi, W. W. (2020). 3D printing technology for the treatment of Alzheimer's disease. Neural Regeneration Research, 15(9), 1599-1600.
9. Lee, E. B., Kim, J. H., Lee, J. Y., Kim, J. H., & Kim, C. H. (2020). Effects of a 3D Printed Learning Tool on the Cognitive Function of Elderly Patients with Mild Cognitive Impairment: A Randomized Controlled Trial. Journal of Clinical Medicine, 9(3), 744.
10. Mihai, F. D., Gîrbacia, F., Negoiță, A., Gîrbacia, S., & Leuștean, A. (2020). 3D Printing and Alzheimer's disease: A systematic review. Journal of Personalized Medicine, 10(4), 200.
11. Park, S. Y., Shin, S. S., Lee, E. S., Choi, B. R., & Kim, J. Y. (2020). Development of a 3D Printing Program for Dementia Patients. Dementia and Neurocognitive Disorders, 19(1), 10-16.
12. Saez de Urabain, I. R., & Smith, T. J. (2021). Designing for older adults with dementia: A review of empirical studies. Journal of Applied Gerontology, 40(1), 3-18.
13. Tanaka, T., Suzuki, M., Shibata, T., Oshio, K., & Horiuchi, S. (2020). Development of a personalized 3D-printed cognitive training system for the elderly. Geriatrics & Gerontology International, 20(11), 1069-1075.
14. Wang, C., Zhang, D., Feng, X., & Liu, Y. (2021). 3D Printed Objects as Cognitive Aids for People with Dementia: A Systematic Review. Journal of Medical Systems, 45(4), 1-14.

15. Zhang, Y., Wang, C., & Liu, Y. (2020). Cognitive training with 3D-printed objects for the elderly with dementia: A randomized controlled trial. Computers in Biology and Medicine, 117, 103590.

16. Zhao, Q., Zhang, C., Shao, Y., & Zheng, Z. (2021). Personalized cognitive training system based on 3D printing technology for the elderly with Alzheimer's disease. Journal of Ambient Intelligence and Humanized Computing, 12(6), 6251-6261.

17. Zheng, J., Li, W., Li, J., Li, J., Li, W., Li, C., … & Zhang, Y. (2020). The Role of 3D Printing Technology in the Rehabilitation of Patients with Alzheimer's Disease. Journal of Healthcare Engineering, 2020.

18. Zuo, C., Yu, Y., Sun, X., Cheng, L., & Qiu, C. (2020). A 3D-printed cognitive training platform for elderly individuals with mild cognitive impairment. International Journal of Medical Informatics, 144, 104267.

THE EXPERIENCE OF LEARNING ANALYTICS AT AUTONOMOUS UNIVERSITY OF MADRID

Isabel Solana Domínguez[1] and María Muelas Gil[2]

[1] *University Autonomous of Madrid, Spain*
[2] *University Autonomous of Madrid, Spain*

Abstract. This paper and the analysis presented in it belong to the European project WE-COLLAB[1], whose purpose is to support and reinforce the necessity to implement innovative practices in the digital age in the teaching/learning environment. The aim here is to present, in a descriptive and reflective way, the technological infrastructure used at the Autonomous University of Madrid to collect data on the learning and teaching process. The analysis that has been carried out consists in an exhaustive review of all the documents and technological platforms that are used by the institution, offering a level-of-impact organized summary that may serve as a reference point within Higher Education.

Keywords: Learning analytics, Teaching platform, Data collection, WE-COLLAB.

1.   INTRODUCTION

Learning Analytics is considered as one of the most important trends in technology-enhanced learning and teacher, as the Horizon Report 2012 identifies (Johnson et al. 2012, 2013). It can be defined as the measurement, collection, analysis and reporting of learners' data and their context with the aim of understanding and improving the learning process and conditions (Peña 2017). In Siemens's words (2010), it consists in "the use of intelligent data, learner-produced data, and analysis models to discover information and social connection, and to predict and advise on learning". Considering it is centered in the learner and the learning processes and the ultimate goal is to improve both factors, it is logical that many scholars and papers have centered on this matter in the last years (Siemens and Long 2011, Johnson et al. 2013, Gašević et al. 2015, Peña 2017, among others). In the same line, the European project WE-COLLAB, in which this paper is embedded, was created as a collaborative and international team to support the implementation and amelioration of innovative digital tools in the learning environment, taking as a starting point the learning analytics parameters of the institutions involved.

The first step for effective Learning Analytics is to gather and analyze the relevant data to present potential interventions that can improve the learning experience (Greller et al. 2014). In fact, Campbell and Oblinger (2007) presented a 5-step process in Learning Analytics: capturing, reporting, predicting, acting, and refining.

The goal of this paper is to present and describe the technological infraestructure used at the Autonomous University of Madrid (UAM henceforth) to collect data on the learning and teaching process at this institution. It offers a reflective analysis that observes the ongoing methods and platforms that are currently deployed to compile quantitative information that serves as the starting point of the learning analytics.

To this aim, a descriptive analysis will be presented in Section 2, which will comment on the different levels where data collection is involved; Section 3 will present the results of

this analysis, paying further attention to the main platforms used at this institution, their main characteristics and the level of data collection they belong to. To conclude, some reflections on future paths and necessary measures to be taken will be provided in Section 4.

Finally, a description or presentation of the institution where this analysis takes places is needed. The UAM is a public university that combines high-quality teaching, international and national research and one of the highest rates of employability in the country, plus a strong social commitment, being a reference point in all these values, as indicated in several global rankings and studies. In fact, as observed in the QS World University Ranking of 2022, it is found among the best 220 universities at a global level, among the 100 most prestigious institutions in Europe, the third at a national level and the top university in Madrid.

2. METHOD

The analytical process or method presented in this paper consists in an exploratory, descriptive study of the current situation in what Learning Analytics is concerned at the UAM.

Thus, this is an explanatory and deductive work that has collected all the relevant analytical, statistical and numerical documents and information that is relevant to summarize and analyze the situation of the institution at present. In other words, the present work has carried out the first two steps of the process presented by Campbell and Oblinger (2007), *id est,* capturing and reporting.

Once all the documentation has been collected, the platforms and their utilities are summarized in a table with the objective of serving as a reference or starting point for the last three steps of the process: predicting, acting and refining.

3. RESULTS AND DISCUSSION

The exhaustive review of the aforementioned documents and of the current situation of UAM in what Learning Analytics is concerned has allowed us to organize the results around two core ideas: data sources (platforms) and the level of impact of the data. The following subsections present them in turn.

3.1. Platforms of Learning Analytics at UAM

Currently, there are mainly four technological platforms of data collection at the UAM that collect different kinds of data. These are:
- **SIGMA.** This platform is used for academic and administrative management goals by the university. It provides the institution with general statistics on the different programs, the students' profile, mobility, etc.
- **Moodle.** It is the virtual or digital classroom where teachers and lecturers share the resources and activities that are also used in on-site learning, so students can access them and work in a more autonomous way. It is also used to assess and evaluate the students' performance in the course.

- **Office 365.** Every UAM user has a corporate Microsoft Office 365 account that gives them access to a myriad of apps and tools that allow them to work online in a collaborative way. Students, lecturers and administrative staff can share processes and documents from such apps.
- **UAMX.** It is the platform that the university uses for online training programs for users. It is used both by students for extracurricular training and learning and by teachers and lecturers for their personal professional development.
- **Personal Teaching Environment (PTE).** Finally, in addition to these platforms, the teachers' preferences open a broad and varied dashboard of digital tools that are made available for students in their classrooms to make the learning and teaching processes more dynamic. These are understood as personal teaching environments or, as we may call them, PTE.

3.2. Level of impact of the data

The data collected from the different platforms are used by the university for different purposes. For this reason, four levels have been established, organized according to their level of impact in the institution: university and faculties, departments and areas, subjects and teachers/students, and university teaching professionals (Fig. 1).
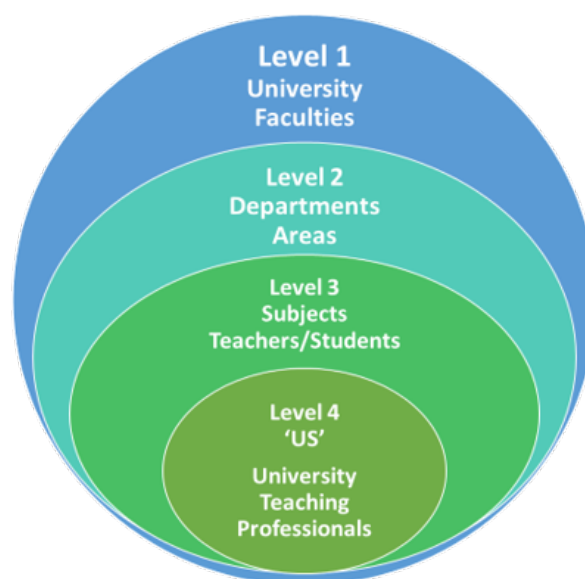
Figure 1. Level of the data

- **Level 1.** It represents the *macro* level, or the highest one in the scale. It refers to the institution and the different faculties. The data collected in the platforms SIGMA and UAMX offer the institution general statistical data to improve the organization and logistics as a whole. The results are published annually on different online sites (Fig. 2):

Figure 2. Annual report from the OAP (Analysis and Planning Office) (UAM, 2022)

- **Level 2.** It represents the *meso* or intermediate level and it refers to the departments and areas of the faculties. The data collected by SIGMA and Moodle concerning enrollment, results, assessment, etc., allow the responsible teams in each department to make decisions in relation to the necessities of human resources and teaching quality improvement (Fig. 3):
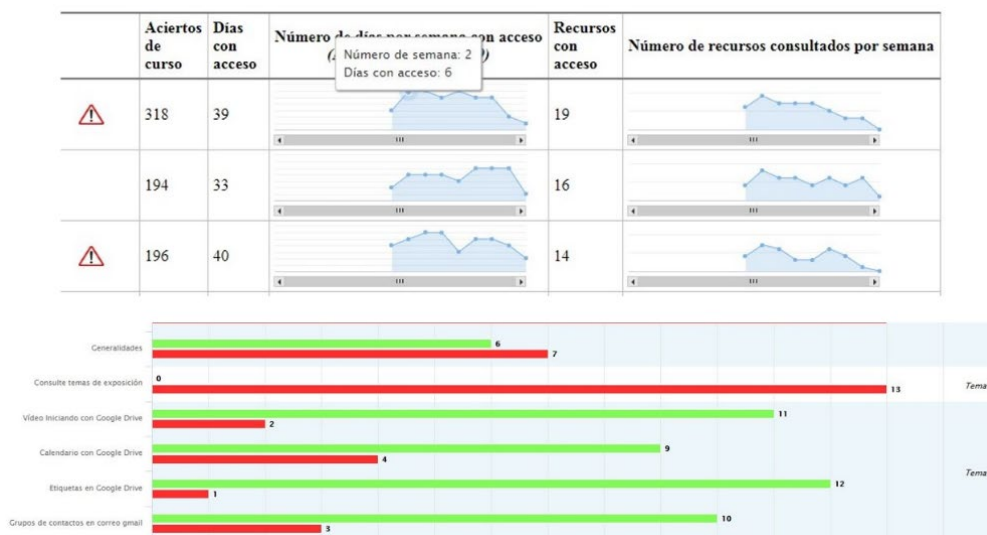
Figure 3. Data found on Moodle (UAM, 2022)

- **Level 3.** It represents the *micro* or lowest level within the platforms that can be monitored by the institution. The results collected by SIGMA, Moodle or Teams, for instance, as applications of Office 365, provide the users with the metrics on the interaction, feedback and follow-up of the students and teachers in the different groups and subjects. Having access to this information improves the coordination

among teachers and boosts the improvement of the quality of the learning and teaching processes as a whole (Fig. 4):
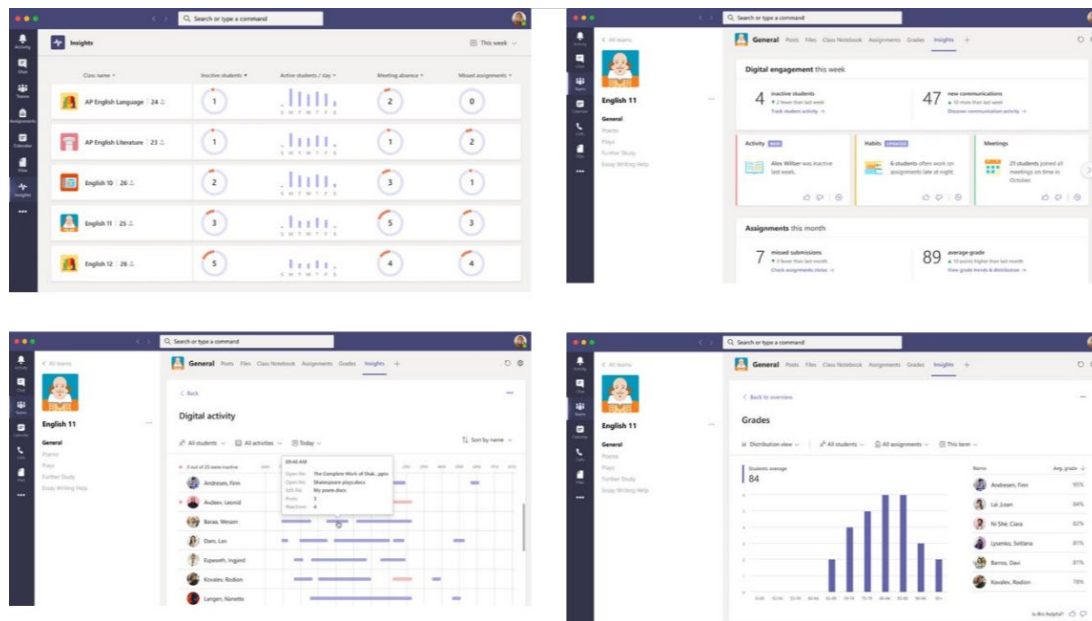
Figure 4. Information collected by *Teams* (Tech Community of Microsoft, 2022)

• **Level 4.** Last, but not least, a fourth level has been included, understood as the teachers' Personal Teaching Environment (PTE). In this case, it is not the institution that monitors the data collection, but the teacher is responsible for the data mining in their favor for self-reflection and improvement of the teaching practice. The teachers' concerns are collected by the university via surveys, and they contribute to a better planning of continuous professional development that the university can offer to their faculty.

Table 1 below summarizes the interaction between the aforementioned platforms and their level of impact for the continuous improvement of the institution:

TABLE 1. LEVEL OF DATA IMPACT OF THE DIFFERENT PLATFORMS

	Level of the impact of the data			
	L1-MACRO *University & Faculties*	*L2-MESO* *Departments & Areas*	*L3-MICRO Subject, Lecturer, Students*	*L4-PERSONAL University Teaching Professional*
Data source	SIGMA UAMX	SIGMA Moodle	SIGMA Moodle Teams	Personal Teaching Environment (PTE)

Data type (examples)	General statistical data (programs & student, staff, mobility, etc.)	Enrollment, results, assessment, etc.	Resources (materials) interaction follow-up and feedback	Follow-up of learner's empowerment
Impact	Organization and logistics	Human Resources and teaching quality	International coordination; learning process quality	Teaching methodology and continuous professional development

4. CONCLUSIONS

The aim of this paper was to summarize and present the available information in what Learning Analytics is concerned at the Autonomous University of Madrid (UAM). In a constantly-evolving learning and teaching environment where digital tools have an enormous notoriety both in on-site and online learning, there has been an increasing interest in the academic and research community around this topic.

Moreover, there has been a turning point for educational institutions in recent years. The global lockdown during COVID-19 (2020-21) brought into light the need for changes for traditional on-site teaching models, spreading and adapting the digital tools that teachers/lecturers had been using in their classes until then. Teachers started to use new teaching/learning platforms and tools (such as Teams – Office 365) that allowed them to share material with the students and interact with them outside Moodle.

Despite the many positive outcomes of the digital transformation, this change in the teaching/learning process provided, at the same time, a much wider range of information via new data collection platforms or sources. However, this also meant a decentralization and scattering of information, making L3 and L4 learning analytics more difficult.

This analytical, descriptive study has collected all the available information that the UAM offers at different levels and has summarized the main platforms that are used in each of these levels to collect data and thus make it available to improve the teaching/learning process, which is, in the end, the final goal of Learning Analytics.

Finally, we advocate for common data collection patterns/models from one site, such as Moodle. Teachers and lecturers need to be aware of the importance of learning analytics so that they can reflect on their teaching practice and collaborate in data collection processes from their Personal Teaching Environment (PTE). This is, in a nutshell, the main aim of WE-COLLAB, the European project that has motivated this paper and study.

REFERENCES

1. Campbell, J. P., Oblinger, D. G. (2007). Academic analytics, EDUCAUSE White Paper. Retrieved February 10, 2016 from https://net.educause.edu/ir/library/pdf/PUB6101.pdf.
2. Gašević, D., Dawson, S., Siemens, G. (2015). Let's not forget: Learning analytics are about learning. TechTrends, 59(1), pp 64-71.
3. Gil Vera, V. D. (2018). Análisis del aprendizaje: una revisión sistemática de literatura Learning analytics:a systematic literature review. Cuaderno Activa, 10(1), 15 - 26.
4. Greller, W., Ebner, M., Schön, M. (2014). Learning Analytics: From Theory to Practice– Data Support for Learning and Teaching. Computer Assisted Assessment. Research into EAssessment. Springer International Publishing, pp 79-87.
5. Johnson L., Adams S., Cummins M. (2012) The NMC Horizon Report: 2012 Higher Education Edition. The New Media Consortium, Austin
6. Johnson, L., Adams Becker, S., Cummins, M., Freeman, A., Ifenthaler, D., Vardaxis, N. (2013). Technology Outlook for Australian Tertiary Education 2013-2018: An NMC Horizon Project Regional Analysis. New Media Consortium.
7. Leitner, P., Khalil, M., Ebner, M. (2017). Learning Analytics inHigher Education – A Literature Review. In: Learning Analytics: Fundaments, Applications, andTrends. Peña-Ayala, A. (Ed.). Springer International Publishing. DOI: 10.1007/978-3-319-52977-6_1.pp. 1-23.
8. Peña, A. (2017). Learning Analytics : Fundaments ,Applications , and A View of the Current State of the Art to (94th ed.). Mexico DF: SpringerBerlin Heidelberg.
9. Siemens, G. (2010). What are learning analytics. Retrieved February 10, 2016 from http://www.elearnspace.org/blog/2010/08/25/what-are-learning-analytics/.
10. Siemens, G., Long, P. (2011). Penetrating the Fog: Analytics in Learning and Education. EDUCAUSE review, 46(5), pp 30-40.
11. Tech Community of Microsoft. (2022). https://techcommunity.microsoft.com/.
12. Universidad Autonoma de Madrid. (2022). https://www.uam.es/uam/inicio.

SELF-DIRECTED LEARNING PROGRAMME EVALUATION: LEARNER'S INSIGHTS

Vytautas Buksnaitis, Edgaras Dambrauskas, Edvinas Zinkevicius, Vytenis Punys

Kaunas University of Technology, Lithuania

Abstract. Self-directed learning received increased attention during the COVID-19 pandemic as it is not dependent on space, time and direct contact restrictions. However, due to its flexibility and division into smaller "bites", it is especially viable for adult learners as it can be easily integrated into the regular routine. In this paper, we overview the characteristics and current situation of SDL and discuss it in the context of a newly developed course for general education school teachers. The paper also takes a look at learner expectations and problems they faced based on the course piloting results and questionnaire.
Keywords: education, self-directed learning, course development, learning approach.

1.   INTRODUCTION

Recent and unprecedentedly rapid technological advances that arrived together with the Fourth Industrial Revolution (Industry 4.0), subsequently advancing and transforming many traditional areas of activities (Pitikoe et al., 2021). Education was not an exception, self-directed learning (SDL) started to become an increasingly popular practice facilitated by the ever-increasing number of sources of the ever-increasing amount of knowledge on both general information as well as highly-specialized formal and non-formal courses. Access to learning content provided by *Youtube*, *Udemy*, *Udacity*, *Khan Academy* and many others, led towards learners being able to learn by themselves without time or space restrictions, usually at a much more affordable rate in comparison to full formal education studies.

SDL concept being used in the context of both higher education and general education schools comes as no surprise and its adaptation rose during the pandemic period of Covid-19 together with distance learning as restricted access to the institution's premises led towards approaches that were not dependent on learner physically arriving to the classroom. Unsurprisingly, studies have shown that given the opportunity, learners tend to lean towards the option of self-directed learning as opposed to the traditional learning approach. Therefore, self-directed learning has long been acknowledged as originating from adult education ideas and its concept revolves around the idea that everyone has unlimited potential for development and progress while instructors were supposed to be the ones who facilitate learning instead of managing it (Tang et al., 2021).

Self-directed learning as an approach on education can be defined as learning in which the conceptualization, design, conduct and evaluation of a learning project are directed by the learner (Brookfield, 2009) and may be understood (Hiemstra, 1994) as any study method where the student has main responsibility for the planning, carrying out, and even assessing the effort is considered self-directed learning. While education is traditionally understood as a hierarchical relationship between a teacher and a learner, there is also an increasing

number of instances when it more specifically referred to the process of bringing out and fostering a student's presumptive innate abilities[2].

Naturally, learners do have their own expectations for the way self-directed learning is implemented and the bar is set quite high for HE institutions as learning opportunities provided by private enterprises or even foreign MOOCs provide solid competition among institutions. The Kaunas University of Technology is an institution believing that the particular educational utilization of advanced innovations is important to encourage learning. Developing learning techniques and technologies opens doors for inventive learning, upgrades creative education and improves learning outcomes.

In this paper, learner insights on the SDL MOOC course developed as part of the *Imoned* project are discussed.

2.   CHARACTERISING SELF-DIRECTED LEARNING

According to Geng et al. (2019), self-directed learners typically engage in learning tasks more actively, such as reading online learning materials, doing assignments in class, and organizing and assessing learning milestones.

Self-directed learning, despite the possible variety in its implementation in practice, tends to share some common characteristics[3]:

(a) individual learners can become empowered to take increasingly more responsibility for various decisions associated with the learning endeavour;

(b) self-direction is best viewed as a continuum or characteristic that exists to some degree in every person and learning situation;

(c) self-direction does not necessarily mean all learning will take place in isolation from others;

(d) self-directed learners appear able to transfer learning, in terms of both knowledge and study skill, from one situation to another;

(e) self-directed study can involve various activities and resources, such as self-guided reading, participation in study groups, internships, electronic dialogues, and reflective writing activities;

(f) effective roles for teachers in self-directed learning are possible, such as dialogue with learners, securing resources, evaluating outcomes, and promoting critical thinking;

(g) some educational institutions are finding ways to support self-directed study through open-learning programs, individualized study options, non-traditional course offerings, and other innovative programs.

Self-directed learning subsequently focuses (Wong et al. 2021) on encouraging students to investigate novel concepts, create goals, choose a potential course of action for responses, and assess their learning results while giving them greater autonomy in their research on specific learning themes. Some studies also identified a positive relationship between skills acquired by students during the self-directed learning process and lifelong learning tendencies (Tekkol & Demirel, 2018).

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[2] https://www.self-directed.org/sde/
[3] https://ccnmtl.columbia.edu/projects/pl3p/Self-Directed%20Learning.pdf

As self-directed learning is focused on the learner and his/her convenient manners, technological advancements are forced to adapt. As a consequence, mobile learning taking its step towards becoming an integral part of self-directed learning since it entails not only the mobility of technology but also more importantly the mobility of time, space, and learning experience (Lai & Zheng, 2018). SDL also pushes students towards making decisions themselves regarding their learning process, including planning, goal setting and selecting suitable strategies for tasks at hand (Geng et al., 2019).

A study by Zhu et al. (2020) indicates student enrolment, interest and completion rate correlate with MOOC use within the educational setting as availability and low or non-existing price become a factor in choosing SDL learning over the traditional face-to-face approach.

3. CHALLENGES ENCOUNTERED WHEN USING A SELF-DIRECTED LEARNING APPROACH

Implementation of the study programme based on the self-directed learning approach requires careful consideration of challenges that may eventually arise as noted by the experience of other institutions. For example (Robinson & Persky, 2020), inexperienced students might not be able to create their own learning objectives or know where to go for reliable information while solving an issue. In addition, conventional education takes place because the teacher is aware of the abilities and information a beginner may need to gain and is skilled at directing learning in a particular field.

Study performed by (Kohan et al., 2017) (shows that several major challenges were identified as barriers to self-directed learning in virtual education, including cognitive barriers (information overload and lack of focus on learning or mind wondering), communication barriers (inadequate coping skills and inadequate writing skills) and educational environment barriers (heavy workload and role ambiguity).

Some scholars do raise a concern that SDL may result in decreased student motivation, however, regular and timely records of self-reflection, discussion of results as well as feedback appear to make SDL more effective and attractive (Noh & Kim, 2019). As noted (Morris & Rohs, 2021), reduced motivation does not only reduce the efficiency of learning, it may also manifest in social loafing and fraudulent practices (cheating). Therefore, for their past knowledge to be activated and connected to the new information, learners may require guidance and stimulation. Students who have prior knowledge are more likely to believe they can complete the job. Otherwise, they may not believe they are effective, which will have an impact on future performance (Kaufman, 2018).

4. PILOTING RESULTS AND LEARNER INSIGHTS

The piloted course is intended to raise teachers' distance learning skills within the context of the COVID-19 pandemic. Self-directed learning approach was selected as the key to providing learning and competence development without space, time and teaching staff restrictions, typical training process would include. Via the SDL approach, the course is also

intended to meet the long-term demands of teachers by enhancing their abilities to create contemporary teaching materials for their apprentices and to continuously improve themselves using cutting-edge and contemporary tools and technology.

Piloting was conducted by teachers representing a number of Lithuanian general education schools across Lithuania with a total of 56 participants. For the purposes of piloting, the national language was used to increase accessibility and ease-of-use. Comments provided by participants and used in this paper were provided in the national language of Lithuanian and translated for further research purposes.

The reflection on feedback on developed course parts in terms of points on a scale of 1-5, indicates that a vast majority considers the content both at the module and the topic level to be *good* or *very good*.
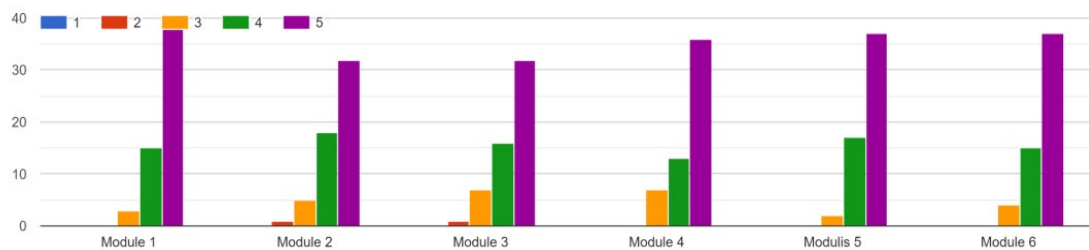

Figure 1. Module effectiveness and usability

Figure 2. Topic effectiveness and usability

The questionnaire part, however, revealed aspects that were not critical to general satisfaction or usability but rather pointed towards technical inconsistencies that were noticed by piloting participants and that are relevant for further updating the content as well as creating new courses. 44 participants indicated that they hadn't experienced any technical issues. Others mentioned minor issues such as mouse wheel flipping pages not as intended, .pdf files not working properly and generally not as convenient to be used on the phone.

The latter one in our opinion is a critical aspect to consider and find necessary solutions for as learning on mobile devices essentially means that learners can read/watch videos in short periods, for example, while commuting, instead of dealing with a whole module at once.

The question "Did you enjoy these practical exercises?" showed which parts of the course were considered the most valuable and engaging as well as indicated what a learner expects at an SDL course for adults. Among such comments, the following advantages were mentioned: being able to "choose from a lot and think about what to create"; the course is useful for refreshing previously-acquired knowledge; participants also note that tasks are related to the material read, related to the learning objectives. It should be noted that several participants noted that the course itself is quite time-consuming, even for an SDL course, since each of the modules is intended to take about 3 hours, depending on the learner's pace and previous skills.

Interestingly, one participant highlighted the importance of interactivity and gamification as important reasons why the content becomes engaging, since, otherwise, the learner would have to depend on intristic motivation to strive for more. Furthermore, methodological experience from other countries appears to be an element that participants valued as it allowed comparison to the state in their school, for example, utilizing mobile devices during lessons as the practice is not widespread in Lithuania.

Lastly, as some participants noted, while the learning content is of high quality and provides valuable information and skills, since it heavily focuses on technology use, its application is limited if students show low computer literacy. The gap in computer literacy is more noticeable among different age groups, unsurprisingly, primary school children show the lowest skills, therefore the course has the lowest impact for teachers of such an audience.

5. DISCUSSION

So far, SDL-based learning for adults or other educators show promising results. While the pandemic-induced need for flexibility indeed resulted in increased interest in such a learning approach, current results and a high satisfaction rate indicate that in general, adult learners are highly interested in learning this way. While minor changes and updates are necessary, it is an inevitable part of the course development process, the key point being the remaining need for flexible, well-structured courses for further professional development.

REFERENCES

1. Pitikoe, S., Ilongo, F. N., & Mavimbela, H. (2021). Sinking or swimming?: The role of Moodle in promoting self-directed learning at the University of Eswatini. In *Re-Envisioning and restructuring blended learning for underprivileged communities* (pp. 204-224). IGI Global.
2. Tang, Y. M., Chen, P. C., Law, K. M., Wu, C. H., Lau, Y. Y., Guan, J., ... & Ho, G. T. (2021). Comparative analysis of Student's live online learning readiness during the

coronavirus (COVID-19) pandemic in the higher education sector. *Computers & education*, *168*, 104211.

3. Brookfield, S. D. (2009). Self-directed learning. In *International handbook of education for the changing world of work* (pp. 2615-2627). Springer, Dordrecht.

4. Hiemstra, R. (1994). Self-directed learning.

5. Geng, S., Law, K. M., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. *International Journal of Educational Technology in Higher Education*, *16*(1), 1-22.

6. Wong, F. M. F., Tang, A. C. Y., & Cheng, W. L. S. (2021). Factors associated with self-directed learning among undergraduate nursing students: *A systematic review. Nurse Education Today, 104*, 104998.

7. Tekkol, İ. A., & Demirel, M. (2018). An investigation of self-directed learning skills of undergraduate students. *Frontiers in psychology*, 2324.

8. Lai, C., & Zheng, D. (2018). Self-directed use of mobile devices for language learning beyond the classroom. *ReCALL*, *3*0(3), 299-318.

9. Geng, S., Law, K. M., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. *International Journal of Educational Technology in Higher Education*, *16*(1), 1-22.

10. Zhu, M., Bonk, C. J., & Doo, M. Y. (2020). Self-directed learning in MOOCs: Exploring the relationships among motivation, self-monitoring, and self-management. *Educational Technology Research and Development*, 68, 2073-2093.

11. Robinson, J. D., & Persky, A. M. (2020). Developing self-directed learners. *American Journal of Pharmaceutical Education*, *84*(3).

12. Kohan, N., Arabshahi, K. S., Mojtahedzadeh, R., Abbaszadeh, A., Rakhshani, T., & Emami, A. (2017). Self-directed learning barriers in a virtual environment: a qualitative study. *Journal of advances in medical education & professionalism*, *5*(3), 116.

13. Noh, G. O., & Kim, D. H. (2019). Effectiveness of a self-directed learning program using blended coaching among nursing students in clinical practice: a quasi-experimental research design. *BMC Medical Education*, 19(1), 1-8.

14. Morris, T. H., & Rohs, M. (2021). The potential for digital technology to support self-directed learning in formal education of children: A scoping review. *Interactive learning environments*, 1-14.

15. Kaufman, D. M. (2018). Teaching and learning in medical education: how theory can inform practice. *Understanding medical education: evidence, theory, and practice*, 37-69.

POSSIBILITIES OF DEVELOPING STUDENTS' LINGUISTIC COMPETENCE IN A VIRTUAL LANGUAGE LABORATORY

Sandra Grinkoviene[1], Vitalija Jakstiene[2]

[1] *Klaipeda Simon Dach Progymnasium, Lithuania*
[2] *Kaunas University of Technology, Lithuania*

Abstract. Linguistic competence is a necessary component of living and working in a modern society. As the need to learn foreign languages grows, the development of pupils' communication linguistic competence at school becomes important. The article analyzes the problem of using a virtual language laboratory for foreign language teaching. When solving the problem, communication linguistic competence and its improvement at school are discussed. The results of the teachers' survey are presented, revealing the attitudes of the survey participants towards the use of virtual language laboratories. The methodology for applying a virtual language laboratory to develop student linguistic competences is presented.
Keywords: Linguistic Competence, Virtual Language Laboratory, Teaching English, Communication Competence.

1.   INTRODUCTION

In our daily lives, communication processes are relevant in almost all situations. Linguistic competence is the basis for a successful life in our society as it is essential for all areas of life. Language teaching and learning is a complex process involving both a teacher and a learner. The main focus of foreign language teaching is a communicative branch. The ability to communicate is one of the most important human competences, the main objective which is to use a foreign language in real life situations.

The usage of active learning methods enables the development of communication competence. Students' communication with each other and with the teacher is relevant. The teacher faces the challenge of how to organize the learning process when there are many students in the class and the class time is limited.

Language learning issues are widely discussed in the research literature. Gupta (2019) analyzes the principles of creating a language learning environment and highlights the role of the teacher in the success of students' learning. The importance of the social context in learning a foreign language is emphasized by Marlina (2022), Tarango & Machin-Mastromatteo (2017), etc. Relevant linguistic competences and skills and their development are analyzed by Moore (2020), Ullauri Moreno & Machado Cevallos (2017), Hartley (2007), etc.

The usage of virtual learning tools enables a greater variety of learning methods and opens up new learning opportunities. Harris (2020) raises the question of the integration of language learning and digital literacy education in adult education. Kublickienė et al. (2021) presents the scenarios and advantages of using one of the communication platforms for learning English oral interaction at school. There are various virtual learning environments and tools that can be applied to language learning. The possibility for learners to communicate online through their avatars in a 3D simulation space, using of Web 2.0, social networking, mobile learning are discussed (Bowwer, 2017). However, the question arises as

to the possibilities of using virtual language laboratories for language learning and especially for developing linguistic competence.

The aim of this research is to analyze the possibilities of developing students' linguistic competence of English in a virtual language laboratory.

Research methods: analysis of scientific literature, written survey, statistical data analysis.

2. COMMUNICATIVE LINGUISTIC COMPETENCES AND THEIR DEVELOPMENT AT SCHOOL

Linguistic competence is usually defined as the ability to produce coherent sentences. Marlina (2022), Tarnago & Machin-Mastromatteo (2017) argues that linguistic competence includes not only language proficiency, but also the ability to convey information in the right context and includes sociocultural knowledge that enables speakers to use and understand different forms of language. In the curricula and educational standards, linguistic competence is defined as the ability of an individual to create, communicate and understand knowledge using verbal and non-verbal tools and technologies. According Ullauri Moreno & Machado Cevallos (2017), linguistic competence focuses on phonetics, grammar and vocabulary that together constitute a language. Developing linguistic competence requires the knowledge and correct use of language structures, a wide vocabulary, an understanding of the functioning of language, and an appreciation of the essential features of language as a system of communication media (Council of Europe, 2020). Linguistic competence is a part of communicative linguistic competence, which consists of: linguistic competence, sociolinguistic competence and pragmatic competence (Council of Europe, 2020).

Sociolinguistic competence is developed by learning to use language in situations, because learning is a social activity, a major part of which is communication. Students learn from the teacher and from each other, sharing experiences, exchanging opinions, debating. The development of pragmatic competence involves the appropriate and purposeful use of language in oral and written communication situations (Council of Europe, 2020). It is the teacher's responsibility to help students to explore different ways of communication and to choose the most appropriate ones, linking learning activities to students' individual experiences and different contexts (domestic, social, cultural).

By developing linguistic competence, students have the opportunity to become familiar with language, its structure, distribution, norms, functions, style and means of linguistic expression, to learn vocabulary, pronunciation, accents and to acquire a general understanding of the functioning of language. Students are taught to use and interpret forms of language according to the situation, to understand and formulate coherent and clear spoken and written texts, and to use a variety of strategies to comprehend a text they are listening to or reading, to produce their own written or oral text (Archer & Hughes, 2011).

Listening is very important in foreign language learning and it is probably the most important activity for learning to speak, read and write. Teaching starts with listening tasks, in which students initially respond in non-verbal language until they feel able to speak a foreign language. The teaching of spoken language is more important than the teaching of

written language, but all four main language activities must be carried out in the classroom: speaking, listening, writing, and reading (Hartley, 2007).

In developing language skills, it is important that the learner is an active participant in the learning process and that the teacher's role is a partner, advisor or facilitator. This enables support to be provided according to the student's need. When a student is focused on learning goals, positive evaluation of achievement is sufficient motivation, but insecure students tend to seek encouraging feedback (Hattie & Timperley., 2007). Relationship between the teacher and students is one of the cooperation and openness, and learning environment is a place where a student feels safe and confident to express his/her opinions and is not afraid to make mistakes. The teacher's efforts are required to create a suitable language learning environment (Gupta, 2019). The best results are achieved when the teacher works with the students to create relevant language situations of interest to them, using a variety of materials and linguistic tools and a variety of learning approaches. Communication is seen not only as a learning goal but also as a mean to achieve personal goals. Thus, there is a question; which tools to use in enabling a learning environment and what is the attitude of teachers towards the application of the virtual laboratory for language learning.

3. A STUDY OF TEACHERS' ATTITUDES TOWARDS THE USE OF VIRTUAL LANGUAGE LABORATORY IN FOREIGN LANGUAGE TEACHING

The written survey method was used to conduct the research. The questionnaire consists of closed type questions. The first group of questions is intended to determine the work experience of the teachers participating in the study. The second group of questions aims to find out the participants' attitude towards the use of the virtual language laboratory for the development of linguistic competence.

The study was conducted in November 2021. Google Forms was used to submit the questionnaire. 22 foreign language teachers from different Lithuanian schools participated in the research. According to their answers, the participants were teachers of different foreign languages (English, German, Russian, Spanish, French, Chinese) with different work experience: 2 participants - less than 5 years, 2 – between 5 and 10 years, 6 – between 11 and 15 years, 4 – more than 15 years but less than 20 and 8 - more than 20 years of experience. Survey participants noted that they use various tools in foreign language classes (Fig. 1).
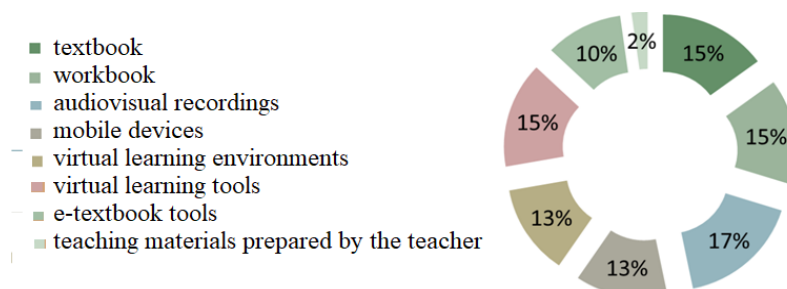
Figure 1. Percent of participants indicated they use resources in foreign language classes

When teachers were asked about the possibility of having a virtual language lab in their school, 16 teachers out of 22 said that they would like to have a virtual language lab in their school, while 8 did not think about it.

The distribution of answers to the question about the advantages of the virtual laboratory for the student is shown in fig. 2. 16 participants out of 22 noted that virtual language laboratory helps to develop linguistic competence and 18 - that it improves linguistic skills and pronunciation. Other advantages of virtual language laboratories are also noted, such as an increase in learning motivation (18 participants out of 22), the possibility to perform interactive tasks (18), learning according to one's abilities (13), less stress (13) and others.

Figure 2. Advantages of the virtual language laboratory and the percentage of participants who marked them

According to the results of the study, it can be said that the teachers who participated in the study have a positive attitude towards the use of the virtual language laboratory for the development of students' linguistic competence and skills.

4.   METHODOLOGY FOR APPLYING THE VIRTUAL LANGUAGE LABORATORY TO DEVELOP STUDENTS' LINGUISTIC COMPETENCES

After analyzing the possibilities of the virtual language laboratory, it can be said that it is a digital learning environment that allows the teacher to work simultaneously with the whole class, live discussion, get feedback, listen to recordings, observe, organize, present, group, display, review and collect audio, videos and online content. The teacher is enabled to train students' speaking, writing, reading and listening using virtual language laboratory. The ability to record student conversations allows the teacher to listen to the recordings, comment and give advice and remarks, and the students have the opportunity to listen to the recordings and hear their mistakes.

In order to purposefully use the possibilities of the virtual language laboratory, a methodology for the development of students' linguistic competences has been prepared (Fig. 3). The methodology includes active learning methods, forms of communication, educational content and recommended tasks according to lesson topics, set goals. The developed methodology emphasizes the creation of various new sources of information and

means of communication that enrich the learning environment, help to develop critical thinking skills, integrate interdisciplinary topics, apply active teaching methods, and highlight individual student's abilities in foreign language learning.
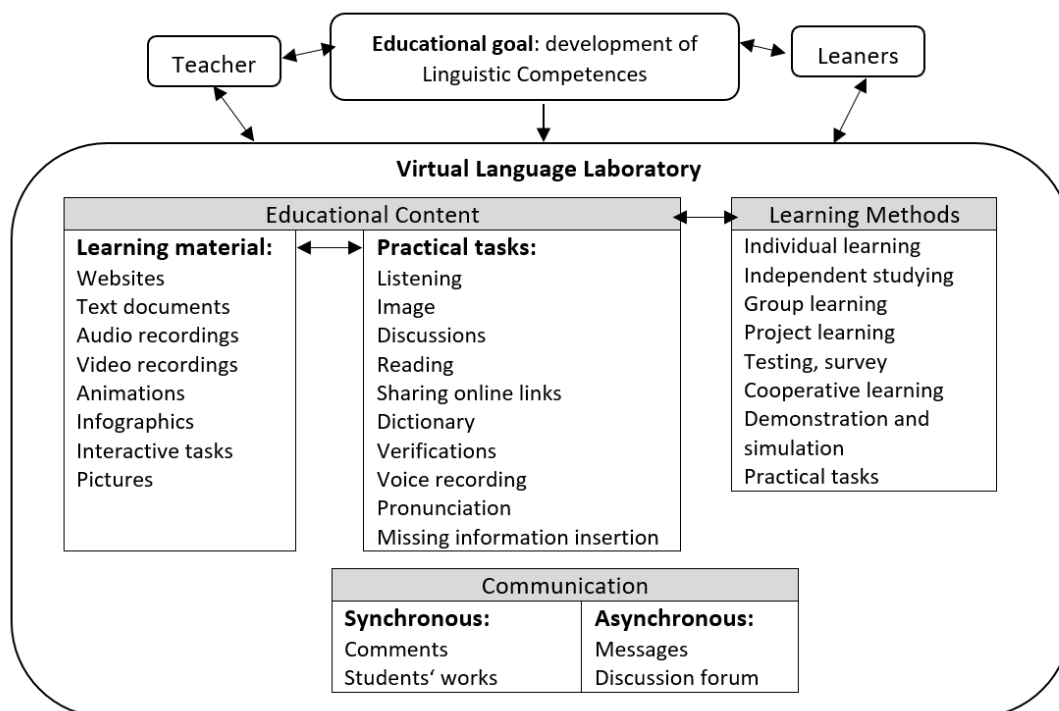
Figure 3. Development of students' linguistic competences using virtual language laboratory

Various tools of the virtual language laboratory are recommended: conference rooms, information search and communication tools, survey tools, questionnaires, interactive tasks, video exercises. When learning from different online platforms, the student has the opportunity to choose the learning method, the pace of learning that he/she likes, and actively participates in the learning process through practical activities. Imitation of real life situations that students recognize is important. This raises students' motivation to learn because they see the meaning of learning.

Conversation is important for developing linguistic competence. Students form pairs and talk to each other using headphones, microphones and the Internet, allowing all students to work simultaneously. Conversations are recorded. After listening to the conversations, the teacher advises and comments. Students hear their mistakes. Communication takes place both synchronously and asynchronously, depending on the task.

The use of a language laboratory includes flexibility and convenience for the learner, greater flexibility in adapting tasks to the learner's needs, and greater variety in the use of multimedia and non-verbal delivery of learning materials.

The developed methodology is implemented in the Sanako virtual laboratory and tested with 5th grade students to learn English. The next steps are to improve this methodology and supplement it with more tasks, as well as to expand it by applying it to students of different classes.

5.   CONCLUSIONS

Developing linguistic competence requires the knowledge and correct use of language structures, a wide vocabulary, an understanding of the functioning of language, and an appreciation of the essential features of language as a system of communication media (Council of Europe, 2020). Linguistic competence is a part of communicative language competence, which consists of: linguistic competence, sociolinguistic competence and pragmatic competence (Council of Europe, 2020). Emphasis is placed on the use of language in various situations and written or oral communication.

The teaching of spoken language is more important than the teaching of written language, but all four main language activities must be carried out in the classroom: speaking, listening, writing, and reading (Hartley, 2007). Achieving good learning results requires a cooperative and open relationship between the teacher and the students, as well as a learning environment where the student feels safe and confident.

According to the results of the survey, the participants have different work experience, but all of them use various virtual tools. 16 teachers out of 22 noted that they would like to have a virtual language lab in their school, while 8 did not think about it. They pointed out the advantages of the virtual laboratory, such as greater attention to the development of linguistic competence, improvement of linguistic skills and pronunciation, etc.

The methodology of developing students' linguistic competences using the virtual language laboratory includes active learning methods, forms of communication, educational content and recommended tasks according to lesson topics, set goals. The methodology emphasizes the creation of various new sources of information and means of communication tools that enrich the learning environment help to develop critical thinking skills integrate interdisciplinary topics, apply active teaching methods, and highlight individual student abilities. The ability to record students' conversations allows all students to work simultaneously and receive feedback from the teacher and/or learn from their mistakes. The usage of a language laboratory includes flexibility and convenience for the learners and teacher and provides more opportunities than learning in the classroom.

REFERENCES

1. Archer, A. L. & Hughes C. A. (2011). Explicit Instruction: Effective and Efficient Teaching. The Guilford Press.
2. Bower, M. (2017). Design of Technology-Enhanced Learning: Integrating Research and Practice. Emerald Publishing.
3. Council of Europe (2020), Common European Framework of Reference for Languages: Learning, teaching, assessment – Companion volume, Council of Europe Publishing, Strasbourg, available at www.coe.int/lang-cefr.
4. Gupta, A. (2019). Principles and Practices of Teaching English Language Learners. International Education Studies 12(7), available at https://doi.org/10.5539/ies.v12n7p49.

5. Harris, K. (2020). Digital Literacy and Adult English Learners. The TESOL Encyclopedia of English Language Teaching, available at https://doi.org/10.1002/9781118784235.eelt0991.
6. Hartley, J. (2007). Reading, Writing, Speaking and Listening: Perspectives in Applied Linguistics. Applied Linguistics, 28(2), 316-320.
7. Hattie, J., & Timperley, H. (2007). The Power of Feedback. Review of Educational Research, 77(1), 81–112.
8. Kublickienė, G., Kublickas, G. & Jakštienė, V. (2021). Anglų kalbos sąveikos bei interakcijos žodžiu mokymosi galimybės Microsoft Teams aplinkoje. ALTA'21: Advance learning technologies and applications: from distance to hybrid learning: learning practices on / for time: conference proceedings, 1st of December, 2021.
9. Marlina, R. (2022). Changing Principles and Practices in Teaching Language. Teaching English as an International Language. Pedagogy, available at https://doi.org/10.1002/9781118784235.eelt0665.pub2.
10. Moore, E. (2020). Competence, Communicative and Linguistic. The International Encyclopedia of Linguistic Anthropology, available at https://doi.org/10.1002/9781118786093.iela0070.
11. Tarango, J., & Machin-Mastromatteo, J. D. (2017). The New Profile of Information Professionals as Scientific Production and Communication Managers: Identification of Competences. In J. Tarango & J. D. Machin-Mastromatteo (Ed.), The Role of Information Professionals in the Knowledge Economy (pp. 71-101). Chandos Publishing. hightly.
12. Ullauri Moreno, M. I., & Machado Cevallos, L. A. (2017). Phonetics, Vocabulary and Spoken Grammar as Linguistic Barriers in Oral communication of English Language. EDU REVIEW. International Education and Learning Review / Revista Internacional De Educación Y Aprendizaje, 5(1), available at https://doi.org/10.37467/gka-revedu.v5.1325.

POST-PANDEMIC STUDIES - LESSONS LEARNED FROM DISTANCE LEARNING DURING THE COVID-19 PANDEMIC: STUDENT PERSPECTIVES

Edita Butrime, Nida Ambrase

SMK University of Applied Sciences, Lithuania

Abstract. The global pandemic has indeed made educational policy makers realize that complete reliance on face-to-face teaching can cause great chaos and disrupt educational activities during an emergency. The aim of this study is to discuss distance learning in a virtual learning environment (VLA) in the post-pandemic period from the students' perspective. Study participants (N=82) of distance studies during the post-pandemic period are second- and third-year students who have tried their studies during the pandemic and post-pandemic period. If the study content is presented in several adequate ways (recorded lecture, synopsis on slides), students can choose the most appropriate way to absorb information. This creates an opportunity for a larger number of students to learn comfortably.
Keywords: Virtual learning environment, virtual learning during the COVID-19 pandemic, virtual learning environment of university, post- pandemic period at university studies.

1.   INTRODUCTION

The global pandemic has indeed made educational policy makers realize that complete reliance on face-to-face teaching can cause great chaos and disrupt educational activities during an emergency. On the other hand, complete dependence on distance learning faces certain challenges and disadvantages (Zuzeviciute, 2021; Edge Foundation, 2020; Thomas, 2020; Coman et al., 2020; Aguilera-Hermida, 2020; Oyedotun, 2020). One of the main disadvantages of distance learning is that it can never replace the live human interaction with professors and students that face-to-face classroom instruction provides, despite the fact that it offers options such as video conferencing. As emphasized in Vygotsky's theory of social interaction and constructivism, human interaction is central to our social lives (Keshavarz, 2020; Larchelle, Bednarz, & Garrison, 1998; Moll, 2014).

Basilaia, Kvavadze (2020) argues that the research on the work of educational institutions during the COVID-19 pandemic is an important moment in the post-pandemic period. During a pandemic, case studies are being conducted that are "urgent". Now, an in-depth research are needed to assess the experiences of universities of different countries, and to improve distance education (Tsantopoulos et al., 2022; Zacharis, & Nikolopoulou, 2022; Masalimova et al., 2021; Rapanta et al., 2021). It is necessary to analyze the applied methods and improve them in further daily study practice.

The aim of this study is to discuss distance learning in a virtual learning environment (VLA) in the post-pandemic period from the students' perspective.
The objectives of the study are the following:
1. To discuss the use of forced innovation in studies during the COVID-19   pandemic.
2. To identify the change in studies during the post-pandemic period.

3. To answer the question whether the lessons/experiences should be integrated into the university studies after the pandemic.

Research methods applied in the study are the following: scientific literature analysis and written survey methods. An original questionnaire consisting of statements and an open question was constructed for the study. The article presents the analysis of students' answers to closed questions. Content analysis was applied for the analysis of the answers to the open question.

2.   STUDIES DURING THE COVID-19 PANDEMIC

For the past two decades universities were introducing opportunities presented by information communication technologies (ICT) to a varied degree. Though certain principles are the same, e.g., the information is being produced and shared, each organisation is a unique entity, however. Though each organisation has its own structure, also the traditions will be different, as will be the style of management, at the same time, in each organisation we will find people, structures, technologies (Abarius & Liubinas, 2014). On-line operation during the pandemic was essentially different from the gradual incorporation of on-line services into universities, therefore, it is legitimate to identify the conditions as extreme conditions. According to Hodges (2020) „moving instruction online can enable the flexibility of teaching and learning anywhere, anytime, but the speed with which this move to online instruction is expected to happen is unprecedented and staggering" (p. 2). Even before the pandemic universities had the necessary infrastructure and support personnel, who could have been relied on for supporting teachers for remote work. However, before the pandemic, only a part of teachers and students were seeking advice from support personnel, those in most cases were the teachers and students, enthusiastic about remote studies. Hence, we all experienced extreme conditions when during the extremely short time, having limited resources and not that many support personnel, we still had to teach teachers to transform from face-to-face teaching to remote work. Huang et al. (2020) summarizes the experience of the Spring 2020 in educational institutions. The authors highlight the flexibility of technology-based teaching/learning (flexible teaching/learning). Flexible teaching/learning is a collection of educational methods and systems designed to provide learners with greater choice, convenience, and customization. Foremost, flexible teaching/learning allows learners to choose where, when, and how teaching/learning takes place, using a variety of technologies to support the teaching/learning process (Lee, McLoughlin, 2010). In the context of the pandemic, flexibility has taken on a slightly different shade. In this case, it is possible to choose not the most attractive tools and methods for students, but to choose those tools and methods that, with the available technical conditions, could ensure smooth work with a huge number of remote students. Hodges et al. (2020) argue that 2020 remote work deserves a special event status and suggests the term for denoting it: emergency remote teaching (ERT). Authors argue that teachers had to cope with the heaviest workload because it was critical during an extremely short time to ensure access to both synchronous and asynchronous processes and contents for studies.

3. STUDIES DURING THE POST-PANDEMIC PERIOD

The term distance studies (online learning according to Rapanta et al., 2021) is widely used, but has various meanings, such as the following: remote learning, networked learning, eLearning, digital education, technology-enhanced learning, etc. (Banks et al., 2003; De Laat et al., 2007; Laurillard & Masterman 2010; Kirkwood & Price 2014; et al.). Acording Rapanta et al. (2021) "although ERT has little in common with online learning and teaching (OLT) and even less with Internet-based distance education, they share one common feature, which is teaching with digital technologies" (Rapanta et al., 2021; p. 716). ERT and OLT are defined differently, have different goals, different design processes, and different ways of delivering training (or integrating technology) (Xie & Rice, 2021; Rapanta et al., 2021). Xie & Rice (2021) revealed the attitudes of instructional designers in the post-pandemic period. The instructional designers who participated in the authors' research claim "that synergistic, hybrid models that used both synchronous and asynchronous formats and a variety of instructional tools were on the horizon" (Xie & Rice, 2021; p. 83).

Masalimova et al. (2021) propose that during the post-pandemic period "collaborative technologies are a new direction in the implementation of distance learning's hybrid format, which has become a priority due to the use of new means of telecommunications and human–machine interaction in the educational space of the university" (p. 392). The use of collaborative technologies in the implementation of a hybrid format of distance learning for students allows to eliminate the routine work of synchronizing workplaces from any supported devices – workstations, tablets, smartphones. Masalimova et al. (2021) distinguished 3 levels of implementation of collaborative technologies to support a hybrid distance teaching/learning format for university students:

1. The informational level. At this level, methodological assistance is provided to students. Special software is used for webinars.
2. The instrumental level. Free tools that are easy and quick to install are employed for work at this level. They are divided into universal technologies (Microsoft Office 365 Education and Google-G Suite for Education) and specialized technologies for creating artifacts (mind map creation, writing scientific papers, work with bibliography and citation, support for project management and other digital tools).
3. Responsibility for collaboration in the process of interaction between the teacher and students.

These levels are based on the theory of G. M. Moore (Moore, 1998), which explains the interaction between students and teachers, and the structure of the course, and how it affects the learning environment. Thus, it can be said that the theoretical basis is not new, but in the post-pandemic stage, its realization is based on the latest technologies. New technology-based teaching/learning environments create opportunities for students to learn new skills and also create engaging learning environments for students whose learning styles prevent them from succeeding in face-to-face learning environments.

Infante-Moro et al. (2021) state that most Spanish university professors did not use a videoconferencing tool before the pandemic. Infante-Moro et al. (2021) state that the application of the videoconferencing tool during the pandemic was a successful practice,

and analyze the possibilities for the application of the conferencing tools in the post-pandemic period. Infante-Moro et al. (2021) distinguished motivational factors that influenced the use of an innovative tool. It was observed that the factors that exerted the most influence were those that affected the character of the teaching staff toward videoconferencing (perceived compatibility, attitude and intention). On the other hand, trust and quality management had the least influence on the other factors because the safety and quality of these tools were not considered important (Infante-Moro et al., 2021).

Konkin at al. (2021) assess the perspectives and provide innovative predictions for the employment of distance learning systems at universities and colleges in the post-pandemic era. The authors claim that the prospects for using innovations of the pandemic period in post-pandemic higher education take place mainly in organizing the educational process in a hybrid (or a mixed) format, which involves the simultaneous use of traditional and innovative teaching methods and technologies (Konkin at al., 2021). The authors identify the following innovative educational technologies that emerged during the pandemic, and that are considered to be promising in the post-pandemic period: remote lectures; remote seminars using online whiteboards, online video conferences, virtual and augmented reality technologies; interactive online learning technologies; remote technologies for organizing the educational process. Traditional technologies that are appropriate to apply in a mixed model in the post-pandemic period are the following: personal consultations with a teacher; personal communication with a supervisor on student research papers; interactive practical classes, as well as a number of other technologies that are built on direct communication between students within a group or on communication between students and a teacher (Konkin at al., 2021). The authors emphasize (Konkin at al., 2021) that the implementation of innovative distance teaching/learning technologies in higher education institutions in the post-pandemic period should complement, but not exclude (eliminate or replace) the application of traditional teaching methods. It is especially important to preserve the face-to-face consultations with the teacher, the opportunity to meet with the teacher to discuss the preparation (writing) of students' research papers (abstracts, theses), and other forms of personal communication with students. Special attention must be paid to practical (laboratory, seminars, problem-based learning, etc.) works, i. e., they should be conducted face-to-face, and be based on direct communication between students in a group or with a teacher. Possible forms of conducting classes after the pandemic are the following:

- Hybrid teaching/learning, where the teacher works simultaneously with students who are in the audience and those who are at a distance (Beatty, 2007). This is not a new method, but it has been applied somewhat more widely in the post-pandemic period. However, this is an expensive method, as special equipment is required, i. e., a special microphone (catch box) and a special camera (Logitech SCRIBE Camera), a camera and microphone in one (OWL LABS). The teacher must be ready to work with this method, and this is a challenge for the teacher.
- In the HyFlex format (Hybrid + Flexible), where each student decide for themselves which parts of the course they choose remotely, and which are full-time, and to what extent (Miller et al., 2013).

- A flipped classroom model with recorded lectures (videos), in which each student receive their set of educational materials in the right order and study at their own pace, followed by face-to-face seminars or consultations in person or in groups (Bishop, 2013; Akçayır, & Akçayır, 2018; Tang et al., 2020). In this case, there are various ways of presenting educational material. They were widely used before the pandemic. However, during the pandemic, they had to be adjusted to the emergency situation. In the post-pandemic period, it is possible to analyze which of these (adjusted flipped classroom methods) are suitable for further application. A modified flipped classroom method was named by Mujtaba Asad et al. (2022) as adaptive learning, and they suggested an Adaptive Learning Platform to accommodate students individually, and quickly inform the instructor when students are struggling based on its data collection and dashboard capabilities.

Daumiller's et al. (2021) study conducted in Germany revealed the positive experiences of teachers who had little use of distance teaching/learning in their work before the pandemic, which was identified as perceived positive challenge and perceived usefulness for competence development.

In conclusion, it can be said that the experience of studying during the pandemic is multifaceted. It is caused by different needs of students, different experience of teachers, environmental conditions, taught subjects, etc.

4. STUDENT POST-PANDEMIC EXPERIENCE

When it comes to students, the results have also been controversial, and the results of the study revealed both negative and positive aspects of the transition of universities to ERT. Despite the measures applied by higher education institutions, the Covid-19 emergency situation had an impact on students' learning difficulties or withdrawal from their studies. The lack of physical contact, the reduction of social interaction, and the negative emotions caused by the pandemic (fear, sadness, uncertainty, etc.) affected students' daily habits (sleeping, eating, watching TV, etc.). Changes in students' environment and daily life are related to students' learning process (Aguilera-Hermida, 2020; Walec et al. 2021; Butrime, E., & Zuzeviciute, 2021, Urboniene et al., 2019). Oyedotun (2020) states that face-to-face assessment methods have been found to be inadequate during the emergency in 2020. The study of Daniels et al. (2021) found that students' achievement goals, engagement, and perceptions of success decreased significantly during an ERT semester, while their awareness of cheating increased (98 undergraduate students from different disciplines at Canadian universities participated in the study). A study by Aguilera-Hermida (2020) found that the transition to distance learning was an unpleasant experience for the majority of students in the study, who reported that online learning was more difficult and less motivating than face-to-face, mainly due to limited access to resources to complete assignments, and to the lack of interaction with instructors (270 North American university students participated in the study).

The positive aspects identified by different studies were not related to the learning experience, but to the fact that more time is spent at home and less time at university

(Butrime & Zuzeviciute, 2021). The studies of Daniels et al. (2021) and Aguilera-Hermida (2020) revealed that students' academic performance during the COVID-19 pandemic was worse compared to previous years. Iglesias-Pradas et al. (2021) compared the academic performance of Spanish telecommunications engineering students during the Covid-19 pandemic with the one of previous years. They found that the first year of the pandemic (2019-2020) saw a significant increase in student performance compared to the previous 2 years. They attribute this positive result to organizational factors, such as the high level of readiness of the educational institution in terms of technical infrastructure, the presence of informal communication channels between teachers and administrators, and the semi-decentralized structure of the institution, which allows teachers to quickly make decisions about the tools, designs and strategies employed. A quantitative study of 544 students in India showed a positive correlation between quality of instructor, course design, prompt feedback and students' expectation, on the one hand, and students' satisfaction and performance, on the other (Gopal et al.; 2021).

Australian students, like in many other countries, said they appreciated the increased ability to manage their time and the wider range of assessment methods available to them. They gave negative feedback on technological issues and lack of teachers' expertise in using digital instruments. There was evidence of improved academic performance (Martin, 2020). Studies conducted in Lithuania reveal similar needs of students, i. e., mixed studies are more convenient for students. According to the students' reflections, this is due to the convenience and attractiveness of such studies (in the right time and way, in the right place, in attractive forms), flexibility and variety of learning forms (listening to theoretical lectures directly remotely, if possible, initial or repeated viewing of recordings of remote contact lectures that have already taken place, conducting practical and/or partly theoretical lectures through direct contact (Advilonienė, 2022)). Students prefer to access the content of distance learning through various means, such as laptops, smartphones, tablets, and desktop computers. It is also important that the content of the study subject is adapted for reading, watching and listening to provide feedback, to interact with other students, to complete individual and group subject assignments and tests (Urboniene et al., 2019).

In summary, it can be stated that students, who had the experience distance learning during the pandemic, in the post-pandemic period are more inclined to mixed studies (face-to-face communication with teachers and other students is important for them); are more demanding about the quality of the content of distance studies; want to use laptops, smartphones, tablets and desktop computers in the process of distance studies.

5. RESEARCH: COLLEGE STUDENTS' ATTITUDES TOWARDS STUDIES DURING THE POST-PANDEMIC

Distance learning is based on the theory of G. M. Moore (Moore, 1998), which explains the interaction between students and teachers, and the structure of the course, and how it affects the learning environment. Distance learning is characterized by a transaction that occurs when a student and a teacher communicate in a virtual learning environment, and that communication may not occur at the same time. This results in unique patterns of

student and teacher behaviour (Nwanko, 2015). G. M. Moore's theory (Moore, 1998) distinguishes 3 types of interaction: student - teacher, student - learning content, and student - student.

Study participants of distance studies during the post-pandemic period are second- and third-year students who have tried their studies during the pandemic and post-pandemic period. Students of SMK High School were invited to participate in the study. The study sample is targeted. A convenience sample was used by inviting student volunteers to participate in the study. The study was conducted in the fall semester of 2022. N=82. Vilnius branch - 25, Kaunas branch - 52, Klaipėda branch - 5. 4th year - 1, 3rd year - 33, 2nd year - 49 students. 70.7 percent of the study participants are full-time, and 29.3 percent of students are of sessional studies (coming to the college once a month).

The students were asked the following question: While studying in VLE (Moodle), how many hours a day do you spend reading instructions and assignments? 42 percent of the students read the instructions from 0.5 to 1 hour. (Fig. 1). 3 students did not specify a time.
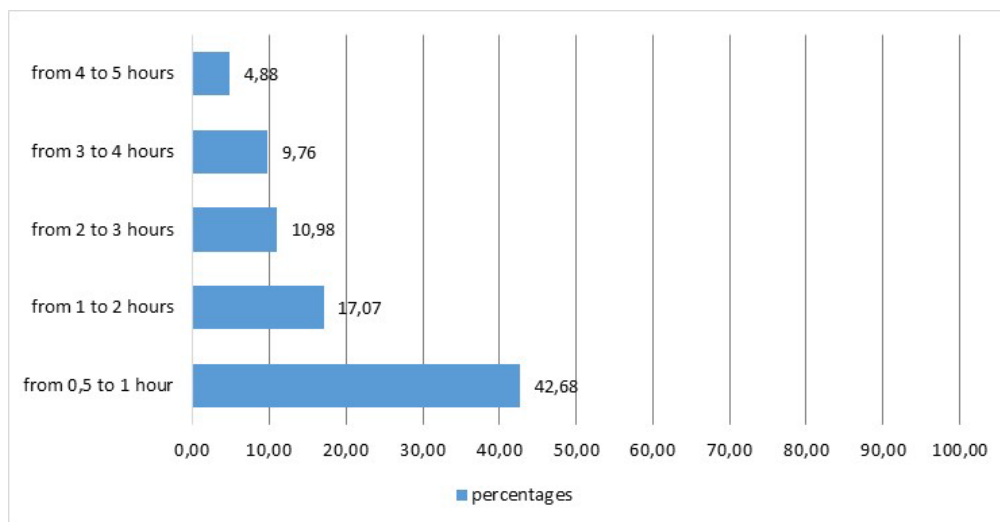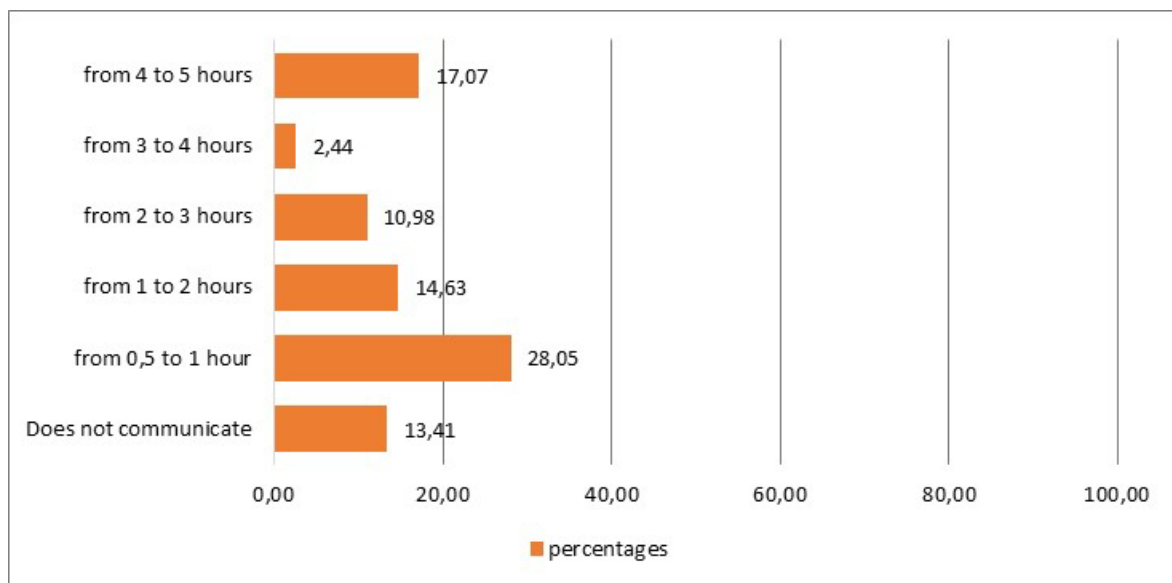

Figure 1. Time spent by the students for reading instructions and assignments. (Type of interaction: student vs learning content)

Others commented as follows: "About 1 hour because everything is written clearly", "Various. It depends on the tasks", "Each teacher presented the tasks differently, so whatever the task is, you read as much", "Very varied from 2 hours and more", "It's hard to say", "I don't know.", "...I didn't record it" "not much.. ."

The question "While studying in VLE (Moodle), how many hours do you spend communicating with the teacher?" turned out to be difficult for the students, because some understood it as lecture time, others as consultation time. 15 students (18.29%) indicated that they did not spend time communicating with the teacher at all. Others understood this question as lecture time and indicated the number of lecture hours. Other students commented: "In 1 lecture? Up to 10 minutes. In reality, it's a completely different level of communication...", "It depends on how clearly the teacher sets out the task that needs to be done. Sometimes there was no need for the teacher's consultation at all, because everything was clearly stated in the explanation of how to complete the task...", "It was different,

sometimes it took 10 minutes, and sometimes it took 2 hours...", "We communicate during lectures, additional time is either not needed or lost to ask..." In conclusion, it can be said that students need to communicate with the teacher if they have questions or the task is not clearly formulated. Many students indicated that interaction with the teacher is lecture time. Type of interaction is student - learning content.

The question "While studying in VLE (Moodle), how many hours do you spend communicating with other students?" 13.41 percent of the students said that they no longer communicate with other students at all. Almost 30 percent of the students said that they communicate with other students from 0.5 to 1 hour. About 17 percent of the students said that they communicate with other students for more than five hours (Fig. 2).

Figure 2. Time spent by the students for inter-communication

Other students wrote the following comments: "...I communicate on other networks...", "... from 1 to 10 hours – depending on...", "...About 10 - 20 hours during the semester...", "...if we do group work it's quite a lot...", ""...little...", "...It's hard to say...".

In conclusion, it can be said that students willingly communicate with each other in VLE or social networks for learning purposes.

The students who took part in the survey say that they make good use of distance learning opportunities. 43.9 percent of students say the following: I think I spend exactly as much time as I need in VLE. The same number of students (43.9%) say they think they spend enough time in VLE.

Students appreciate the possibilities of distance learning. The students were presented with statements (Table 1), which they had to evaluate according to the LIkert scale: 5 - strongly agree, 4 - agree, 3 - cannot answer (no opinion), 2 - disagree, 1 - strongly disagree.

Statement	Evaluation according to Likert scale
I feel good when I can access VLE (Moodle) and the study material published there with the help of a computer.	4.63
The content of distance courses (Moodle) (materials for lectures, seminars and exercises) is well prepared.	4.15
The methods of content presentation in the VLE (Moodle) meet my expectations.	4.13
The interaction with other students online during distance studies in the Moodle meets my expectations.	4.12
The activities and discussions in VLE (Moodle, GoogleMeet) meets my expectations.	4.10
The interaction between the student and teacher during distance learning (Moodle, GoogleMeet) meets my expectations.	4.06
Distance studies (Moodle) at present (2022/2023) meet my expectations.	3.93

The students who participated in the survey evaluate distance studies positively. Three interaction types according to G. M. Moore (1998) were evaluated positively: student - learning content (4.15), student – student (4.12), and student – teacher (4.06). All the interaction types were evaluated similarly.

The students were asked the following open question: "Write what is important to you in distance studies". A total of 47 students who participated in the study wrote their reflections. One student said that distance studies are completely unacceptable to him: "…distance studies are a big mistake for those who want to learn something, because you don't pay as much attention as during a live lecture. You can't concentrate, sometimes you're late or don't come to the lecture, because you think you won't have anything interesting said…".

The following are the most important aspects of distance studies for students:

1. Quality of the prepared distance course content. The students' answers show that this is the most important aspect (23 statements): "…there are wonderful teachers who provide a lot of useful information…", "…a good microphone from the teacher's side and detailed teaching of the subject…", "…Quality and good lectures…", "…Clear and understandable study material…", "Everything was fine in the first year, in the second year [study EB] got worse because it was VERY relaxed, and in the third year it was a DISASTER.", <…> really interesting presentation of the material, that would willingly invite to participate in the lectures…".

2. The ways of distant communication (the ethics of remote communication) (12 statements): "…it is important to use cameras in distance studies and to promote attendance [remote EB]…", "…communication with teachers…", "…during GoogleMeet when a regular lecture is held, turning on the camera is not required (in my opinion, it does not change the productivity and feedback of students)…", "…Mutual respect

for time between teacher and student...", "...collaboration, understanding, ethics...", "...Discussion with others students and teacher...".

3. Quick feedback (6 statements): "...quick contact...", "...Good contact...", "Teacher and student contact. And not answers in 3 days. I'm not talking about all the teachers..."
4. The ability of teachers to work at a distance (5 statements): "...I would like all teachers to be able to engage and check that the person on the other side of the screen is actively listening...", "...quality and good delivery of lectures...", "...Good microphone from the teacher's half and detailed teaching of the subject...".
5. Flexibility of distance learning (4 statements): "...I can attend a lecture almost always...", "...Flexibility...", "...convenience, compatibility with work...".

Summing up the answers to the open question, it can be said that all three types of interaction are significant for the students according to G.M. Moor (1998) theory: student - learning content, student - teacher, and student - student. The quality of distance course content, the equipment employed (microphones, cameras, phones, tablets, computers), the ability of teachers to work remotely, and the flexibility of distance studies are also important for students.

CONCLUSIONS

1. Distance studies during the pandemic should be called emergency remote teaching (ERT) and learning, because it was necessary to choose those tools that were "at hand", the learning content was prepared by all the teachers, i.e., those who had experience and those for whom it was the first time. All students participated in distance studies: those who liked distance studies very much and those for whom it was completely unacceptable.
2. The purpose and method of organization of distance learning applied in the post-pandemic period is different from the emergency distance learning. In this case, the main goal is to apply the right tools, to prepare high-quality and attractive content for students.
3. Based on the scientific literature, online teaching/learning developers and providers analyze the emergency distant teaching/learning experience and, considering the needs of students, create mixed and hybrid courses. The experience gained allows not only to create higher quality online teaching/learning courses, but also to create suitable content for those students whose learning style is independent. It is also necessary to note that not all students can participate in face-to-face classes, but willingly study at a time acceptable to themselves, when the study content (theory, tasks, and self-analysis tests) is presented in VLE. If the study content is presented in several adequate ways (recorded lecture, synopsis on slides), students can choose the most appropriate way to absorb information. This creates an opportunity for a larger number of students to learn comfortably (face-to-face lectures are not suitable for everyone).

REFERENCES

1. Abarius, P., & Liubinas, V. (2014). Integration of electronic learning environment and academic information system. Electronic learning, information and communication: theory and practice, (1), 22-52.

2. Advilonienė, Ž. (2022). Prerequisites for the Integration of Face-to-Face and Distance Contact Teaching/Learning in Virtual Space in Higher Education at College and University Level: Students' Views and Experiences. Auditorinio ir nuotolinio kontaktinio mokymo (si) virtualioje erdvėje integravimo prielaidos aukštojo mokslo koleginiu ir universitetiniu lygmeniu: studentų požiūris ir patirtys. Pedagogika, 147(3), 58-80.

3. Aguilera-Hermida A. P. (2020) College students' use and acceptance of emergency online learning due to COVID-19. International Journal of Educational Research Open. 1 (2020) 100011. Elsevier. https://doi.org/10.1016/j.ijedro.2020.100011.

4. Akçayır, G., & Akçayır, M. (2018). The flipped classroom: A review of its advantages and challenges. Computers & Education, 126, 334-345.

5. Beatty, B. (2007, June). Transitioning to an online world: Using HyFlex courses to bridge the gap. In EdMedia+ Innovate Learning (pp. 2701-2706). Association for the Advancement of Computing in Education (AACE).

6. Bishop, J., & Verleger, M. A. (2013, June). The flipped classroom: A survey of the research. In 2013 ASEE Annual Conference & Exposition (pp. 23-1200).

7. Butrime, E., & Zuzeviciute, V. (2021). Online Studies in Higher Education during the COVID-19 Pandemic: Students' Perspective. International Association for Development of the Information Society.

8. Clark, R. M., Kaw, A. K., & Braga Gomes, R. (2022). Adaptive learning: Helpful to the flipped classroom in the online environment of COVID?. Computer Applications in Engineering Education, 30(2), 517-531.

9. Coman C., Tiru L., G., Mesesan-Schmitz L., Stanciu C., & Bularca M., C. (2020). Online Teaching and Learning in Higher Education during the Coronavirus Pandemic: Students' Perspective. Sustainability 2020, 12, 10367; doi:10.3390/su122410367.

10. Daniels, L. M., Goegan, L. D., & Parker, P. C. (2021). The impact of COVID-19 triggered changes toinstruction and assessment on university students' self-reported motivation, engagement and perceptions. Social Psychology of Education, 24(1), 299-318. https:// doi. org/ 10. 1007/ s11218- 021- 09612-3.

11. Daumiller, M., Rinas, R., Hein, J., Janke, S., Dickhäuser, O., & Dresel, M. (2021). Shifting from face-to- face to online teaching during COVID-19: The role of university faculty achievement goals for attitudes towards this sudden change, and their relevance for burnout/engagement and student evaluations of teaching quality. Computers in Human Behavior, 118. https:// doi. org/ 10. 1016/j. chb. 2020. 106677.

12. Edge Foundation (2020). The Impact of Covid-19 on Education: evidence on the early impacts of lockdown. (Ed. by D. Dabbous, A. de Caires, K. Emms, A. Laczik, O. Newton) London: Edge Foundation.

13. Gopal, R., Singh, V., & Aggarwal, A. (2021). Impact of online classes on the satisfaction and performanceof students during the pandemic period of COVID 19. Education and Information Technologies. https:// doi. org/ 10. 1007/ s10639- 021- 10523-1.

14. Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020). The difference between emergency remote teaching and online learning. EDUCAUSE Review.

15. Huang, R. H., Liu, D. J., Tlili, A., Yang, J. F., Wang, H. H., et al. (2020). Handbook on Facilitating Flexible Learning During Educational Disruption: The Chinese Experience in Maintaining Undisrupted Learning in COVID-19 Outbreak. Beijing: Smart Learning Institute of Beijing Normal University.

16. Iglesias-Pradas, S., Hernández-García, Á., Chaparro-Peláez, J., & Prieto, J. L. (2021). Emergency remote teaching and students' academic performance in higher education during the COVID-19 pandemic: A case study. Computers in Human Behavior, 119. https:// doi. org/ 10. 1016/j. chb. 2021. 106713.

17. Infante-Moro, A., Infante-Moro, J. C., Gallardo-Pérez, J., & Luque-de la Rosa, A. (2021). Motivational Factors in the Use of Videoconferences to Carry out Tutorials in Spanish Universities in the Post-Pandemic Period. International Journal of Environmental Research and Public Health, 18(19), 10474.

18. Infante-Moro, A., Infante-Moro, J. C., Gallardo-Pérez, J., & Luque-de la Rosa, A. (2021). Motivational Factors in the Use of Videoconferences to Carry out Tutorials in Spanish Universities in the Post-Pandemic Period. International Journal of Environmental Research and Public Health, 18(19), 10474.

19. Keshavarz, M. H. (2020). A Proposed Model for Post-Pandemic Higher Education. Budapest International Research and Critics in Linguistics and Education (BirLE) Journal, 3(3), 1384-1391.

20. Konkin, A. A., Dronova, S. Y., Tretyakova, G. V., Bermudez-Alekina, A. E., & Kotenko, V. V. (2021). Prospects of using innovations in post-pandemic higher education. In SHS Web of Conferences (Vol. 127, p. 01001). EDP Sciences.

21. Lee, M. J. W., McLoughlin, C. (2010). Beyond distance and time constraints: Applying social networking tools and Web 2.0 approaches to distance learning. In G. Veletsianos (Ed.), Emerging technologies in distance education (pp. 61–87). Edmonton, AB: Athabasca University Press.

22. Martin, L. (2020). Foundations for good practice: the student experience of online learning in Australian higher education during the COVID-19 pandemic. Canberra: TEQSA.

23. Masalimova, A. R., Ryazanova, E. L., Tararina, L. I., Sokolova, E. G., Ikrennikova, Y. B., Efimushkina, S. V., & Shulga, T. I. (2021). Distance Learning Hybrid Format for University Students in Post-Pandemic Perspective: Collaborative Technologies Aspect. Cypriot Journal of Educational Sciences, 16(1), 389-395.

24. Miller, J., Risser, M., & Griffiths, R. (2013). Student choice, instructor flexibility: Moving beyond the blended instructional model. Issues and trends in educational technology, 1(1), 8-24. doi: https://doi.org/10.2458/azu_itet_v1i1_16464.

25. Moore, G. M. (1989). The three Types of Interaction. American Journal of Distance Education, 3(2), 1-6.

26. Mujtaba Asad, M., Athar Ali, R., Churi, P., & Moreno-Guerrero, A. J. (2022). Impact of Flipped Classroom Approach on Students' Learning in Post-Pandemic: A Survey Research on Public Sector Schools. Education Research International, 2022.

27. Oyedotun T., D. (2020). Sudden change of pedagogy in education driven by COVID-19: Perspectives and evaluation from a developing country. Research in Globalization. 2 (2020) 100029. https://doi.org/10.1016/j.resglo.2020.100029.

28. Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2021). Balancing technology, pedagogy and the new normal: Post-pandemic challenges for higher education. Postdigital Science and Education, 3(3), 715-742.

29. Tang, T., Abuhmaid, A. M., Olaimat, M., Oudat, D. M., Aldhaeebi, M., & Bamanger, E. (2020). Efficiency of flipped classroom with online-based teaching under COVID-19. Interactive Learning Environments, 1-12.

30. Thomas, C. J. (2020). Coronavirus and challenging times for education in developing countries. Washington DC. April 13 2000. Education Plus Development. https://www.brookings.edu/blog/education-plus-development/2020/04/13/coronavirus-and-challenging-times-for-education-in-developing-countries/.

31. Tsantopoulos, G., Karasmanaki, E., Ioannou, K., & Kapnia, M. (2022). Higher Education in a Post-Pandemic World. Education Sciences, 12(12), 856.

32. Urbonienė, J., Bartuševičienė, V., & Puidokaitė-Savickienė, R. (2019). Studijuojančiųjų poreikiai E. studijoms Lietuvos aukštosiose mokyklose. Įžvalgos, 71-86.

33. Walec, M., Michon, W., Surma, N., Rzaca, M., Nowicki, G. ir Slusarska, B. (2021). Impact of coronavirus outbreak events, perceptions of sense of safety and distance learning among college students during the COVID-19 pandemic. Kwartalnik Naukowy Fides Et Ratio, 47(3), 530-551. https://doi.org/10.34766/fetr.v47i3.843.

34. Xie, J., & Rice, M. F. (2021). Instructional designers' roles in emergency remote teaching during COVID-19. Distance Education, 42(1), 70-87. https:// doi. org/ 10. 1080/ 01587 919. 2020. 18695 26.

35. Zacharis, G., & Nikolopoulou, K. (2022). Factors predicting University students' behavioral intention to use eLearning platforms in the post-pandemic normal: an UTAUT2 approach with 'Learning Value'. Education and Information Technologies, 1-18.

36. Zuzevičiūtė, V. (2021). Memoirs of a higher education teacher, who survived two years of teaching during the covid pandemic. In ALTA'21. Pažangios mokymosi technologijos ir aplikacijos. Nuo nuotolinio iki hibridinio mokymosi. Konferencijos pranešimų medžiaga, 2021 m. gruodžio 1 d./edited by Danguole Rutkauskiene (pp. 145-153). Technologija.

LESSON LEARNT IN HEI TEACHING AFTER THE CORONAVIRUS PANDEMIC: THE SOULSS PROJECT

Marco Montanari[1,2], Fernando Martínez de Carnero[1], Mary Grammatikou[3], Dimitrios Pantazatos[3], Miguel Augusto Santos[4], Karolina Dostatnia[5], Gianluca Di Flumeri[1,6], Alberto Hernando[7]

[1] Sapienza University of Rome, Italy
[2] Casa Santa Rosa, Italy
[3] National Technical University of Athens, Greece
[4] inED, ESE, Polytechnic of Porto, Portugal
[5] Poznan Supercomputing and Networking Center, Poland
[6] BrainSigns, Italy
[7] Universidad Rey Juan Carlos, Spain

Abstract. As lockdowns ease and students return to campuses across Europe, it is becoming increasingly clear that the higher education landscape has shifted dramatically. HEIs provide flexible blends of synchronous, asynchronous, and face-to-face (f2f) instruction, enabling tertiary-level teachers and students to switch seamlessly between delivery options. It is crucial in the actual post-emergency situation to support teachers who need the training to design optimal combinations of different delivery modes that utilize the unique strengths and overcome the potential constraints of each method. Among the lessons learned from the emergency, the Universal Learning Design (UDL) principles are among the most important. The Erasmus+ project Scaffolding Online University Learning: Support Systems (SOULSS) envisages supporting teachers in implementing UDL in their teaching, considering new technologies and approaches.

Keywords: Universal Design of Learning - UDL, Inclusive higher Education Systems, Supporting Digital Capabilities, Stimulating Innovative Learning and Teaching Practices.

1. INTRODUCTION

One of the most critical aspects of the recent Coronavirus pandemic was its global impact in all the world. It was especially true in the formal aspects of citizens' life: governments worldwide adopted several strategies whose application was meaningful and general regarding public offices, especially public universities. The suspension of face-to-face lessons in higher education institutions was generalized worldwide and generally accepted by public opinion. It was different for primary education. In several countries, at least kindergartens stayed open, and most elementary schools followed after the first period of forced online education. The difference in the approach resulted from most political leaders and decision-makers thinking that adult people could easily switch to online learning. Some teachers considered this situation as an excellent opportunity to test online education in all subjects and involving a massive number of students (Sepulveda-Escobar & Morrison, 2020), while another part felt worried in front of this unexpected task that added stress factors to their situations (Ozamiz-Etxebarria et al., 2021). The latter study is a review, and it is interesting to underline as the results generally cover university teachers from all continents. Institutions worldwide tried to support professors in promoting the acquisition and application of new pedagogical approaches and technical skills, like the case of Brazil

(Gusso et al., 2020). However, each professor reacted differently depending on their attitude and experience (Teng & Wu, 2021; Alqabbani et al., 2021).

Generally speaking, it was not an error to consider higher education as an environment more ready to accept online learning than secondary and primary education. University professors could apply effective instructional strategies to guarantee course continuity (Mahmood, 2021), while primary school teachers could only do the same sometimes, primarily because of the difference in readiness of students and families to adapt to the new rules and educational ecosystems. For example, studies show that the passage from face-to-face to online was very punitive for students with disabilities in primary education (Montanari et al., 2021; Santos et al., 2022). Instead, university students' attitude toward e-learning was more positive because of the involved persons' maturity and capacity to have a peer-to-peer relationship with their instructors (Tejedor, 2020). Also, university professors were, in general, more ready to accept the new ecosystem in comparison to their colleagues from primary and secondary schools due to the different kinds of relations needed in class, so including blended courses in the future in university curricula has been suggested as a good option (Giovannella & Passarelli, 2020).

The future of university teaching is at a critical point: the pandemic emergency seems to be disappearing, but nobody knows the near future. The impact of the emergency has been huge on a teaching approach (Ojo & Lorenzini, 2021) but also in terms of psychological effects on professors themselves (Akour et al., 2020). The starting Erasmus+ Project Scaffolding Online University Learning: Support Systems (SOULSS) aims to contribute to the definition of a better strategy to scaffold university professors and students in their activities, focusing on one of the most valuable pedagogical framework in this field: the Universal Design of Learning (UDL).

2. THE UDL LEGACY

The universal design movement inspired the Universal Design for Learning concepts in architecture and product development, initially formulated by Ronald L. Mace at North Carolina State University. According to the Center for Universal Design (CUD), UD is "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." (Connell et al., 1997).

This definition can be modified. For example, to apply UD to teaching and learning activities, this basic definition can be modified to "the design of teaching and learning products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design."

Product developers, architects, and engineers at CUD established seven UD principles to consider in the design of any product or environment (Connell et al., 1997, cit in. Crow, 2007):

- Equitable Use,
- Flexibility in Use,
- Simple and Intuitive Use,
- Perceptible Information,

- Tolerance for Error,
- Low Physical Effort,
- Size and Space for Approach and Use.

Planning a lesson using the UDL framework is a process that requires a clear definition of four fundamental components: Goals; Assessments; Methods; Materials (Meyer et al., 2014). The UDL Cycle of instructional planning can be summarized in figure 1:
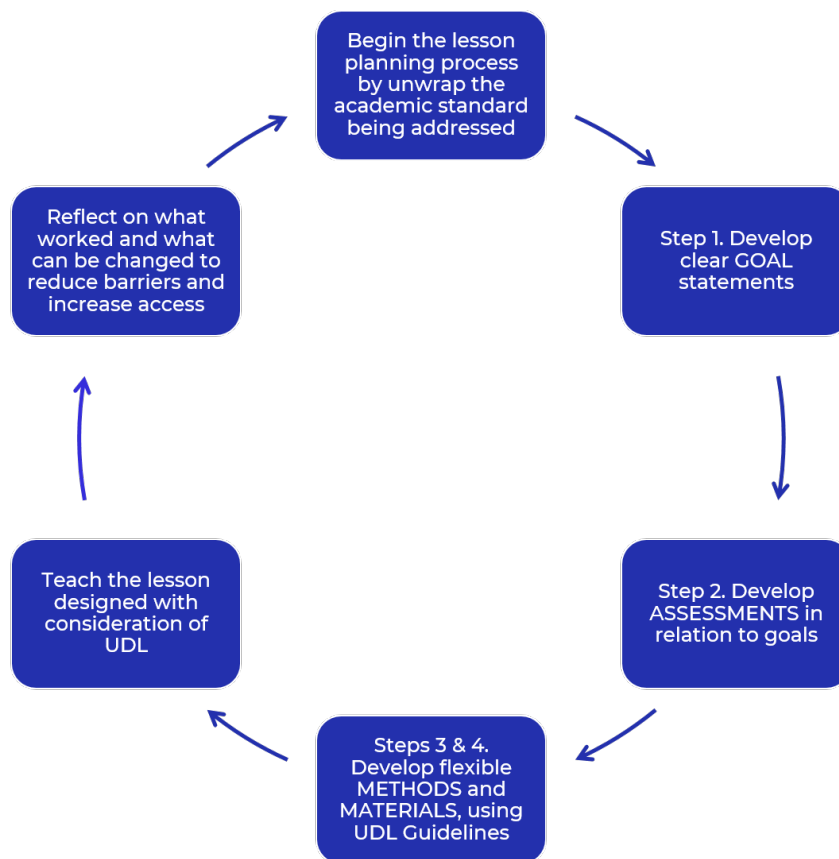
Figure 1. UDL Cycle of instructional planning (based on Rao & Meo, 2016)

UDL principles were previously examined and implemented by some project partners during the Erasmus+ project SUCCESS4ALL for primary and secondary schools focused on online support for students with special educational needs. The scope of this project, which ended at the beginning of 2023, was to provide guidelines and a self-paced online course based on Universal Design for Learning principles as well as an e-learning platform and a networking center that could support the work of teachers and caregivers whenever needed. During the project, a course dedicated to UDL was created to help school teachers implement the UDL principles in inclusive education. This course is available online at the SUCCESS4ALL homepage (SUCCESS UDL Course).

3. THE SOULSS PROJECT

The Erasmus+ Project SOULSS aims to help the diffusion of the UDL approach in the HEIs by creating and supporting dedicated digital self-paced learning courses. The project

intends to support higher education institutions in their digital transformation. During the last decades, several institutions created online learning material and Massive Open Online Courses (MOOCs), but their impact on the general public could have been more substantial. The outbreak of the COVID-19 crisis forced all higher education institutions (HEIs) to adopt online teaching on a scale never seen before. Now, as countries across Europe start to ease lockdown restrictions and prepare for 'the day after the pandemic,' three dramatic shifts in the higher education landscape can be seen:

Many students may now prefer the increased flexibility the blend of delivery options offers.

HEIs who started offering online courses when the pandemic began will continue to offer them to reach different student populations who cannot attend studies on campus.

The continued threat of other health-related crises and restrictions will require HEIs to increase their institutional resilience by enabling teachers and students to switch seamlessly between delivery options.

As a result of these shifts in the post-pandemic higher education landscape, many HEIs will now expect their educators to be able to design and deliver a range of flexible hybrid teaching and learning options. These new expectations will require educators to be able to 'think like an expert instructional designer,' adapt their pedagogy and re-design optimal blends of delivery options that support effective and inclusive instruction for all their students. Unless this training gap is filled, we assume that teachers who lack the additional expertise, skills, and attitudes to meet these new expectations will:

Tend to replicate their F2F courses instead of re-designing them to overcome the potential barriers and utilize the relative strengths of different delivery modes.

Directly affect the extent to which each student is included or remains excluded from developing their full learning potential.

Based on these assumptions, the SOULSS project will develop, pilot, and evaluate the impact of a training course to build teachers' capacity to design:

- inclusive UDL-based instruction,
- small interventions to keep on track at-risk students identified by an early warning system,
- optimal combinations of hybrid learning environments that utilize the strengths of different delivery modes.

Educational decision-makers represent the target group at different levels, such as policymakers, educational institutions, and teachers from different European countries. Moreover, all Higher Education stakeholders have been involved: students, teachers, and university staff. Students are the main target group of the project, an essential aspect of tertiary education nowadays.

More specifically, the project will implement a learning platform open for all HEIs with three newly created online MOOC-like learning units to provide them with a stable digital environment. The units will follow three paths:

- Innovative Technologies to gather feedback in Online Education,
- Innovative approach for Online Teaching,
- Universal Design of Learning.

In the first two years of the project life, partners will design and implement the platform and the learning units, while the last (third) year will be dedicated to testing activities in all HEIs involved in the project in several European countries such as Italy, Spain, Portugal, Greece, and Lithuania.

4.   CONCLUSIONS

During the last pandemic, Universities had to switch to flexible pedagogical models based primarily on online learning. UDL is the key to this approach as it provides a concrete framework for creating immersive courses, even for special education. The Erasmus+ project SOULSS aims to take advantage of this framework and from the experience that project partners have obtained from another European project focused on special education and the usage of UDL. SOULSS case is different as it is focused on tertiary education. The SOULSS project partnership believes UDL principles alongside solid evaluation mechanisms can help achieve the goal of disseminating innovative technologies and methods in the field of Higher Education.

REFERENCES

1. Akour, A., Al-Tammemi, A. B., Barakat, M., Kanj, R., Fakhouri, H. N., Malkawi, A., & Musleh, G. (2020). The Impact of the COVID-19 Pandemic and Emergency Distance Teaching on the Psychological Status of University Teachers: A Cross-Sectional Study in Jordan. The American Journal of Tropical Medicine and Hygiene, 103(6), 2391–2399. https://doi.org/10.4269/ajtmh.20-0877.
2. Alqabbani, S., Almuwais, A., Benajiba, N., & Almoayad, F. (2021). Readiness towards emergency shifting to remote learning during COVID-19 pandemic among university instructors. E-Learning and Digital Media, 18(5), 460–479. https://doi.org/10.1177/2042753020981651.
3. Connell, B. R., Jones, M., Mace, R., Mueller, J., Mulick, A., Ostroff, E., & Vanderheiden, G. (1997). Principles of universal design. Version 2.0. Raleigh, NC: North Carolina State University.
4. Crow, K. L. (2007). Universal Design Principles: An Overview. 2007 Annual Proceedings-Anaheim: Volume# 2, 99.
5. Giovannella, C., & Passarelli, M. (2020). The effects of the Covid-19 pandemic seen through the lens of the Italian university teachers and the comparison with school teachers' perspective. Interaction Design and Architecture(s), 46, 120–136. https://doi.org/10.55612/s-5002-046-006.
6. Gusso, H. L., Archer, A. B., Luiz, F. B., Sahão, F. T., Luca, G. G. de, Henklain, M. H. O., Panosso, M. G., Kienen, N., Beltramello, O., & Gonçalves, V. M. (2020). Ensino Superior em Tempos de Pandemia: Diretrizes à Gestão Universitária. Educação & Sociedade, 41, e238957. https://doi.org/10.1590/ES.238957.

7. Mahmood, S. (2021). Instructional Strategies for Online Teaching in COVID-19 Pandemic. Human Behavior and Emerging Technologies, 3(1), 199–203. https://doi.org/10.1002/hbe2.218.

8. Meyer, A., Rose, D. H., & Gordon, D. (2014). Universal design for learning: Theory and Practice. Wakefield, MA: CAST Professional Publishing.

9. Montanari, M., Santos, M. A., Third, A., Pellegrini, C., Prasauskiene, A., Lariccia, S., Grammatikou, M., & Pantazatos, D. (2021). Digital Learning for Students with Disabilities in Primary School: from the Management of the Pandemic Emergency Situation Towards a New Normality. INTED2021 Proceedings, 5429–5435. https://doi.org/10.21125/inted.2021.1104.

10. Ojo, E., & Lorenzini, E. (2021). Global Higher Education Beyond Pandemics in a Future of Uncertainties. Texto & Contexto - Enfermagem, 30, e20210101. https://doi.org/10.1590/1980-265X-tce-2021-0101.

11. Ozamiz-Etxebarria, N., Idoiaga Mondragon, N., Bueno-Notivol, J., Pérez-Moreno, M., & Santabárbara, J. (2021). Prevalence of Anxiety, Depression, and Stress among Teachers during the COVID-19 Pandemic: A Rapid Systematic Review with Meta-Analysis. Brain Sciences, 11(9), Art. 9. https://doi.org/10.3390/brainsci11091172.

12. Rao, K., & Meo, G. (2016). Using universal design for learning to design standards-based lessons. Sage Open, 6(4), 1-12.

13. Santos, S., Pantazatos, D., Grammatikou, M., Montanari, M., Virgili, I., Galeoto, G., Flocco, P., Bernabei, L., Prasauskiene, A., Bakaniene, I., Dominiak-Świgoń, M., & Meneses, M. (2022). Challenges of online learning for children with special educational needs and disabilities during the COVID-19 pandemic: A scoping review.

14. Sepulveda-Escobar, P., & Morrison, A. (2020). Online teaching placement during the COVID-19 pandemic in Chile: Challenges and opportunities. *European Journal of Teacher Education*, *43*(4), 587–607. https://doi.org/10.1080/02619768.2020.1820981.

15. SUCCESS UDL Course, available online at: https://learn.success4all.eu/course/view.php?id=49.

16. Tejedor, S., Cervi, L., Tusa, F., & Parola, A. (2020). Education in times of pandemic: Reflections of students and teachers on virtual university education in Spain, Italy, and Ecuador. Revista Latina de Comunicación Social, English Ed., 78, 1–21. https://doi.org/10.4185/RLCS-2020-1466.

17. Teng, M. F., & Wu, J. G. (2021). Tea or tears: Online teaching during the COVID-19 pandemic. Journal of Education for Teaching, 47(2), 290–292. https://doi.org/10.1080/02607476.2021.1886834.

DEVELOPING DIGITAL SKILLS IN GAMIFIED EDUCATIONAL PROGRAMS FOR ADULT LEARNERS

Rolanda Rimkeviciene

Kaunas University of Technology, Lithuania

Abstract. Today's possibilities of distance learning, virtual tools and online communication and collaboration allow learners to implement learning to overcome various time or location restraints. However, the lack of digital skills is one of the challenges that adults face trying to engage in life-long learning. Thus, the acquisition of digital skills often goes along with the process of distance learning. This article reviews research implemented to find out to what scale gamification is used in adult teaching programs and describes a case of a gamified learning program for adults presenting the influence of gamified activities related to the development of digital skills as well as responding to the other challenges of adult education.
Keywords: adult education, digital skills, gamification, educational programs.

1. INTRODUCTION

Life-long learning encourages adults to learn and develop their skills in order to ensure a level playing field in the competitive labour market and the ability to be active in modern society. Formal and informal education provides a variety of courses and educational programs and adults choose either to attend various educational institutions where they acquire formal degrees or choose private courses to improve their qualifications and skills needed for their labour market or simply consider learning as a free time activity.

However, learning can bring various challenges. As it was described in Lamanauskas and Makarskaitė-Perkevičienė (2021) research, many problems can be averted using distance learning, as it is more convenient to study this way, it is easier to keep the balance between studies, work and personal life. The same research states that various psychological problems are also minimised, moreover the possibility to develop digital skills was named as one of the benefits. Despite these findings, there remain certain difficulties in motivation and involvement. Celešienė and Kvieskienė (2016) point out that, "Gamification strategies are not yet acquired in educational practices and can help educators achieve their goals". The influence of gamification on learning and behavioural psychology was widely analysed by Yu-kai Chou (2019) in his book "Actionable Gamification" where he closely linked the usage of gamification elements to certain behaviour models. Nieto-Escamez and Roldan-Tapia (2021) analysed the integration of gamification into distance learning and the conclusions revealed that gamification can be easily used to improve student involvement and motivation, which supported similar research conducted by Saleem et al. (2020) where the emphasis was put on involvement through communication and collaboration.

Is gamification as well popular in adult education in Lithuania? And what is the attitude of educators to gamification when working with adults? What challenges do they face when applying gamification elements in their activities? The questions were answered during the conducted research. And the practical review of the gamified educational program showed

that combined with distance learning gamified programs can improve the digital skills of adult learners.

2. GAMIFICATION IN ADULT EDUCATION

2.1. Description of research methodology

44 respondents combined of adult educators and people working in the field of adult education formally or informally participated in this research. The majority of respondents work with adults in the area of informal education. The questionnaire was provided in Google forms. All in all, there were 17 questions asking for information related to the work peculiarities, adult education, gamification and gamification elements and their application, also the expectations for the implementation of gamified programs in adult education. Additionally, a group of 6 adult educators were interviewed more in detail, in order to find out what their experience of using gamification while working with adults is, what problems they face as professionals and what help they would like to receive.

2.2. Results and conclusions

The respondents were asked what the challenges that their adult students face in the process of learning are and the majority (Fig. 1) pointed out, that the most complicated things are to keep the balance between studies and personal life and also studies and work as answered 29 and 28 respondents respectively. Among other challenges, the lack of motivation (16 respondents), the lack of study skills (15 respondents) and digital skills (14 respondents) were mentioned. Respondents mentioned that some of these problems could be tackled by introducing the elements of gamification in the process of education.
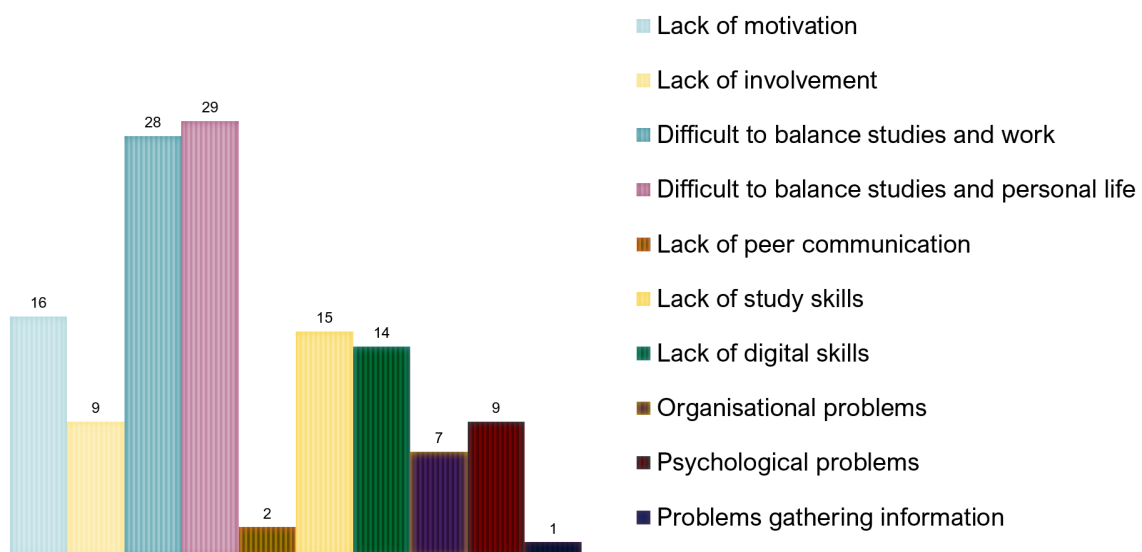

Figure 1. Learning challenges

Adult educators were asked about their opinion on gamification and what impact based on their opinion is made, when using gamification elements in the educational process (Fig. 2). Many respondents agreed that the impact is positive, bringing and keeping the interest of learners, making the process more enjoyable and also aimed at results.

Do you agree that gamification:
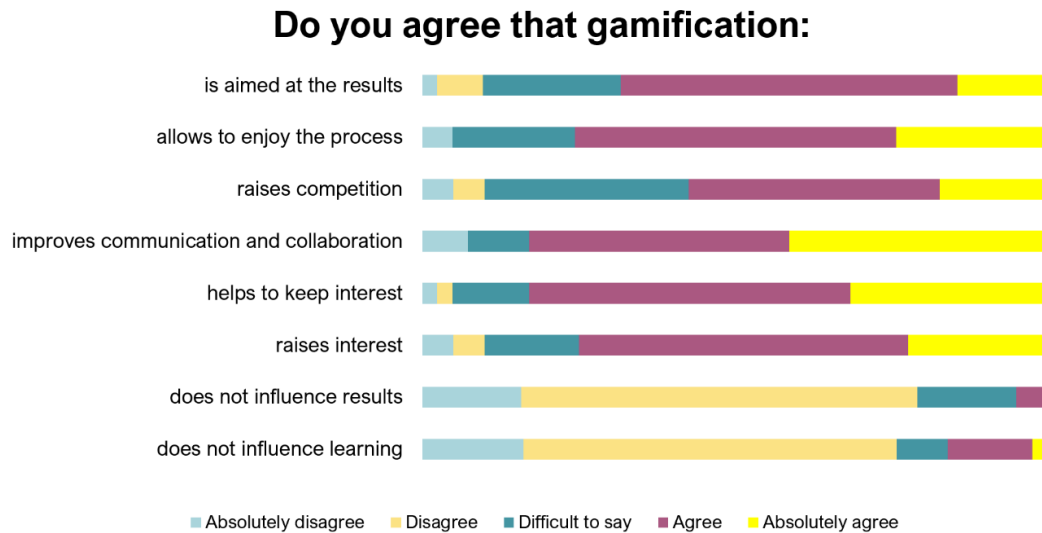
Figure 2. The impact of gamification

When asked what is needed in order to make the implementation of gamification elements of scenarios in the educational process (Fig. 3) the majority of the respondents named the versatility of use (26 answers), which was followed by the versatility of the developed competencies when using a certain element (23 respondents) and the elements being methodologically suitable for the educational subject (19 respondents).
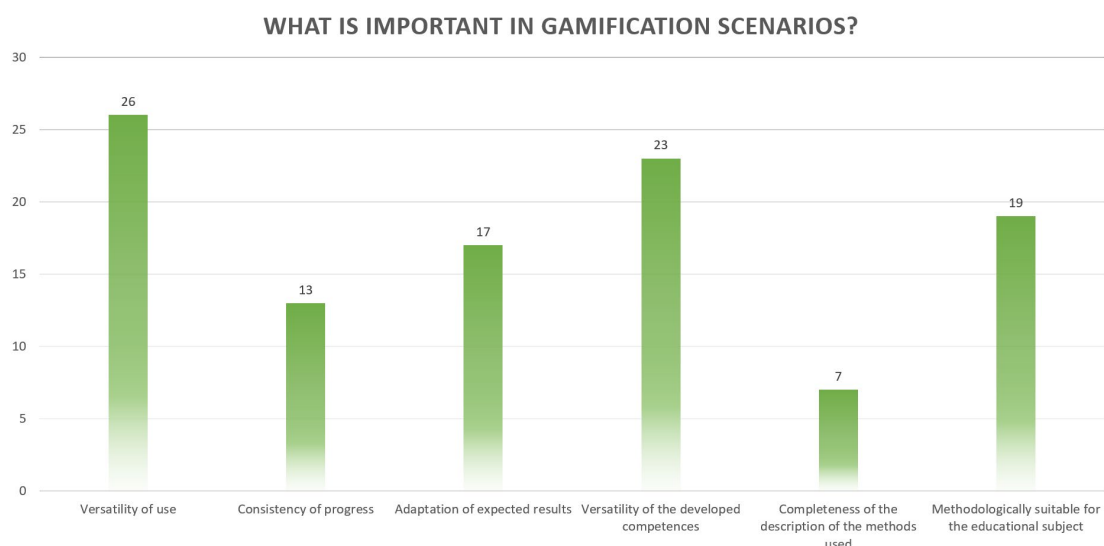
Figure 3. Aspects important in implementation gamification scenarios in the process of learning

During the follow-up interview educators also pointed out that there is a lack of support for educators working with adults in informal areas, such as museums, libraries, sports clubs, etc. The same respondents also stated, that though there is information on how to implement gamification elements in traditional education, such informal institutions providing various educational services lack it. Another important challenge is facing technical issues while using various online tools and also educating adult learners on how to use these tools, as some learners lack digital skills.

Summarizing the results of this research it can be stated that although understanding the impact of gamification on adult education, adult educators still face various problems and challenges, that make it difficult to use gamification elements in their work. Especially this is difficult in the institutions or organisations providing informal education, due to a lack of information and support and also due to problems from the side of learners.

3. THE CASE OF A GAMIFIED EDUCATION PROGRAM

As an example of a gamified educational program for adults, where along with the main subject adult learners develop their digital skills, the intense English language course "Hive" is reviewed. The course is provided online, providing material for various levels combining distance learning where the majority of activities are implemented in an asynchronous way, while some speaking activities are organised synchronously.

In Figure 1, pictures showing some implemented gamification elements are provided. The avatars for learners are used, which provide confidentiality and at the same time a possibility to compete with other learners by observing progress marking and monthly leaderboards.
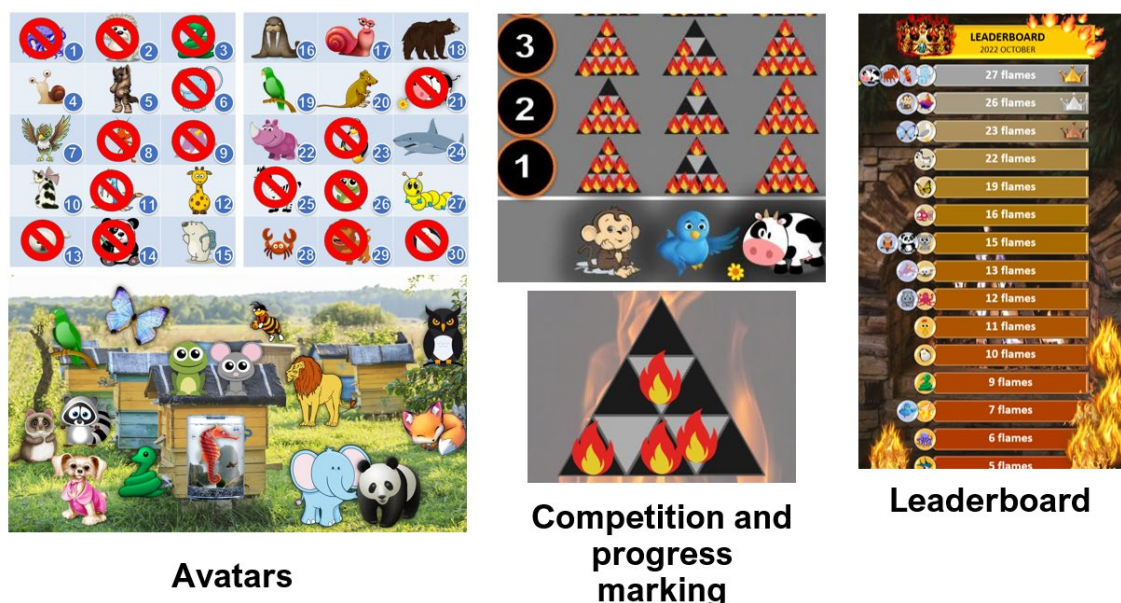

Avatars

Competition and progress marking

Leaderboard

Figure 5. Examples of gamification elements in a gamified education program

Along with the gamification elements implemented directly to learning activities (Fig. 6), there are also some educational games used (e.g. Wordle, Contexto, Semantle, Žodžiu) not only to practise language learning skills but also to increase engagement and encourage students to use various online tools for language learners, providing the guides how to use them in video material. This way the students get support while developing their digital skills.

WORDLE

CONTEXTO

SEMANTLE

ŽODŽIU

Figure 6. Integration of educational games

While learning online and participating in different activities, students learn to use various tools and programs in order to get the full benefit of the material provided. Therefore, the digital skills of the learners are improved. For the implementation of all educational processes, the following tools and programs are used:

- For communication and provision of support: email, FB messenger messages, Discord server messages, Dropbox, YouTube;
- For tasks: MS Word, MS PowerPoint, pdf readers, VLC player, mobile phone voice recorder, camera;
- Additional activities are implemented using Zoom meetings.

The course also provides support for the learners connected to course organisation and administration, the usage of needed programs and online tools, clarifying linguistic issues, and providing motivation and psychological support if needed. All this support is provided online and encourages learners to develop their digital skills while actively participating.

4. CONCLUSIONS

The research about gamification elements used by adult educators in Lithuania and its results were presented, as well a case of gamified education program was reviewed. The following can be concluded:

1. Adult learners face different problems while learning, the main of them being difficulties in keeping the balance among studies, work and personal life, lack of motivation and engagement, and a lack of digital skills, which are needed in distance learning.

2. The use of gamification elements by adult educators allows learners to tackle some of the problems mentioned above.
3. The lack of support for adult educators when implementing gamification elements, especially in informal education and related to technical usage of needed tools and being in need of specific information, because of a specific subject, raises challenges.
4. The reviewed gamified educational program provided an example of how gamification can be integrated into learning activities and the support and material provided online encourage learners to develop their digital skills along with language learning.
5. Using distance learning for self-development, due to the specific way in which learning material is provided, learners learn how to use various programs and tools, which help them learn and thus improve their digital skills.

REFERENCES

1. Bhatt, A., & Chakrabarti, A. (2022). Gamification of design thinking: A way to enhance effectiveness of learning. AI EDAM, 36, E29. doi:10.1017/S0890060422000154.
2. Celiešienė, E., & Kvieskienė, G. (2016). Žaidybinimo ir sumaniosios edukacijos sąsajos. Socialinis ugdymas, 44(3).
3. Chou, Y. K. (2019). Actionable gamification: Beyond points, badges, and leaderboards. Packt Publishing Ltd.
4. Contexto. (n.d.). https://contexto.me/.
5. HIVE course description https://rolanda.lt/hive/.
6. HIVE Discord Server (n.d.). Discord. https://discord.com/invite/YV4s28Dw.
7. Lamanauskas, V., & Makarskaitė-Petkevičienė, R. (2021). Distance Lectures in University Studies: Advantages, Disadvantages, Improvement. Contemporary Educational Technology, 13(3), ep309. https://doi.org/10.30935/cedtech/10887.
8. Nieto-Escamez, F. A., & Roldán-Tapia, M. D. (2021). Gamification as online teaching strategy during COVID-19: A mini-review. Frontiers in Psychology, 12, 648552.
9. Saleem, A. N., Noori, N. M., & Ozdamli, F. (2022). Gamification applications in E-learning: A literature review. Technology, Knowledge and Learning, 27(1), 139-159.
10. Semantle. (n.d.). https://semantle.com/.
11. Wordle. (n.d.). https://www.nytimes.com/games/wordle/index.html.

CHALLENGES AND OPPORTUNITIES OF USING ARTIFICIAL INTELLIGENCE IN EDUCATION: TEACHERS' POINT OF VIEW

Algirdas Litvinas

Kaunas University of Technology, Faculty of Informatics, Lithuania, Kaunas

Abstract. The development of artificial intelligence technology is very fast, covering daily activities, work and more. Education is no exception. Since teachers are the persons on whom the organization and success of the educational process depends, this article analyzes the teachers' attitude towards the opportunities and challenges of AI technologies in education. In order to achieve this goal, an empirical study was conducted - a survey in which 203 pedagogues participated. Based on the research data, there is a favorable attitude of teachers towards AI technologies, therefore it is necessary to expand their application in education.
Keywords: Artificial intelligence, education, teachers, technology.

1. INTRODUCTION

Due to the rapid development of technology, digital solutions occupy more and more of everyday life, and education is no exception. Solutions such as distance learning technologies are already commonplace. As the availability, applicability and capabilities of technologies increase, even more advanced solutions are being sought to simplify education and make it more effective. One such solution is artificial intelligence (AI). AI technology in education can be used in many ways, such as enabling more personalized, flexible, inclusive learning; automated learning, perform tasks such as automatic assessment and feedback (Batuchina et al., 2022). Despite these advantages of AI, the development of such technologies is contested, arguing that the excessive use of technology can negatively affect the formation of students, it can create many challenges for teachers who will find it difficult to adapt to new teaching methods, etc. (Tao et al., 2019). So, the question arises - can AI technologies be successfully used in education?

It is recognized that when analyzing the opportunities of using AI in education, it is appropriate to analyze the attitude of teachers, since they play a key role in organizing education (Polak et al., 2022), so whether AI technologies would be used in education and how they would be used depends on their preparation and attitude towards AI technologies.

The purpose of this study is to investigate teachers' opinions about the challenges and opportunities of using AI technologies in education.

2. THEORETICAL BACKGROUND

Artificial intelligence (AI) technologies can be diverse and used in various fields: science, business, etc., because it is a powerful information management tool that not only collects and processes information, but also predicts and learns from data based on it (Diwaker et al., 2021). AI is the ability of a computer-controlled device to perform tasks similar to what a

human does: reasoning, creating meaning, generalizing, learning from experience (Pedro et al., 2019).

Batuchina et al. (2022) identified the following AI technologies that can be used in education:

- *intelligent tutoring systems* (this is a system that imitates human learning, the artificial intelligence teacher diagnoses the motivation and knowledge of his students, individualizes the selected teaching/learning activities, and aims to make the tasks meet the needs of his students).
- *pedagogical agents* (virtual teacher who communicates with students in writing and orally and can provide information, model learning content, be a mentor, evaluate learning outcomes).
- intelligent learning environments (a virtual environment in which a student can learn various subjects, the learning method, and paths of which are individually adapted, i.e., an individual teaching pace and methods are selected that best meet the needs of the learner).
- *learning analytics* (historical data on learning and achievements are analyzed and further learning scenarios are modeled accordingly).
- *adaptive learning* (adaptation to the individual needs of the student, when the teaching strategy, methods, tasks, and their complexity are adapted according to the learner's behavior, achievements, learning preferences, for example, if the student fails to solve the task, he is given hints).

2.1. Opportunities of using AI in education

The scientific literature describes various benefits of artificial intelligence, for example, AI can help to automatically check and evaluate the tasks completed by students, help the student to complete the tasks, prepare constructive feedback reports on learning progress and critical gaps. AI also enables trial-and-error learning method (Fahimirad & Kotamjani, 2018), can take over part of the teacher's work: help find information, ask self-checking questions, explain the topic in more detail, etc. (Owoc et al., 2021), adapt to the student's learning pace and abilities, so everyone can learn individually (Mohammed & 'Nell'Watson, 2019). Using AI, it is possible to create a wide variety of engaging tasks, ensure greater availability of information, and create an interactive learning environment (Pedro et al., 2019).

2.2. Challenges of using AI in education

Despite the discussed opportunities of AI, there are opposing opinions. It is believed that the use of AI in education will not necessarily be successful, because the use of AI in education can lead to a lack of leadership in the classroom, children need the attention of the teacher, which is not provided by any technology, the learning process with AI is passive, only the teacher can encourage active learning, learning with the help of AI technology is not encouraged critical thinking, students may become indifferent to the environment

around them if learning is only with the help of technology, AI cannot represent the teacher's example and authority that children follow and follow in life, and AI cannot increase learning motivation as a teacher can (Tao et al., 2019). Akgun & Greenhow (2021) add that AI technologies can limit the development of emotional, social, and other competencies and raise ethical challenges due to the manipulation of a child's feelings, attitudes, and opinions.

Polak et al. (2022) after conducting a study on the attitude of teachers towards AI technologies, evaluated it not only according to what challenges and opportunities they see, but also considered the opinions of teachers about how they assess whether AI technologies should be known by teachers and students, or whether the school should introduce and teach children how AI technologies work and how they can be used in daily life. Considering this and other aspects discussed in the literature, a study will be conducted to find out the attitude of teachers towards AI technologies, the challenges, and opportunities they provide in education.

3. METHODOLOGY

A quantitative research strategy was chosen for the study. A survey of teachers who work in various educational institutions in Lithuania was conducted. A total of 203 teachers were interviewed. The description of the teachers who participated in the study is presented in Table 1.

TABLE 1. OVERVIEW OF SURVEY PARTICIPANTS

Criteria		N	%
Work area	Preschool teacher	42	20,7
	Primary school teacher (grades 1-4)	44	21,7
	Basic education teacher (grades 5-8) (pro-gymnasium)	46	22,7
	Basic education teacher (grades 9-12) (gymnasium)	67	33,0
Pedagogical work experience	5 years and less	38	18,7
	6 - 10 years	24	11,8
	11 - 20 years old	50	24,6
	21 years old and more	91	44,8
Field of education	Moral education	9	4,4
	Linguistic education	39	19,2
	Mathematical, scientific, and technological education	41	20,2
	Public education	20	9,9
	Artistic education	14	6,9
	Physical and health education	2	1,0
	Preschool education	39	19,2
	Primary school education	38	18,7
Education	College degree	7	3,4
	University degree	196	96,6
Gender	Male	16	7,9
	Female	187	92,1
Age	35 years old and younger	37	18,2

	36 – 45 years old	71	35,0
	46 – 55 years old	59	29,1
	56 years and older	36	17,7

The instrument used in the research was created based on the articles reviewed in this study. The questionnaire consisted of 12 questions: questions 1-6 about the opportunities and challenges of using artificial intelligence in education, and questions 7-12 are intended to describe the respondents who participated in the study.

Questions 1-3 and 5 are made according to the Likert scale. Q1. How familiar are you with the technologies below? (1- I don't know anything, 2- I know a little about it, 3- I know, 4- very well, 5- I know everything about it)? Chronbach's alpha = .881. Q2. Below are the statements about the capabilities of artificial intelligence. Please indicate how useful/important these opportunities of using artificial intelligence technologies are to you in educating children (1-not at all useful, 2-useless, 3-neither useful nor useless, 4-useful, 5-very useful)? Chronbach's alpha = .937 Q3. Below are the statements about the challenges of artificial intelligence. Rate to what extent you agree that these challenges are relevant, because of which artificial intelligence technologies cannot be used in educating children by completely replacing the pedagogue (1-completely disagree, 2-disagree, 3-neither agree nor disagree, 4-agree, 5-strongly agree)? Chronbach's alpha = .898

Q5. To what extent do you agree with the following statements about the extent to which artificial intelligence technologies should be applied in schools (1-strongly disagree, 2-disagree, 3-neither agree nor disagree, 4-agree, 5-strongly agree)? Chronbach's alpha = .947

Research data were analyzed using the statistical analysis program SPSS 24.0. Research data are presented as percentages and averages.

ANOVA factorial analysis was used to compare the means, the chi-square criterion was used to identify differences in categorical variables, the difference in means was considered statistically significant when $p < 0.05$. Only statistically significant differences are reported in the article.

4.   RESULTS

The research participants were first asked a question about how familiar they are with AI technologies (table 2). The study found that teachers are aware of AI, pedagogical agents, intelligent learning environments, adaptive learning and learning analytics technologies, but know little about intelligent teaching systems that simulate individual human learning. The study found statistically significant ($p<0.05$) differences according to the gender of teachers and knowledge about pedagogical agents and intellectual learning environment, smart classes. It was found that men know more about pedagogical agents ($p=0.021$, $F=5.447$, male (mean 3.3, SD=1.528); female (mean 2.4, SD=1.328)), and about intellectual learning environment, smart classes ($p=0.024$, $F=5.203$, male (mean 3.2, SD=1.515); female (mean 2.4, SD=1.277)). No further statistically significant differences were found.

TABLE 2. TEACHERS' KNOWLEDGE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES

Statements	Mean	SD
Artificial intelligence	2,8	1,353
Intelligent training systems	2,4	1,208
Pedagogical agents	2,5	1,358
Intelligent learning environments, smart classrooms	2,5	1,358
Adaptive learning	2,7	1,265
Learning analytics	2,8	1,404

According to the research, almost all the opportunities of using artificial intelligence technologies presented in Table 3 would be useful and important for teachers in educating children, i.e. Teachers participating in the study indicated that it would be useful if AI could check and evaluate the tasks completed by students, give constructive feedback reports on learning progress and show critical deficiencies, if AI could help find information, ask self-monitoring questions, explain the topic in more detail, create a wide variety of involving tasks adapted to the student's learning pace and abilities. From the teachers' point of view, AI can ensure greater access to information, help create an interactive learning environment, and enable trial-and-error learning.

However, the teachers who participated in the study indicated that the ability of AI to "assist a student with tasks" is or would be "neither useful nor useful." After analyzing the data, no statistically significant differences were found according to the socio-demographic characteristics of the study participants in assessing the benefits and importance of AI opportunities.

TABLE 3. EDUCATORS' ATTITUDE ON THE IMPORTANCE/BENEFITS OF USING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN EDUCATING CHILDREN

Statements	Mean	SD
AI helps to automatically check and evaluate assignments completed by students	3,9	1,121
AI helps the student complete tasks	3,4	1,209
AI prepares constructive feedback reports on learning progress and critical gaps	4,0	1,158
AI can take over part of the teacher's work: help find information, ask self-check questions, explain the topic in more detail, etc.	3,8	1,145
AI adapts to the student's learning pace and ability, so everyone can learn individually	3,8	1,138
A wide variety of engaging tasks can be created with the help of AI	4,2	1,028
AI makes information more accessible	4,1	1,008
AI helps create an interactive learning environment	4,1	1,067
AI enables trial-and-error learning	3,9	1,105

Teachers who participated in the study were asked to indicate the extent to which they agree with statements about the challenges of AI technologies. Teachers who participated in the study agree will teachers agree with almost all the AI challenges listed in Table 4.

However, the teachers who participated in the study neither agree nor disagree that the use of AI in education can lead to a lack of leadership in the classroom or that learning with the help of artificial intelligence technologies does not encourage critical thinking, AI cannot increase learning motivation, as a teacher can (Table 4). After analyzing the data, no statistically significant differences were found according to the socio-demographic characteristics of the study participants in assessing AI challenges.

TABLE 4. THE ATTITUDE OF TEACHERS ON THE CHALLENGES POSED BY ARTIFICIAL INTELLIGENCE TECHNOLOGIES

Statements	Mean	SD.
The use of AI in education can lead to a lack of leadership in the classroom	3,3	1,154
Students need a teacher's attention that no technology can provide	4,3	1,006
The learning process with AI is passive, only the teacher can encourage active learning	3,5	1,114
Learning with the help of AI technologies does not encourage critical thinking	3,1	1,153
Students can become indifferent to their surroundings if they only learn with the help of technology	3,8	1,153
AI cannot replace the teacher's example and authority that children follow and follow in life	4,2	0,972
AI limits the development of emotional, social and other competencies	4,0	1,117
AI poses ethical challenges due to the manipulation of a child's feelings, attitudes and opinions	3,6	1,158
AI cannot increase learning motivation like a teacher can	3,4	1,123

Most of the teachers who participated in the study (48.8%) indicated that they sometimes use AI technologies in education process, but a large part (30.0%) indicated that they do not use such technologies. 8.9% of teachers use AI in their work every day. After analyzing the data, no statistically significant differences were found according to the socio-demographic characteristics of the research participants in evaluating the use of AI in pedagogical work.
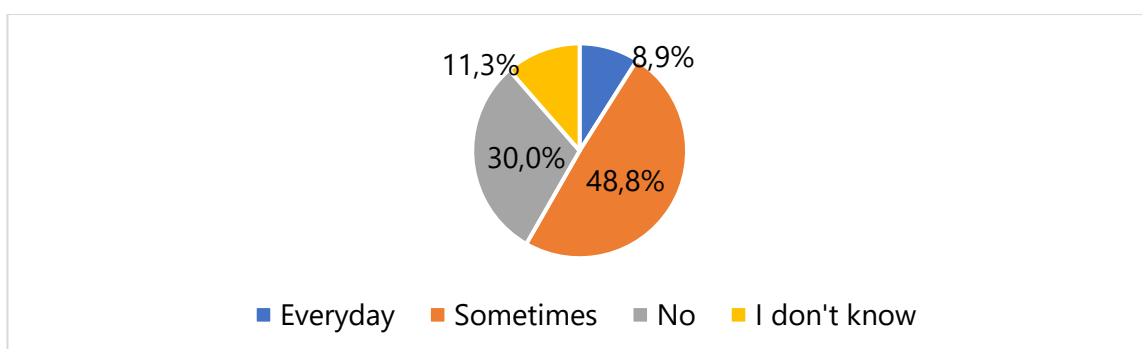

Figure 1. Use of AI technologies in pedagogical work

The teachers who participated in the study agree with all the statements presented in Table 5, i.e. AI must be taught in schools, both teachers and students should know what it is, how to use AI technologies, understand the basic concepts of AI, how AI affects people's

daily lives, and both teachers and students should have a personal opinion about AI. After comparing the opinions of teachers, according to socio-demographic characteristics, it was found that teachers of basic education (grades 9-12) (mean 4.0) less often than teachers of primary classes (grades 1-4) (mean 4.4) and teachers of preschool education (mean 4.3) agree with the statement that "Teachers should learn learn how to use AI technologies " (p=0.036, F=2.619).

TABLE 5. TEACHERS' ATTITUDE ON THE NEED FOR USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN SCHOOLS

Statements	Mean	SD
AI is a subject that should be taught in school	3,9	0,996
Teachers should learn the basic concepts of AI technology	4,1	0,977
Teachers should learn how to use AI technologies	4,1	0,978
Teachers should know how AI affects people's daily lives	4,3	0,9
Teachers should have a personal opinion about AI	4,3	0,94
Students should be taught to understand the basic concepts of AI technologies	4,1	0,901
Students should be taught how to use AI technologies	4,0	0,995
Students should be taught how AI affects people's daily lives	4,2	0,907
Students should be encouraged to form their own opinions about AI	4,2	0,963

Statistically significant differences (p = 0.016, F = 2.429) were found in evaluating this statement and according to the field of education. With the statement that "Teachers should learn how to use AI technologies " agree with moral (mean 4.7, SD =.500), linguistic (mean 4.0, SD = 1.038), mathematical, scientific and technological (mean 3.9, SD =1.127), public (mean 4.2, SD = 0.988), artistic (mean 3.6, SD = 0.929), preschool (mean 4.3, SD = 0.724) and primary school (mean 4.3, SD = 0.809) teachers, but physical and health education teachers (mean 3.0, SD =2.828) neither agree nor disagree with this statement.

Statistically significant differences were also found when evaluating the statement that "Teachers should have a personal opinion about AI" (p = 0.017, F = 2.395). The moral (mean 5.0 SD =.000), linguistic (mean 4.1 SD = 1.174), mathematical, scientific and technological (mean 4.4 SD =0.774), public (mean 4.2 SD = 0.894), artistic (mean 4.1 SD = 0.949), preschool (mean 4.5 SD = 0.720) and primary school (mean 4.4 SD = 0.855) teachers agreed with this statement, but physical and health education teachers (mean 2,5 SD =3.536) were neither inclined to agree nor disagree with this statement.

The same situation was found when evaluating the statement that "Students should be encouraged to form their own opinions about AI" (p=0.022, F= 2.315). Moral education (mean 4.9 SD =.333), linguistic education (mean 4.2 SD = 0.951), mathematical, scientific and technological education (mean 4.3 SD =0.855), public (mean 4.0 SD =1.026), artistic (mean 3.6 SD = 1.499), preschool (mean 4.3 SD = 0.850) and primary school (mean 4.7 SD =0.828) teachers agree with this statement, but physical and health education teachers (mean 2.5 SD =2.121) neither agree nor disagree with this statement.
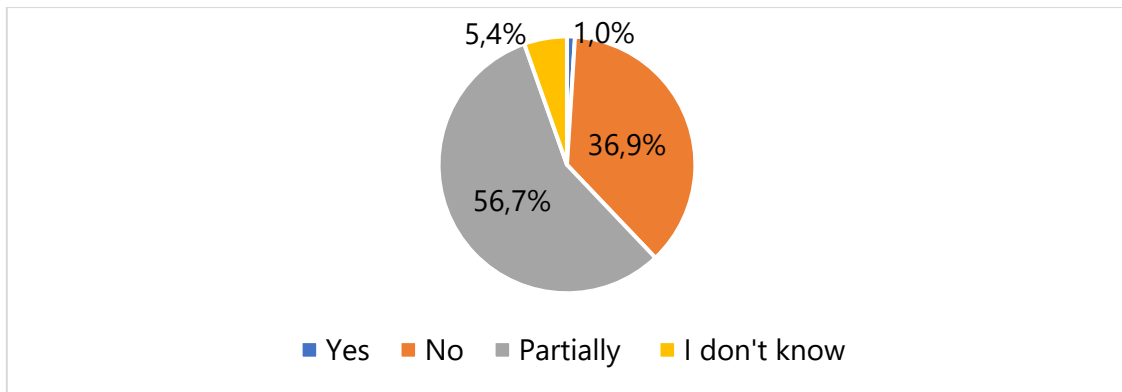
Figure 2. Assessing the prospects of AI technologies to replace educators in the future

As shown in "Fig. 2", the majority (56.7 %) of teachers who participated in the study believe that AI will partially replace teachers in the future, but 36.9 % believe that AI will not replace teachers in the future, 5.4 % do not know whether AI will replace teachers in the future, and 1 % of teachers who participated in the study believe that AI will in the future will replace teachers.

5.   CONCLUSIONS

This research represents the results of the survey of 203 Lithuanian teachers. It was found that teachers in Lithuania are familiar with artificial intelligence technologies, they know about pedagogical agents, intellectual learning environments, adaptive learning, learning analytics. It was found that male teachers have more knowledge about AI technologies than female teachers.

The research revealed a positive attitude of teachers towards AI technologies in education. Almost half of the teachers who participated in the study use AI technologies when educating. Almost all teachers (apart from physical and health education teachers) believe that both teachers and students need to understand and be able to use AI technologies. The opportunities of using AI technologies such as automated assessment of students, feedback reports on learning progress, creation of engaging tasks and individualization of the educational process are useful and important for teachers.

Nevertheless, from the point of view of teachers, AI poses challenges such as insufficient attention to students, the threat that students will become indifferent to the environment around them, limiting the development of emotional, social, and other competencies, and ethical challenges. Given these challenges, according to teachers, AI technologies will only partially be able to replace teachers in the future.

Based on the research data, it can be concluded that there is a favorable attitude of teachers towards AI technologies, therefore it is necessary to expand their application in education.

REFERENCES

1. Akgun, S., & Greenhow, C. (2021). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. AI and Ethics, 1-10.
2. Batuchina, A., Baziukė, D., Melnikova, J., Šmitienė, G., & Šakytė-Statnickė, G. (2022). AIedukacijoje: integravimo galimybių teorinė analizė. Regional formation and development studies, (2), 19-28.
3. de la Higuera, C. (2019). A report about education, training teachers and learning artificial intelligence: Overview of key issues, 1-12.
4. Diwaker, C., Sharma, A., & Tomar, P. (2021). Artificial Intelligence in Higher Education and Learning. In Impact of AI Technologies on Teaching, Learning, and Research in Higher Education (pp. 62-72). IGI Global.
5. Fahimirad, M., & Kotamjani, S. S. (2018). A review on application of artificial intelligence in teaching and learning in educational contexts. International Journal of Learning and Development, 8(4), 106-118.
6. Fissore, C., Floris, F., Marchisio, M., & Sacchet, M. (2022). Didactic activities on Artificial Intelligence: the perspective of STEM teachers. In Proceedings of the 19th international conference on Cognition and Exploratory Learning in the Digital Age (CELDA 2022), 11-18.
7. Ilkka, T. (2018). The impact of artificial intelligence on learning, teaching, and education. European Union.
8. Mohammed, P. S., & 'Nell'Watson, E. (2019). Towards inclusive education in the age of artificial intelligence: Perspectives, challenges, and opportunities. Artificial Intelligence and Inclusive Education: Speculative futures and emerging practices, 17-37.
9. Owoc, M. L., Sawicka, A., & Weichbroth, P. (2021). Artificial intelligence technologies in education: benefits, challenges and strategies of implementation. In Artificial Intelligence for Knowledge Management: 7th IFIP WG 12.6 International Workshop, AI4KM 2019, Held at IJCAI 2019, Macao, China, August 11, 2019, Revised Selected Papers (pp. 37-58). Cham: Springer International Publishing.
10. Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: Challenges and opportunities for sustainable development. Working Papers on Education Policy. https://www.expoelearning.com/wp-content/uploads/2019/08/Artificial-Intelligence-in-Education.pdf.
11. Polak, S., Schiavo, G., & Zancanaro, M. (2022). Teachers' Perspective on Artificial Intelligence Education: an Initial Investigation. In CHI Conference on Human Factors in Computing Systems Extended Abstracts, 1-7.
12. Tao, B., Díaz, V., & Guerra, Y. (2019). Artificial intelligence and education, challenges and disadvantages for the teacher. Arctic Journal, 72(12), 30-50.

UNDERSTANDING THE DELTAS IN THE 21ST CENTURY: KEY INSIGHTS AND IMPLICATIONS

Danguole Rutkauskiene[1], Marcus Flachmeyer[2], Gerda Zvirblyte[3], Monika Tuskeviciute[1]

[1]Kaunas University of Technology, Lithuania
[2]HeurekaNet - Freies Institut für Bildung, Forschung und Innovation e.V., Germany
[3]Baltic Education Technology Institute, Lithuania

Abstract. DELTAs are 56 distinct element of talent that fall within these four skills groups – cognitive skills, interpersonal skills, self-leadership skills, digital skills. As the 21st century rapidly evolves, the skills required for success in various domains are also changing. It is important to analyse and understand what necessary skills are to succeed in the tomorrow's world, where technologies are taking over every aspect of people's lives and the need for manual and physical skills will decline.
Keywords. Skills, DELTAs, cognitive skills, interpersonal skills, self-leadership skills, digital skills.

1. INTRODUCTION

Digital and artificial intelligence (AI) technologies are causing major changes in the workplace, radically changing how organizations function and individuals execute their professions. Traditional employment roles are being transformed by automation, with regular tasks progressively being mechanized, resulting in the redefining of job criteria and skill sets. Workers must learn new skills to keep up with the shifting nature of work in the digital era. Along with technical abilities, there is an increasing demand for digital literacy (Eryansyah et al., 2019), which includes data analysis, coding, and digital communication tools expertise. Critical thinking, problem-solving, and flexibility are necessary talents for navigating the complicated and continuously changing workplace. In the digital era, emotional intelligence, which includes qualities like empathy, collaboration, and communication, is increasingly recognized for effective teamwork and leadership. Lifelong learning skills are also important, since employees must constantly upskill and reskill in order to remain competitive in the labor market. Workers must learn these new skills in order to succeed in the changing work environment moulded by digital technology.

2. RESEARCH INSTITUTIONS PERSPECTIVE ON LEARNING FOR THE 21ST CENTURY

Research institutions have started analysis on the future skills that will be required in the world of work. Research conducted by McKinsey Global Institute analysed 18000 people from 15 different countries take on competencies that will be required in the future. The authors of the study identified a set of 56 foundational skills "that will benefit all citizens and showed that higher proficiency in them is already associated with a higher likelihood of employment, higher incomes, and job satisfaction." (Dondi et al., 2021). These foundational skills were given the name DELTAs. "Looking for still more precision, we identified 56 distinct elements of talent (DELTAs) that fall within these skills groups. We call them DELTAs, rather

than skills, because they are a mix of skills and attitudes." (Dondi et al., 2021). These 56 DELTAs were grouped across 13 skill groups and four categories, named cognitive, self-leadership, interpersonal, and digital DELTAs.

3.1. Cognitive DELTAs

Cognitive skills play a critical role in our daily lives, influencing our ability to understand, learn, and solve problems effectively. These skills are essential for success in various areas, such as education, career, and personal relationships. The main four cognitive skills groups, that were identified by Dandi et al. (2021) research, are critical thinking, planning and ways of working, communication, mental flexibility.

Critical thinking	Planning and ways of working	Communication	Mental flexibility
• Structured problem solving • Logical reasoning • Understanding biases • Seeking relevant information	• Work-plan development • Time management and prioritization • Agile thinking	• Storytelling and public speaking • Asking the right questions • Synthesizing messages • Active listening	• Creativity and imagination • Translating knowledge to different contexts • Adopting a different perspective • Adaptability • Ability to learn

Figure 1. Cognitive DELTAs

In the digital age, failing to develop cognitive skills might make it difficult to adapt to quick changes and breakthroughs in technology and information. Individuals may struggle to keep up with the evolving digital world if they lack skills that were mentioned above, which may hinder their capacity to master new technologies, adjust to changing job needs, or efficiently utilize digital tools and platforms.

3.2. Interpersonal DELTAs

Interpersonal skills, also known as people skills or social skills, are crucial for effective communication and interactions with others in various settings. Strong interpersonal skills also contribute to personal and professional success, as they enable individuals to connect with others, build trust, and establish meaningful connections. The three main skill groups that Dandi et al. (2021) research highlighted are: mobilizing systems, developing relationships and teamwork effectiveness.

Mobilizing systems	Developing relationships	Teamwork effectiveness
• Role modeling • Win-win negotiations • Crafting an inspiring vision • Organizational awareness	• Empathy • Inspiring trust • Humility • Sociability	• Fostering inclusiveness • Motivating different personalities • Resolving conflicts • Collaboration • Coaching • Empowering

Figure 2. Interpersonal DELTAs

In the technological era, failing to acquire interpersonal skills can have serious consequences, including problems in developing connections, networking, and navigating the modern job. Individuals who lack excellent communication, empathy, and cooperation abilities may struggle to connect with people on a human level, potentially leading to misunderstanding, disputes, and restrictions in personal and professional progress. In today's digitally-driven society, interpersonal skills are still critical for success in a variety of areas.

3.3. Self-leadership DELTAs

Individuals must have self-leadership abilities to successfully manage their time, create goals, prioritize activities, and sustain motivation and productivity in this age of technology and remote work arrangements. In the absence of traditional hierarchical structures in remote or virtual work situations, people must rely on self-leadership to effectively manage their own performance. Three groups of self-leadership skills are: self-awareness and self-management, entrepreneurship, goals achievement (Dandi et al, 2021).

Self-awareness and self-management	Entrepreneurship	Goals achievement
• Understanding own emotions and triggers • Self-control and regulation • Understanding own strengths • Integrity • Self-motivation and wellness • Self-confidence	• Courage and risk-taking • Driving change and innovation • Energy, passion, and optimism • Breaking orthodoxies	• Ownership and decisiveness • Achievement orientation • Grit and persistence • Coping with uncertainty • Self-development

Figure 3. Self-leadership DELTAs

In this era, failing to develop self-leadership abilities can hinder personal and professional progress. Individuals may struggle with productivity, time management, and well-being if they lack abilities such as self-motivation, self-discipline, and self-awareness. Lack of self-leadership abilities can restrict success and create stress in a fast-paced digital world where self-direction is critical.

3.4. Digital DELTAs

Digital skills are essential for success in the contemporary world, from the employment to accessing information, communication, learning, and civic involvement. Digitalization has profoundly transformed the labor market, bringing about significant changes in how work is conducted, and the skills required for employment (Bejaković, Mrnjavac, 2020). Traditional employment positions have been disrupted by automation, artificial intelligence, and digital technology, with jobs being automated, outsourced, or rendered obsolete. Dandi et al. (2021) grouped digital skills in three competencies: digital fluency and citizenship, software use and development, understanding digital systems.

Digital fluency and citizenship	Software use and development	Understanding digital systems
• Digital literacy • Digital learning • Digital collaboration • Digital ethics	• Programming literacy • Data analysis and statistics • Computational and algorithmic thinking	• Data literacy • Smart systems • Cybersecurity literacy • Tech translation and enablement
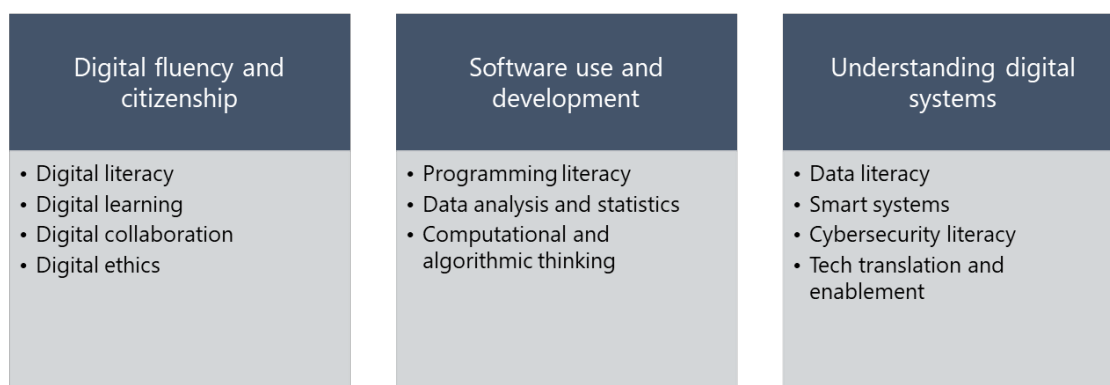
Figure 4. Digital DELTAs

Failure to acquire digital skills can have serious consequences for an individual's capacity to succeed in today's digital-driven environment. Basic computer literacy, online communication, and digital problem-solving abilities are becoming increasingly important in many parts of life, including school, job, and daily duties. In an era where technology plays a central role in almost every aspect of life, the absence of digital skills can create barriers to success and participation in the modern digital age.

3. RESEARCH ABOUT SKILL LEVEL OF DELTAS IN LITHUANIA

The research aimed at helping to understand the level of knowledge adults in Lithuania have on each of the 13 groups of DELTAs. 50 respondents were asked to evaluate their skill level for each group of DELTAs. They were given three different knowledge level descriptions and had to choose the one that best described their knowledge.
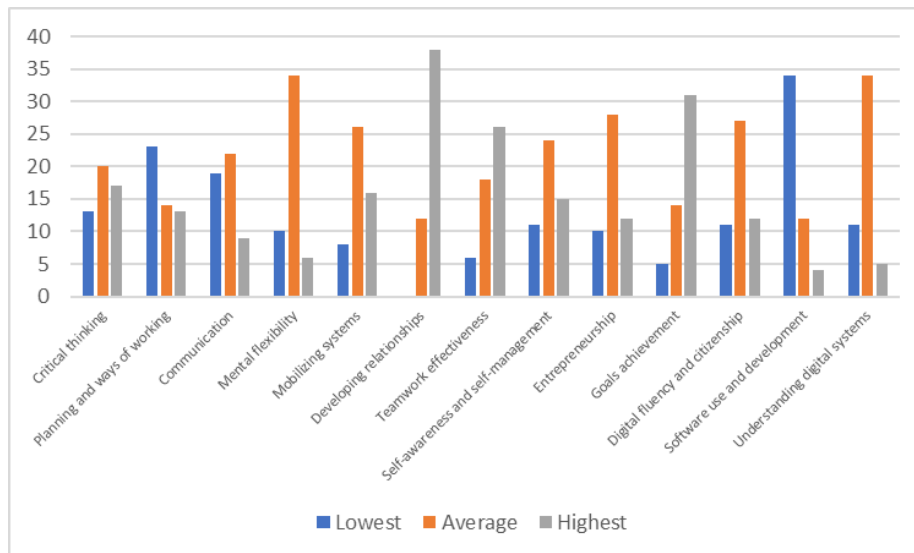
Figure 5. Respondents knowledge level on each skills group

The diagram (Figure 5) shows that the respondents rated their knowledge the lowest when talking about software use and development. 34 participants out of 50 chose this answer. Another two groups of skills that participants do not feel confident about are communication and planning and ways of working. All 50 participants rated their knowledge in developing relationships as average or good. From the diagram (Figure 5) it can be seen that the respondents have the most confidence in their knowledge of the three topics – goals achievement, teamwork effectiveness and developing relationships. The minority of respondents have selected the highest level of knowledge to evaluate their skills in digital systems (5 out of 50), software use and development (4 out of 50) and mental flexibility (6 out of 50).

This survey showed that the respondents feel least confident in their knowledge about software use and development, communication and planning and ways of working. Additionally, respondents expressed lower confidence in their knowledge of digital systems, software use and development, and mental flexibility, with only a minority selecting the highest level of knowledge in these areas. On the other hand, participants reported higher confidence in their knowledge about goals achievement, teamwork effectiveness, and developing relationships, with the majority selecting average or good ratings. This suggests that respondents feel more comfortable with these skills compared to others.

4. CONCLUSION

In the 21st century, the need for different skills has evolved rapidly due to technological advancements, globalization, and changing work environments. Keeping up with the demand for different skills is crucial for individuals and organizations alike. Even though digital skills are highly important due to the influence of technology in our personal and professional lives, it is essential to pay the same amount of attention to soft skills. Research in Lithuania showed that adults are lacking the most knowledge in three skills groups -

software use and development, communication and planning, and ways of working. However, respondents were the most confident in their knowledge about goal achievement, teamwork effectiveness and developing relationships. The situation shows that to survive in the future world of work it is important to nail both digital and soft skills.

ACKNOWLEDGEMENT

REFERENCES

1. Dondi, M., Klier, J., Panier, F., & Schubert, J. (June 2021). *Defining the skills citizens will need in the future world of work* (Public & Social Sector Practice).
2. Commission of the European Communities (2000, October 30). A Memorandum on Lifelong Learning: Commission staff working paper. SEC(2000) 1832. Brussels.
3. European Commission (2020, July 1). European Skills Agenda for sustainable competitiveness, social fairness and resilience.
4. Cedefop (2021). Skills-OVATE: Skills in occupations.
5. Haan, G. de (2006). The BLK '21' programme in Germany: a 'Gestaltungskompetenz'-based model for Education for Sustainable Development. Environmental Education Research, 12(1), 19–32. https://doi.org/10.1080/13504620500526362
6. Eryansyah, E., Erlina, E., Fiftinova, F., & NURWENI, A. (2019). EFL Students' Needs of Digital Literacy to Meet the Demands of 21st Century Skills.
7. Facione, P. A. (2015). Critical Thinking: What It Is and Why It Counts. Insight Assessment.
8. Venter, E. (2019). Challenges for meaningful interpersonal communication in a digital era.
9. Furst, J., & Barrett, A. (2018). Developing mental flexibility: The role of habituation and cognitive flexibility in managing information complexity. Computers in Human Behavior.
10. Bejaković, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market.

DIGITAL FINANCE SKILLS

Karolina Sirvinskaite[1], Fauste Ginataite[1], Gedvile Valentaite[1]

Kaunas University of Technology, Lithuania

Abstract. The rapid development of technology and the digitalization of financial functions determine the need to understand financial culture and develop digital finance skills. Financial culture means knowing the elements of a financial management toolbox. The digital finance skills include technology and automation, data literacy, advanced analytics, business process management and business partnering and collaboration. Must-have digital competencies: technological literacy, digital translation, digital learning and development, digital bias management, digital ambition.

Keywords: finance, digital skills.

1. INTRODUCTION

As technology constantly advances, it is crucial to prepare ourselves for the future. To not get dragged along and improve alongside the new age and evolving world, we must adapt professionally by choosing a profession that is not only important now but also essential for the future. According to Kiersz and Hoff (2021), financial managers are ranked number 4 for the 30 best high-paying jobs of the future. In pursuance of this position, it is necessary to understand the financial culture and what digital skills this profession requires.

2. DIMENSIONS OF FINANCIAL CULTURE

Financial culture refers to the knowledge of money and financial products that people can apply financial choices to make informed decisions about managing their finances (Beaver, Ryan, 2005). According to Kefela (2011), financial literacy includes the following areas: savings, budgeting, debt management, financial negotiations, taxation, risk management, and banking services. Without knowledge of basic economic, financial, and management principles, it is extremely difficult to make well-informed decisions that are most likely to reflect how each decision will affect a company's results, not only considering the short but medium to long term as well (Dalton 2021).

According to Szobonya (2021), the dimensions of finance culture can be divided into four categories: general competences, subjective factors, financial knowledge and usage, behaviour.

General competences consist of:
- Reading comprehension – this is an ability to not only read the text but also understand its meaning.
- Numeracy – this is an ability to work with numbers as well as mathematical formulas, such as division, multiplication, ratios, and percentages.
- Communication – this is an important ability that involves conveying and receiving information through a range of verbal and non-verbal means.

- Digital – this is the ability to find, use, evaluate, share, and create content using digital devices, such as computers and smartphones.

Subjective factors are essential to the economic and financial system itself. They relate to psychological characteristics of human nature and social structure. These factors can influence a person's decision-making process and overall thinking process:

- Attitude,
- Motivation,
- Approach,
- Confidence,
- Self-assessment,
- Satisfaction,
- Future-orientation.

The third part of financial culture – financial knowledge indicates that the person must have general (micro and macro) economic knowledge (inflation, taxation) and understand financial products and services.

The last category – usage, behaviour signifies that the person must have future-oriented management and monitoring of personal finances skills supported by responsible decisions.

Summarization of the dimensions of financial culture is depicted in Fig.1.
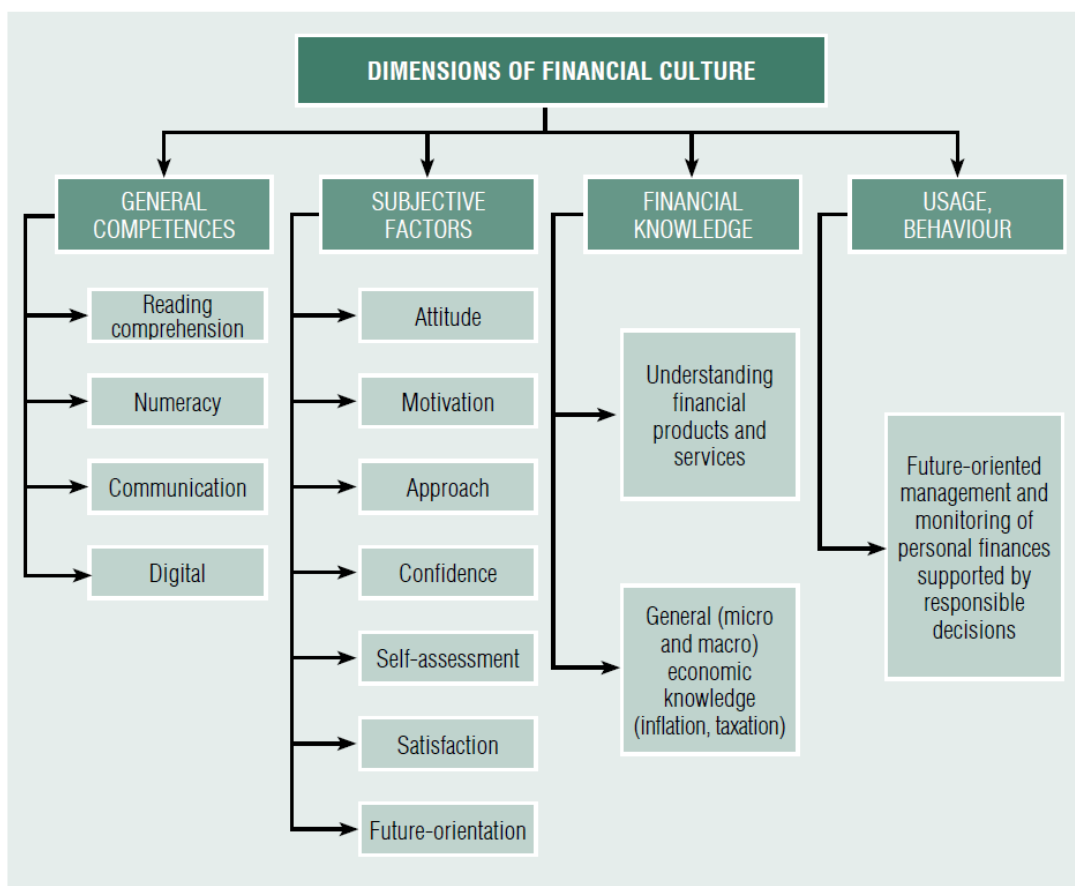
Figure 1. Dimensions of financial culture (Szobonya, 2021)

3. DIGITAL SKILLS

As technology rapidly alters finance and business processes, accelerating the digitalization of the finance function is a priority for finance leaders. In order to exploit technology and automation digital skills and competencies are very needed.

Finance skills (learned abilities) relate to technology, processes and business needs, and competencies more broadly span the knowledge and behaviour required to perform well in a digital finance function. Both are crucial to advancing the digital maturity of the finance function. The success of finance function depends on combining the right technology with the right skills.

Must-have digital finance skills are more specific than competencies and include (Van Der Maulen, 2021):

1. Technology and automation – innovations like cloud financial management system applications will change how end users perform their roles, and finance staff must be knowledgeable enough to exploit the capabilities of advanced technology and robotization to remove time-consuming manual tasks.
2. Business process management (BPM) – the skill to control BPM technologies driven by advances in artificial intelligence, lets finance staff standardize processes and reduce the risk of human error. Leaders need to understand the nuances of such technologies and make decisions that were once in the IT domain.
3. Data literacy – research shows that a lack of skills in data literacy can cost a company as much as 1% of revenue. Finance leaders must be skilled to diminish this unneeded loss of revenue. They must be able to analyse data-driven financial insights to help the wider organization identify hidden growth opportunities and manage heightened risks.
4. Advanced analytics – this skill is critical to driving business insight. It is the examination of data or content using sophisticated techniques and tools to discover deeper insights, make predictions or generate recommendations.
5. Business partnering and collaboration – as technology automates and takes more transactional workflows, the finance organization must shift to becoming strategic advisors and business partners to the rest of the business.

Beyond specific skills, there are significant finance functions too about which digital competencies are most relevant for the future of finance (Van Der Maulen, 2021):

1. Technological literacy – it is the competence to comprehend, manage, analyse, and use technology safely, effectively, responsibly, and proficiently, as well as knowing how to exploit digital technology to drive better outcomes for finance and the business.

2. Digital translation – the knowledge of digital solutions like AI to be able to explain how digital technologies interact with finance stakeholders, processes, and systems.
3. Digital learning and development – the ability to quickly adapt and learn new digital requirements in a new learning environment. The fast pace of change means finance leaders have little time to train the staff and fast learning enables finance to extract more value from technologies.
4. Digital bias management – the ability to understand and articulate bias in machine learning and manage the risk. For example, FP&A analysts trained in digital bias are more likely to be sceptical of financial projections that are unreasonably optimistic or pessimistic before they result in potentially harmful decision making by business partners.
5. Digital ambition – the capability and motivation to embrace technology and new ways of working. Finance workers that have the digital ambition also have the will to build digital skills. They have an authentic interest in how new technologies can ameliorate their work, as well as business results. These workers are the ones that adopt the technology early and are not afraid of experimenting with it to improve their work and finance processes.

4.   CONCLUSIONS

As finance remains one of the most perspective jobs in the future it is crucial for finance leaders to advance their digital finance skills. Specific digital finance skills include technology and automation, business process management, data literacy, advanced analytics, and business partnering and collaboration. In addition, digital competencies like technological literacy, digital translation, digital learning and development, and digital bias management are essential for the future of finance.

REFERENCES

1. Kiersz, A., & Hoff, M. (2021). The 30 best high-paying jobs of the future. Insider. Retrieved February 16, 2023, from https://www.businessinsider.com/best-jobs-future-growth-2019-3.
2. Beaver, W. H., & Ryan, S. G. (2005). Conditional and Unconditional Conservatism: Concepts and Modeling. Review of accounting studies, 10. Retrieved February 16, 2023, from https://tarjomefa.com/wp-content/uploads/2018/04/70-English-TarjomeFa.pdf.
3. Kefela, G. (2011). Implications of financial literacy in developing countries. African Journal of Business Management, 5(9), 3699. Retrieved February 16, 2023, from https://www.academia.edu/download/33730332/Aplicacao_da_educacao_financeira_para_desenvolvimento_de_paises_(jornal_africa).pdf.

4. Dalton, S. (2021). Why Financial Literacy Is an Organizational Concern, and How Finance Teams Can Help. The Modern Finance Leader. Retrieved February 16, 2023, from https://blogs.oracle.com/modernfinance/post/why-financial-literacy-is-an-organizational-concern-and-how-finance-teams-can-help.

5. Van Der Maulen, R. (2021). Fill Finance's Skill Gaps. Gartner. Retrieved February 16, 2023, from https://www.gartner.com/smarterwithgartner/fill-finances-skill-gaps.

INFORMACINIŲ KOMUNIKACINIŲ TECHNOLOGIJŲ INFRASTRUKTŪROS VALDYMO PASLAUGŲ IŠVYSTYMAS ŠVIETIMO ĮSTAIGŲ DARBE

Dalė Dzemydienė[1], Sigita Turskienė[1], Irma Šileikienė[2,3]
Artūras Baltrukaitis[1,4], Aušra Kazlauskienė[1]

[1]Vilniaus universitetas, Šiaulių akademija Regionų plėtros institutas, Lietuva
[2]Vilniaus Gedimino technikos universitetas - Vilnius Tech, Fundamentinių mokslų fakultetas Informacinių technologijų katedra, Lietuva
[3]Vilniaus Kolegija, Lietuva
[4]Klaipėdos universiteto „Žemynos" gimnazija, Lietuva

Santrauka. Elektroninio (el.) turinio perteikimas ir informacinių komunikacinių technologijų (IKT) infrastruktūros valdymo paslaugos pastaraisiais metais tampa vis svarbesniu ir sudėtingesniu procesu. IKT infrastruktūros aptarnavimo paslaugų veiksmingumo skatinimas ir įvairaus profilio informacijos perteikimo galimybių valdymas įgyja vis didesnę svarbą daugelyje veiklos sričių. Straipsnyje nagrinėjamos IKT valdymo metodologijų ir priemonių išvystymo galimybės, kurios tampa reikšmingomis švietimo įstaigų darbo organizavime. Pristatoma metodologija - ITIL v4, kuri formuoja naują vertės supratimą, įgyjamą per IKT infrastruktūros plėtrą. Nauji IKT infrastruktūros valdymo iššūkiai turi įtakos IKT infrastruktūros valdymo specialistų ruošime ir visos IKT infrastruktūros vystyme, pasitelkiant tinkamas kompiuterizuotas, debesyje veikiančias sistemas. Nagrinėjama atvejo analizė aprėpia vidurinio ugdymo įstaigos IKT sektoriaus infrastruktūros valdymą, pradedant komunikacinių tinklų infrastruktūros tobulinimu ir baigiant turinio perteikimo priemonių vystymu bei valdymu.
Raktiniai žodžiai: informacinės komunikacinės technologijos (IKT), informacinių technologijų infrastruktūros biblioteka (ITIL), IT valdymo programinė įranga.

1. ĮVADAS

Turinio perteikimas, užtikrinantis tinkamą visų organizacijos valdymo procesų vykdymą ir taikomos bei ateinančios naujos IKT formuoja naujus uždavinius sudėtingos infrastruktūros valdymui. Tenka spręsti tam tikro pobūdžio problemas, kai pradeda strigti tam tikros IKT grandies pajėgumai, kyla kibernetinio pažeidžiamumo grėsmės ar energijos tiekimo trikdžiai ar kiti nesklandumai. IKT aptarnavimo paslaugų veiksmingumo skatinimas ir įvairaus profilio informacijos perteikimo galimybių valdymas įgyja vis didesnę svarbą įstaigų darbe (Dzemydienė ir kt., 2022).

Šiame darbe nagrinėjamos IKT paslaugų valdymo metodologijų ir priemonių išvystymo galimybės, kurios reikšmingos išsiplėtus IKT paslaugų aptarnavimo spektrui švietimo įstaigų darbo valdyme. Tinkamų IKT paslaugų valdymo priemonių pasirinkimas įtakoja visos organizacijos veiklos sklandumą bei efektyvumą. Tačiau viduriniojo lavinimo švietimų įstaigų darbe nepakankamas dėmesys kol kas yra skiriamas IKT metodologijų bei kompiuterinių valdymo priemonių taikymui tokių paslaugų efektyviam valdymui.

Pasaulyje IKT sektoriaus darbe taikomos įvairios IKT priemonių kūrimo ir valdymo metodologijos, tokios kaip SCRUM, Agile, ITIL, DevOps, Lean, kurios įgalina IKT infrastruktūros aptarnavimo procesus tinkamiau struktūrizuoti, specifikuoti ir valdyti. ITIL metodologija yra plačiai naudojama daugelyje organizacijų, kurios siekia efektyviai valdyti

teikiamas IKT paslaugas ir užtikrinti kuo aukštesnę teikiamų IKT paslaugų kokybę. ITIL v4 apibrėžia naują paslaugų vertės supratimą IKT infrastruktūros valdymo kontekste (ITIL v4, 2018).

Naujos IKT iš esmės keičia ne tik valstybės ir savivaldos institucijų veiklą, bet ir švietimo įstaigoms sudaro prielaidas gerinti teikiamų paslaugų kokybę, produktyvumą, didinti valdymo veiksmingumą, užtikrinti veiklos skaidrumą visame švietimo sektoriuje (Ginevičius ir kt., 2006). Valdžios institucijos, švietimo įstaigos perkėlusios administravimo paslaugas į el. erdvę, sunaudoja mažiau finansinių išteklių šioms paslaugoms teikti. Novatoriškos IKT, tokios kaip į paslaugas orientuota architektūra, debesijos technologijos, šablonizuotų scenarijų taikymas, atvirų duomenų prieigos sukūrimas, sudaro sąlygas intensyviau plėtoti duomenų mainus ir naudoti duomenis pakartotinai bei padidina paslaugų veiksmingumą. Lietuvos Respublikos (LR) teisės aktai ir Europos Sąjungos (ES) direktyvos įpareigoja pereiti prie efektyvesnių skaitmenizacijos formų ir informacinių sistemų (IS) integracinių galimybių (Lietuvos pažangos strategija, Lietuva 2030).

Teisinė ir techninė bazė viešajame sektoriuje pakankamai paruošta, suderinta ir atitinka ES reikalavimus bei standartus oficialių sistemų naudojimui (LR Teisės aktas, 2022; Ožalienė, 2007). Tačiau švietimo įstaigos vis dar neryžtingai pereina prie IKT teikiamų inovacijų ir inovatyvių priemonių bei galimybių taikymo. Jaučiama skaitmeninė diferenciacija administravimo priemonių naudojimo srityje. Stinga integruoto, suderinto požiūrio į informacinių išteklių taikymą, jų įgyvendinimą visų lygmenų švietimo įstaigų infrastruktūroje.

Švietimo įstaigų valdymo specifika lemia, kad visų lygmenų darbuotojai dalijasi valdymo, darbo grupių ir veiklos planavimo koordinavimu. Dalyvaujantys kiekviename lygmenyje pagrindiniai klientai - mokytojai, viduriniosios grandies vadovai, vadovai yra suinteresuotieji asmenys, kurie siekia bendrų tikslų įgyvendinimo, o jų darbo principai perkeliami į informacinių sistemų (IS) veiklos procesus, kurie įgalina automatizuotų sistemų kūrimą. IKT valdymo nauda švietime turi įtakos geresniam mokyklos, kaip administracinio vieneto, tėvų ir išorės institucijų bei vietos valdžios bendradarbiavimui. IKT paslaugų valdymas įtakoja organizacijos, įmonės ar įstaigos darbo produktyvumą ir efektyvumą, mažėja priklausomybė nuo popierinių dokumentų, sukuriama organizuota informacijos ir paslaugų perdavimo sistema, kurioje atsižvelgiama į įstaigos poreikius. Įstaigos, kurios neįgyvendina IKT paslaugų valdymo naujovių, rizikuoja prarasti galimybes efektyviai atlikti sudėtingų procesų valdymą ir būti produktyvios bei konkurencingos.

Šiame darbe atskiro atvejo analizei pasirinkta X viduriniojo mokslo švietimo įstaigos IKT infrastruktūra. Keliamas tikslas – atlikti IKT infrastruktūros valdymo paslaugų analizę ir parodyti šiuolaikinių ITIL v4 metodologijos taikymo priemonių galimybes. Sprendžiami uždaviniai susiję su IKT funkcinių galimybių plėtra viduriniojo mokslo švietimo institucijų darbo modernizavimui, demonstruojant IKT valdymo paslaugų metodologijos privalumus ir eksperimentinio tyrimo rezultatus, kurie įgalina pasirinkti IKT infrastruktūros valdymo įrankius bei demonstruoti jų funkcinius privalumus.

2. IKT PLĖTRĄ SKATINANČIOS INICIATYVOS

ES skaitmenizacijos plėtros strategijoje iki 2030 m. yra numatyti tikslai, kurių įgyvendinimui būtina siekti IKT inovatyvių plėtos priemonių, kad ES taptų visuomenės, kuriai IKT suteikia daugiau galimybių, pavyzdžiu (ES duomenų strategija, 2019). Nuo IKT vystymosi ir informacinių valdymo sistemų kūrimo ir diegimo kokybės priklauso veiklos organizavimo, gamybos valdymo metodai, vartojimo ir gyvensenos įpročiai. Prieiga prie informacinių sistemų ir gebėjimas naudotis inovatyviomis IKT yra neparastai svarbūs, siekiant inovacijų ir racionalaus augimo. IKT plėtojama infrastruktūra ir inovatyvios valdymo sistemos duoda visokeriopą naudą piliečiams ir ekonomikai, padeda tobulinti el. viešąsias paslaugas (Europos duomenų strategija, 2019).

IKT diegimo švietime strategijos pagrindinis tikslas – numatyti visų lygmenų IKT integravimo į Lietuvos bendrąjį lavinimą perspektyvą ir kryptis bei suplanuoti jos įgyvendinimo žingsnius, padėti harmonizuoti įvairių institucijų darbus bei veiksmingai panaudoti švietimo kompiuterizavimui skiriamas lėšas. (Ališauskas, Brazdeikis ir kt., 2000; Lietuvos pažangos strategija Lietuva 2030, 2022).

IKT diegimas Lietuvos valstybės bendrojo lavinimo mokyklose pradėtas jau 1986 m., pradedant mokyti informatikos ir skaičiavimo technikos pagrindų, siekiant mokyklas centralizuotai aprūpinti kompiuteriais ir sudaryti palankias sąlygas mokyti informatikos. Nuo 1990 metų kompiuterių diegimu mokyklose rūpinosi LR Kultūros ir švietimo ministerija, tam tikslui įsteigusi Informatikos ir prognozavimo centrą. Švietimo kompiuterizavimas vyko šalies lygiu, įsteigtasis centras buvo atsakingas už valstybės lėšų skirstymą IKT diegimui Lietuvos bendrojo lavinimo, profesinėse ir aukštesniosiose mokyklose (Ališauskas, Brazdeikis ir kt., 2000). Už IKT diegimo Lietuvos bendrojo lavinimo mokyklose politikos formavimą atsakingas dabar – Švietimo informacinių technologijų centras. Nuolat stokojant tam skiriamų valstybės lėšų, nesant ilgalaikės ir visapusiškos IKT diegimo švietime strategijos, šio Centro įtaka ugdymo kompiuterizavimui buvo ribota, trūko dermės tarp valstybės skelbiamų bendrųjų informacijos technologijos integravimo nuostatų ir žemesnių valdymo grandžių vykdomų darbų.

Švietimo sistemos organizavimą ir valdymą reglamentuojančiuose įstatymuose apskričių švietimo centrų ir rajonų švietimo skyrių misija, diegiant IKT mokyklose tiesiogiai nėra įvardyta. Tačiau šių institucijų įtaka yra ženkli ir svarbi: apskričių švietimo ir regioniniai kompiuterių centrai organizuoja kvalifikacijos tobulinimo renginius, skiria lėšų kompiuterių technikai bei programinei įrangai įsigyti. Jaučiamas vietos valdžios palankumas rūpintis IKT diegimu mokyklose (Ališauskas, Brazdeikis ir kt., 2000). IKT diegimo Lietuvos švietime strategija, tai dokumentas bendras šalies švietimo institucijoms, politikams, šalies švietimo valdininkams, apskričių, savivaldybių ir kitų švietimo valdymo institucijų darbuotojams, pedagogus rengiantiems universitetams ir aukštesniosioms mokykloms, mokslo institutams, fondams, mokyklų bendruomenėms bei kitoms IKT diegimu švietime besirūpinančioms institucijoms ir asmenims. IKT diegimo į ugdymą politiką formuoja valdymo institucijų nurodymai bei mokyklų bendruomenės. Nuo mokyklos aktyvumo, nuostatų ir sprendimų priklauso kaip bus naudojama ir plėtojama IKT infrastruktūra, informacinės sistemos, kaip bus vykdoma informacijos apie modernias technologijas sklaida, kiek ir kokios paramos

pavyksta gauti mokyklų modernizavimo projektams įgyvendinti. Nustatant IKT diegimo mokykloje prioritetus svarbus vaidmuo tenka informatikos mokytojams, mokyklų bibliotekininkams, administracijai. Patikimų technologijų plėtra įgalina naujus pokyčius atvirai ir demokratinei visuomenei, gyvybingai ir tvariai ekonomikai. Skaitmeniniai sprendimai taip pat nepaprastai svarbūs kovojant su klimato kaita ir pereinant prie žaliosios ekonomikos.

ES skaitmeninėje strategijoje nurodoma, kad bus investuojama į visų gyventojų skaitmenines kompetencijas. Kuriamos priemonės, kurios didins apsaugą nuo kibernetinių grėsmių (kompiuterinių įsilaužimų, išpirkos reikalaujančių programų, el. tapatybės vagysčių) ir užtikrins, kad dirbtinio intelekto sistemos būtų plėtojamos taip, kad būtų gerbiamos žmonių teisės ir pelnytas pasitikėjimas. Ypač aktualu, diegiant į mokyklas IKT, paspartinti itin greito plačiajuosčio ryšio diegimą. Numatomi plėtros veiksmai, išvystant superkompiuterių pajėgumus, pareikalaus trasformacijų kurios įtakos naujoviškų sprendimų įgyvendinimą, spartins sąžininga ir konkurencinga skaitmeninę ekonomiką.

Strateginio skaitmenizavimo uždaviniai paliečia priemones stiprinti duomenų valdymo, dirbtinio intelekto ir pažangiųjų technologijų pajėgumus. ES - skaitmeninis suverenumas priklausys nuo gebėjimo saugoti, gauti ir apdoroti duomenis, laikantis pasitikėjimo, kibernetinės saugos ir pagrindinių teisių reikalavimų. Skaitmeninė ekonomika, duomenų apdorojimas, debesijos kompiuterija ir tinklų kompiuterija, gali daryti teigiamą poveikį ES ekonomikai ir konkurencingumui. ES įmonės ir viešojo administravimo institucijos skatinamos taikyti vartotojų ir subjektų duomenų analitikos metodus, daiktų interneto technologijas, dirbtinio intelekto metodus ir priemones. Šios technologijos turi platų ir įvairų pritaikymą. ES iškėlė didelius investavimo tikslus ir parengė finansavimo priemones plėtrai skatinti ir naujos kartos, debesijos kompiuterijos bei pažangiosioms technologijoms diegti. Naudojant duomenis pramonės, švietimo sistemos ir verslo reikmėms, strateginis požiūris į plėtrą ir daiktų interneto pramoninių sistemų diegimas, 5G tinklo aprėpties kompiuterija įgalins naujai valdyti ir greitai analizuoti didelių duomenų saugyklų duomenis, kuriant priemones kurios įgalina inovatyvią pertvarką (EC Direktyva, 2019).

Projektas „EdTech" - tai skaitmeninės švietimo transformacijos įgyvendinimo uždavinius keliantis aukštosioms mokykloms projektas, skirtas skatinti naudoti technologijas ir skaitmeninius sprendimus, kurti paskatų ir palaikymo sistemą pedagogams. Skaitmeninių kompetencijų ugdymas yra centrinė projekto ašis. Galime turėti daug skaitmeninių sprendimų, bet juos visgi turime naudoti veiksmingai. Skaitmeninės kompetencijos – raktas į tas technologijas ir jų panaudojimą (EdTech, 2021), didinant turinčių magistro laipsnį pedagogų gretas.

3.   ITIL METDOLOGIJOS TAIKYMO PRINCIPAI

Viena iš tyrimų sričių, kaip perteikti ir valdyti informacinių technologijų infrastruktūrą švietimo įstaigose. Siūloma tokių uždavinių sprendimui - ITIL v4 metodologija, kaip naujos kartos IT paslaugų valdymo metodologija, tampanti standartu pasaulyje (ITIL v4, 2020). ITIL (angl. Information Technology Infrastructure Library) tai IT infrastruktūros aptarnavimo ir

valdymo metodologija orientuota į darbo optimizavimą bei kokybės užtikrinimą IT kompanijose ar įmonių IT padaliniuose.

IT paslaugos apima du IT infrastruktūros valdymo aspektus, t. y. aptarnavimas ir paslaugų teikimas. Paslaugos teikiamos glaudžiai bendradarbiaujant su užsakovu. Paslaugos kokybės įvertinti iš anksto neįmanoma. Ji dažniausiai priklauso nuo bendradarbiavimo su užsakovu. Paslauga gali būti keičiama teikimo užsakovui metu.

Paslaugos teikimo procesas – tai yra gamybos ir vartojimo samplaika, kurioje paslaugos teikėjas ir užsakovas dalyvauja vienu metu. ITIL daugiausia dėmesio skiria IKT paslaugų suderinimo su organizacijos poreikiais praktikai. ITIL gali padėti organizacijoms prisitaikyti prie vykstančių transformacijų. Remiantis ITIL gairėmis, IKT infrastruktūrą sudaro: technika (tinklai, kompiuteriai, serveriai, darbo vietos, kiti įrenginiai ir pan.), programinė įranga ir žmonės, užtikrinantys sklandų ir saugų svarbiausių organizacijos sistemų veikimą. Tai ir patirtis bei ekspertinės žinios, jungiant skirtingus IT komponentus į darnią visumą, kuri atitinka organizacijos poreikius, ir tuo pat metu nereikalauja milžiniškų investicijų.

ITIL tapo privalomu IT paslaugų valdymo standartu. Ji suteikia galimybę įvairių sektorių įmonėms teikti paslaugas atsižvelgiant į kokybę ir ekonomiškai efektyvų paslaugų teikimo būdą. ITIL geroji praktika yra suderinama su pasauliniais kokybės sistemos standartais, tokiais kaip ISO 20000 ir perima daugelio kitų IT valdymo metodikų bruožus, tokių kaip Agile, SCRUM, Lean.

ITIL metodika skirta sėkmingai valdyti IT paslaugas per visą paslaugų teikimo ciklą. ITIL sistemoje pateikiama geriausia praktika ir numatomos kryptys, kaip tvarkyti penkis IT paslaugų gyvavimo ciklo etapus:

- IKT infrastruktūros įgyvendinimo ir aptarnavimo paslaugų strategija, kuri turėtų atitikti įmonės tikslus. Šio komponento naudingumas ir garantija užtikrina, kad teikiamos IT paslaugos yra suplanuotos, atitinka organizacijos veiklų prioritetus ir kurią vertę paslaugų teikimo klientams.

- Paslaugų projektavimas yra vienas iš pagrindinių IT gyvavimo ciklo etapų, susijęs su paslaugų kūrimu ir visais įgalinančiais komponentais jų įgyvendinimui realioje darbinėje aplinkoje. Keturios paslaugų dizaino sritys į kurias reikėtų atsižvelgti kuriant paslaugas: yra žmonės, procesai, produktai bei partneriai.

- Paslaugų perdavimas su paslaugų tarnybos perėjimo proceso tikslu - kurti ir diegti IT paslaugas, kartu užtikrinant, kad paslaugų ir paslaugų valdymo procedūrų pakeitimai būtų atliekami darniai.

- Aptarnavimo operacijos - tai IT valdymo paslaugų operacijos, susijusios su galutinių vartotojų lūkesčių tenkinimu, tuo pačiu subalansuojant išlaidas ir nustatant galimus sunkumus. Klientų užklausų vykdymas, paslaugų trikdžių šalinimas, išorinių trikčių numatymas ir šalinimas, įprastų veiklos pareigų atlikimas yra aptarnavimo operacijų proceso veiklos, apimanti funkcijas ir procesus.

- Nuolatinis paslaugų tobulinimas, kurio tikslas – taikyti kokybės vadybos sistemas, kad būtų galima mokytis iš ankstesnių pasiekimų ir klaidų. Ji siekia nuolat didinti IT procesų ir paslaugų efektyvumą, taikyti ISO standartus ir nuolatinio tobulinimo koncepciją.

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Nuolatinis paslaugų tobulinimas sprendžiamas septyniais žingsniais:
- Tobulintinų sprendimų nustatymas;
- Naudotinos metrikos nurodymas;
- Duomenų rinkimas;
- Duomenų tvarkymas;
- Duomenų analizė;
- Analitikos ir iš duomenų gautos informacijos pateikimas ir naudojimas;
- Duomenų naudojimas paslaugoms tobulinti.

ITIL padeda įmonėms pasiekti savo tikslus teikiant IT paslaugas. Tai išbandytas metodas, leidžiantis pritaikyti geriausią IT praktiką ir teikti viso gyvavimo ciklo paslaugas (AXELOS Limited, 2019). ITIL v4 skiriasi nuo kitų metodikų yra susijusi su paslaugų taikymu visoje istaigoje, įmonėje ar organizacijoje, ir susijusi su standartiniais IKT paslaugų teikimo metodais. Administratoriai gali pasirinkti taikyti tik atskirus ITIL elementus, naudodami kitas sistemas ar visą metodologinį karkasą. ITIL yra IKT infrastruktūros bibliotekos sudarymo ir valdymo geroji praktika, kurioje daugiausia dėmesio skiriama IKT infrastruktūros, paslaugų valdymo praktikoms. Kai tuo tarpu „Agile" yra procesų rinkinys, skirtas kurti programinę įrangą.

4. ITIL V4 METODIKOS TAIKYMO PAVYZDŽIAI ŠVIETIMO ĮSTAIGŲ IKT INFRASTRUKTŪROS PASLAUGŲ VALDYME

ITIL v4 metodika švietimo įstaigų IT infrastruktūros paslaugų valdyme gali būti ypač vertinga IKT inžinieriams. ITIL taikymo metodika padeda valdyti IKT infrastruktūros komponentus, juos derinti tarpusavyje, suskirstyti incidentus ir aptarnavimo užklausas į tam tikras kategorijas. Incidentais apibrėžiami neplanuoti IKT paslaugų nutraukimai arba paslaugų teikimo kokybės pablogėjimas (AXELOS Limited, 2019). Incidentų valdymas nėra tas pats, kas vartotojo paprastos aptarnavimo paslaugos užklausa. Paslaugos užklausa gali būti susijusi su sauga, patalpų valdymu, transporto priemonių parko rezervavimu, priemonių poreikiu ar turto valdymo stebėjimu. Pranešimas apie incidentą paprastai yra kažkas skubesnio nei, tarkime, prašymas dėl tam tikros įrangos poreikio įvertinimo. Incidentas tai įvykis, kuris turi neigiamos įtakos teikiamų IKT paslaugų kokybei, t.y. IKT paslaugos tampa neprieinamos arba teikiamos žemesniu nei sutarta kokybės lygiu. Tai gali būti kompiuterinio tinklo gedimas, kuris apriboja naudojimosi galimybes elektroninėmis paslaugomis. Kaip pvz., mokymosi aplinkos neprieinamumas pamokų metu. Kai kurie incidentai gali sukelti mokymo proceso sutrikimus.

IKT aptarnavimo centrai gali pagerinti veiklų teikimo galimybes. Dauguma švietimo įstaigų pereina į bendrą paslaugų aplinkos valdymo infrastruktūrą, kad galėtų vieningai valdyti incidentus ir neefektyvius procesus. IT valdymo paslaugų automatizuotos priemonės suteikia matomumą operacijų veiksmų vykdymui ir leidžia užtikrinti aukštesnį paslaugų teikimo dokumentavimo lygį ir tuo pačiu sumažinant incidentų skaičių.

Paslaugų valdymas taip pat leidžia vartotojams atlikti savitarnos veiksmus. Naudodamiesi savitarnos technologijomis, darbuotojai, prieš susisiekdami su aptarnavimo

centru, gali rasti paslaugų sutrikimų sprendimus. Įgyvendinus IKT paslaugų aptarnavimo funkcijas ir jas automatizavus, sumažėja aptarnavimo centro analitikų darbo krūvis.

Dauguma švietimo įstaigų naudoja paslaugų valdymo technologijas, kad galėtų dalytis informacija ir sprendimų rinkiniais su vartotojais. Ši technologija reiškia, kad aptarnavimo centrų vartotojai gali bendradarbiauti, dalintis duomenimis ir informacija tiesiogiai (Price, 2019). Pasaulyje, kuriame tikimasi visada gauti tinkamas IKT infrastruktūros palaikymo paslaugas, svarbu turėti greitą ir paprastą incidentų valdymo procesą. Incidentų valdymo praktikos tikslas – sumažinti neigiamą incidentų poveikį kuo greičiau atkuriant įprastą paslaugų veikimą.

Vienas iš programinės įrangos pasirinkimo pavyzdžių - tai "FreshDesk" programinis paketas, kuris įgalina IKT paslaugų tvarkymo ir operacijų atlikimo komandos suformavimą ir reagavimo veiksmus į neplanuotus įvykius, paslaugų sutrikimo atvejus, kad būtų atkurta paslauga.

Sistemoje incidentas turi būti užregistruotas ir tvarkomas taip, kad jis būtų išspręstas per tą laiką, kuris atitinka kliento ir vartotojo lūkesčius. Incidento sprendimo laikas yra susitartas, dokumentuotas ir perduotas siekiant užtikrinti, kad lūkesčiai būtų realūs. Incidentams suteikiamas prioritetas, remiantis sutarta klasifikacija, siekiant užtikrinti, kad incidentai turintys didžiausią poveikį veiklai, pirmiausia būtų išsprendžiami. Organizacijos turėtų sukurti savo incidentų valdymo praktiką, tinkamą valdymą ir išteklių paskirstymą įvairių tipų incidentams valdyti. Mažo poveikio incidentai turi būti valdomi efektyviai, kad būtų užtikrinta, jog nebus sunaudota per daug išteklių. Didesnio poveikio incidentams gali prireikti daugiau išteklių ir sudėtingesnio valdymo. Paprastai yra atskiri procesai didelių incidentų valdymui ir informacijos saugumo incidentų valdymui. Informacija apie incidentus turėtų būti saugoma incidentų įrašuose naudojant tinkamą įrankį. Idealiu atveju šis įrankis taip pat turėtų pateikti nuorodas į susijusius pakeitimus, problemas, žinomas klaidas ir pateikti kitų žinių, leidžiančių greitai ir efektyviai diagnozuoti bei atkurti incidentus.

Šiuolaikiniai IKT infrastruktūros paslaugų valdymo įrankiai gali užtikrinti automatinį incidentų valdymą ir pateikti išmaniųjų incidentų duomenų analizę, siekiant sudaryti rekomendacijas, kaip padėti būsimiems incidentams.

Svarbu, kad žmonės, dirbantys su incidentu, pateiktų informacijos atnaujinimus laiku. Šiuose atnaujinimuose turėtų būti informacija apie sutrikimus, verslo poveikį, incidento paveiktas sritis, užbaigtus veiksmus ir planuojamus veiksmus. Kiekvienas iš šių komponentų turėtų turėti laiko žymą ir informaciją apie dalyvaujančius žmones, kad galėtų būti nuolat informuojami. Gali prireikti ir bendradarbiavimo įrankių, kad žmonės, dirbantys su incidentu, galėtų bendradarbiauti efektyviai.

Incidentus gali nustatyti ir išspręsti įvairių grupių žmonės, atsižvelgiant į problemos sudėtingumą arba incidento tipą. Visos šios grupės turi suprasti incidentų valdymo procesą ir vykdyti jiems priskirtas veiklas, nes tai padeda valdyti paslaugų vertę, rezultatus, išlaidas ir riziką:
- Kai kuriuos incidentus gali išspręsti patys vartotojai, pasitelkę savipagalbą. Naudojimui turėtų būti fiksuojami konkretūs savipagalbos įrašai.
- Kai kuriuos incidentus gali išspręsti aptarnavimo skyrius.

- Sudėtingesni incidentai paprastai perduodami palaikymo komandai (support team) tolesniam sprendimui. Paprastai sprendimas yra pagrįstas incidento kategorija, kuri turėtų padėti atpažinti tinkamą incidento sprendimą.
- Incidentas gali būti perduotas tiekėjams ar partneriams, kurie siūlo savo pagalbą, produktus ir paslaugas.
- Sudėtingiausiems incidentams ir visiems dideliems incidentams inicijuojamas problemų valdymo procesas, kuris atsakingas už išsamų incidento tyrimą ir galimų sprendimų paiešką. Problemų valdymo komandoje gali būti daugelio suinteresuotųjų šalių atstovai, įskaitant paslaugų teikėją, tiekėjus, vartotojai ir kt.
- Kai kuriais ekstremaliais atvejais, siekiant išspręsti problemą, gali būti naudojami atkūrimo planai.

Veiksmingas incidentų valdymas dažnai reikalauja aukšto lygio bendradarbiavimo tarp komandos narių ar atskirų komandų. Šios komandos gali apimti aptarnavimo skyrių, techninę pagalbą, programų palaikymo specialistus, IKT tiekėjus. Bendradarbiavimas gali palengvinti dokumentavimo procesus, informacijos apsikeitimą ir padėti efektyviau išspręsti incidentą.

Kai kurios organizacijos naudoja techniką, vadinamą „spiečių", kad padėtų valdyti incidentus. Tai apima daug skirtingų suinteresuotųjų šalių, kurios iš pradžių dirba kartu, kol paaiškės, kuri iš jų geriausiai tinka tęsti užduotį, o kuri gali pereiti prie kitų užduočių.

Taikant „Fresh Desk" programinę įrangą atliekamas formalizuotas incidentų registravimo ir valdymo procesas. Šis procesas paprastai neapima išsamių diagnozavimo, tyrimo ir incidentų sprendimo procedūrų, bet gali pasiūlyti efektyvesnius tyrimo ir gedimo nustatymo metodus. Tai gali būti scenarijai informacijai iš vartotojų rinkti, pradiniai kontaktiniai duomenys, kurie palengvina paprastų incidentų sprendimą. Sudėtingesnių incidentų tyrimas dažnai reikalauja ekspertinių žinių. Pirmenybė teikiama tiek incidentų dažnumo, tiek sunkumo lygiui įvertinti:

- Incidentų valdymui reikalingas reguliarus bendravimas tarp IKT paslaugų teikėjų ir vartotojų, kad suprasti gedimus, nustatyti lūkesčius, pateikti būsenos atnaujinimus ir informuoti, kuris gedimas spendžiamas ar išspręstas ir incidentas pašalintas;
- Atliekamas IKT konfigūravimas, projektavimas ir perėjimas prie naujesnių infrastruktūros komponentų versijų, kai bandomosios versijos testuojamos prieš pateikiant naujas paslaugas;
- Numatymas ir vertinimas kaip „gauti/kurti" naujas IKT paslaugas, kad perėjimo prie naujų technologijų metu reinžinerijos klausimai nesukeltų darbo veiklų trikdžių, kad pokyčiai būtų iš anksto suplanuoti, atsiradę incidentai būtų išspręsti laiku ir sukontroliuoti;
- Stengiamasi, kad naujovių pristatymas darbuotojams ir pokyčių perteikimas įgalintų tinkamą problemų sprendimą.

Gimnazija vadovaujasi X miesto savivaldybės tarybos patvirtintu veiklos modeliu, kuriuo siekiama stiprinti mokinių STEAM, t.y. gamtos mokslų, technologijų, inžinerijos, matematikos ir menų srities dalykų mokymą ir kartu formuoti mokinių vertybines nuostatas, taikant klasikinio ugdymo sampratos elementus. Pagal tokį STEAM ugdymo modelį, įgyvendinamos visų veiklų skaitmenizavimo užduotys, į kurias taip pat įkomponuojamos dėstytojų-mokytojų

darbo užmokesčio apskaitos ir skiriamų lėšų apskaitos ir pan. užduotys. Su planavimu susiję uždaviniai sprendžiami tam tikra tvarka:

- nustatomas X švietimo įstaigos atitinkamų klasių skaičius mokslo metams ir derinamas su Savivaldybės tarybos sprendimu;
- vertinamas dėstytojų-mokytojų etatų skaičius ir išlaidų jų darbo užmokesčiui poreikis teisės aktų nustatyta tvarka, atsižvelgus į formuojamų klasių ir skiriamų valandų per metus dalykų mokymui skaičių (etatų skaičiavimo principai);
- planuojamos Savivaldybės biudžeto tikslinės lėšos Savivaldybės strateginiame veiklos plane dėstytojų-mokytojų darbo užmokesčiui, pagal poreikį Gimnazijos mokomosios aplinkos gerinimui, mokymosi priemonių užsiėmimams įsigijimui ir skiriamos Gimnazijai teisės aktų nustatyta tvarka. Papildomais finansavimo šaltiniais gali būti ES struktūrinių fondų, nacionalinių ir tarptautinių švietimo programų, verslo įmonių ir asociacijų, Gimnazijos paramos ir kt.

Švietimo įstaigos dokumentacija yra registruojama sistemoje „Avilys", kurios pagalba dokumentai yra perduodami kitoms rajono švietimo įstaigoms ar miesto savivaldybės specialistams. Tačiau didžioji dauguma dokumentų yra popieriniai ir nėra pereita visiškai prie el. dokumentų valdymo sistemos. Mokiniai yra įtraukiami į mokinių registrą. Mokinių priėmimas kompiuterizuotas, tačiau turi trūkumų.

Visų veiklų, kurioms reikia organizuoti IKT aprūpinimą modelis pateikiamas (1 pav).
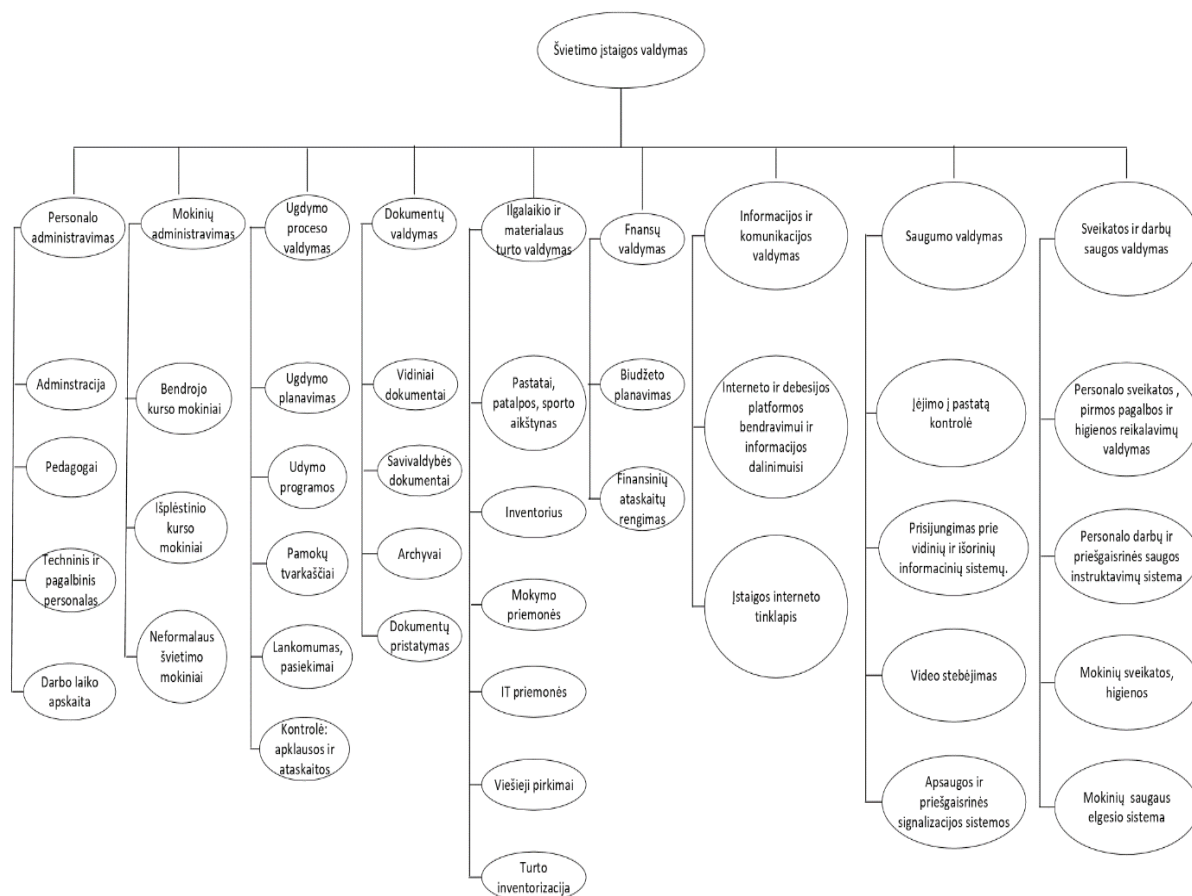
1 pav. X švietimo įstaigos (gimnazijos) veiklų hierarchinis medis

Mokinių vertinimas yra suvedamas į el. dienyną - „Mano dienynas", kurio pagalba vyksta įstaigos darbuotojų ir mokinių bei jų tėvų tam tikra komunikacinė veikla. Toks skaitmeninis dienynas yra įrankis mokinių lankomumui stebėti.

Gimnazijos IKT infrastruktūra susideda iš daugelio komponentų, tokių kaip darbo vietų kompiuteriai, jų prieiga prie kompiuterinių tinklų, serverių ir kitų sistemų (Lentelė 2). Yra naudojami spartesnės prieigos tinklai, pvz., LitNet tinklas, valdomos ir pateikiamos belaidžių tinklų funkcijos WAN, LAN, Interneto teikimo funkcijos (INT), kitos belaidžio tinklo aprėpties technologijos, tokios kaip Wi-Fi, internetinių sąsajų su Nacionalinės reikšmės registrais platformos: vatis.lt - valstybės tarnautojų registras ir valstybės tarnybos valdymo informacinė sistema (VATARAS/VATIS), administracinių ir viešųjų el. paslaugų portalas - epaslaugos.lt, internetinė sistema - pedagogai.emokykla.lt , jungiantis pedagogų registrą, švietimo ir mokslo institucijų registrą- smir.smm.lt, aukštesnių valdymo funkcijų platformą - bvs.klaipeda.lt, kuri turi sąsajas su strateginio planavimo informacinė sistema ir kt.

Įdiegus bendradarbiavimo sistemas (tokias kaip SharePoint), įstaigoje būtų galimybė sukurti daugiau vertės vartotojui sutaupant laiko gaunant operatyvesnes paslaugas. Pasiūlytos paslaugos leistų sumažinti popierinės dokumentacijos apimtis, perkeliant daugumą informacijos į informacines sistemas ir taupant laiką, kai informacija kartojasi ir jos reikia išskirstytos pagal poreikius esamuoju laiku.

IT infrastruktūros paslaugų valdymas, taikant ITIL metodologiją, kuria vis didesnę pridėtinę vertę, nes leidžia sparčiau dirbti ir didinti IKT infrastruktūros aptarnavimo paslaugų produktyvumą. Bet kokia techninė įranga, kaip pavyzdžiui, galingo serverio ar duomenų centro įsigijimas, reikalauja tinkamo planavimo veiksmų ir mokėjimo integruoti tarpusavyje susijusią programinę įrangą, išmanyti visą IT infrastruktūrą ir IT aptarnavimą. Svarbus išlieka ir tinkamas kainos bei patikimumo derinys.

Konkrečios švietimo įstaigos IKT infrastruktūra susideda iš įvairių IT komponentų ir teikiamų produktų ir paslaugų (Lentelė 1). Tai daugelio komponentų: techninės įrangos ir programinės įrangos sąveiki integracija. Integruojama techninė įranga (pvz., staliniai, nešiojami kompiuteriai, serveriai, tinklo įranga) ir programinė įranga (pvz., vartotojų grupėms skirtos kompiuterinės priemonės ir programinės sisteminės, operacinės sistemos bei su jų darbu susijusi taikomoji programinė įranga).

5. EKPERIMENTINIO TYRIMO REZULTATAI X GIMNAZIJOS IKT INFRASTRUKTŪROS INCIDENTŲ VALDYMUI

IKT infrastruktūros paslaugų valdymui skirtos programinės įrangos pasaulyje yra nemažai. Galima paminėti tokias sistemas, kaip JIRA Service Desk, Help Desk, FreshDesk ir kt. Viena iš lengviau adaptuojamų sistemų paminėtina FreshDesk, leidžianti atlikti agentų rolių priskyrimą ir incidentus aptarnaujančių grupių sukūrimą, pokalbių palaikymą, el. pašto ir pranešimų persiuntimo funkcijas potencialiems klientams, pagalba telefonu, svetainių „Facebook" ir „Twitter" funkcijų integravimą į taikomas paslaugas. Sistemos priemonėmis atliekami vieši ir privatūs pranešimai apie iškilusius incidentus, užklausų apie iškilusius incidentus gavimas ir sprendimo organizavimas. Yra integruotos tokios galimybės: kaip prietaisų stebėsenos skydelis, užklausų apimties tendencijų ataskaitų generavimas, užklausų

sujungimas, bendrosios autentifikacijos ir SSL sertifikatas, DKIM (DomainKeys Identified Mail) konfigūracijos funkcijos (FreshDesk. com).

Eksperimentiniam tyrimui atlikti buvo imituojami tam tikri organizacijos IT infrastruktūros trikdžiai ir programos FreshDesk priemonėmis sprendžiami incidentai. Imituojami trikdžiai tokie kaip incidentai, kurie gali kilti ir yra susiję su techniniais, programiniais gedimais arba žmogiškaisiais veiksmais. Nagrinėjami realiai kylantys techninių gedimų incidentai švietimo organizacijoje. Buvo atliekami keli žingsniai eksperimentuojant su programine įranga FreshDesk:

- Registracija FreshDesk.com svetainėje;
- Komandos narių suskirstymas rolėmis: administratorius, agentai;
- Incidentų tipo (skubus, vidutinis, neskubus) ir atlikimo laiko nustatymas;
- Informacijos apie incidentų atlikimą pateikimas;
- Ataskaitų peržiūra ir įvertinimas.

X gimnazijai interneto ryšį ir kompiuterinio tinklo funkcijas Lietuvos mokslo ir studijų institucijų kompiuterių tinklas LITNET. Pagrindinės LITNET paslaugos, kurios gali būti teikiamos organizacijai yra šios: interneto ryšys; belaidis tinklas Wi-Fi; Domenų vardų registracija; el. paštas; tinklapių priegloba; mokymai.

Pagrinde organizacija naudojasi interneto ryšio ir belaidžio tinklo paslaugomis. Atidžiau nagrinėjami belaidžio tinklo Wi-Fi paslaugos incidentai.

LENTELĖ1. IKT INFRASTRUKTŪROS SANDARA X ŠVIETIMO ĮSTAIGOJE

Eil. Nr.	Veiklos/ funkcijos	Organizacijos informacinių technologijų infrastruktūros sandara				
		Techninė įranga ir kompiuterių tinklai			Programinė sisteminė įranga	Taikomoji programinė įranga
		Kompiuterių tinklai (WAN, LAN, WIFI, INT)	Kompiuterizuotos darbo ir mokymo vietos techninė įranga	Kita techninė įranga	Operacinės sistemos, Saugos sistemos	Taikomos programos ir WEB įrankiai
1.	Informacijos ir komunikacijos valdymas	WAN, LAN, INT (iki 1 Gb/s, WIFI (iki 1 Mb/s, realiai apie 200 Mb/s). INT šviesolaidinis ryšys per LITNET.	1. **Ethernet** 144 stacionarios darbo ir mokymosi vietos. 2. **WiFi** – iki 600 nešiojamų kompiuterių ir išmaniųjų įrenginių. Atskiros vietinės tarnybinės stoties įstaiga neturi	**Interneto tinklus valdanti įranga:** 1. Ethernet maršrutizatoriai ir komutatoriai, 4 vnt-valdomi ir 6 nevaldomi. 2. WiFi prieiga per MIKROTIK RB760iGS maršrutizatorių ir komutatorių UNIFI US24P250, 26 WiFi taškai UNIFI U7LR.	**Operacinės sistemos:** 1. Stacionariose darbo ir mokymosi vietose pagrindinė OS – MS Windows 10/11. 2. Išmanieji įrenginiai su OS Android. 3. Išmanieji įrenginiai su iOS. **Saugos sistemos:** 1. Stacionariose darbo ir mokymosi vietose – standartinis MS Windows OS saugos įrankių rinkinys. 2. LITNET teikiama Ethernet ir WiFi prisijungimo prie Internet duomenų stebėsenos ir filtravimo sistema, naudojanti Fortigate su UTM programinę įrangą.	LITNET teikiama Ethernet ir WiFi prisijungimo prie Internet duomenų stebėsenos ir filtravimo sistema.
1.1	Interneto ir debesijos platformos bendravimui ir informacijos dalinimuisi	Įstaiga turi valdomus WAN, LAN, INT (iki 1 Gb/s, WIFI (iki 1 Mb/s, apie 200 Mb/s). INT šviesolaidinis ryšys per LITNET.	Visi PK ir išmanieji įrenginiai Debesijos tarnybinės stotys		„Google For Education" platformoje taikomos saugos ir filtravimo sistemos.	**Google For Education** platformoje teikiamos programos stacionarioms darbo ir mokymosi vietoms ir išmaniosios programėlės telefonams, planšetėms ir išmaniems ekranams. **Office 365** platforma, kurią teikia mokykloms emokykla.lt. **Organizacijos oficialus puslapis** - programa PyroCMS, Inc 0.17 s | 14 mb v3.3.3
1.2	Įstaigos interneto tinklapio valdymas	Įstaiga turi valdomus WAN, LAN, INT (iki 1 Gb/s, WIFI (iki 1 Mb/s, realiai apie 200 Mb/s).	Visos darbo vietos Debesijos tarnybinės stotys		Prie tinklapio TVS ir domeno valdymo sistemos gali prisijungti tik įstaigos įgalioti darbuotojai.	1. Web platforma leidžianti redaguoti švietimo įstaigos tinklapį. 2. iv.lt web klientų sistema, teikianti interneto tinklapio domeno valdymo planą. 3. wolet.lt virtualaus serverio paslaugos svetainės prieglobai.

Eil. Nr.	Veiklos/ funkcijos	Techninė įranga ir kompiuterių tinklai			Programinė sisteminė įranga	Taikomoji programinė įranga
		Kompiuterių tinklai (WAN, LAN, WIFI, INT)	Kompiuterizuotos darbo ir mokymo vietos techninė įranga	Kita techninė įranga	Operacinės sistemos, Saugos sistemos	Taikomos programos ir WEB įrankiai
		INT šviesolaidinis ryšys per LITNET.				
2.	Personalo administravimas	LAN, INT	Personalo administravimo darbo vietos		Naudotojo autentifikavimo ir dokumentų pasirašymo sistema naudojanti el. asmens sertifikatą.	Portalas skirtas Valstybinio socialinio draudimo fondo biudžeto pajamoms ir išlaidoms sodra.lt
2.1	Administracijos atliekamos funkcijos	Atskiras administracijai skirtas LAN potinklis.	Tik administracijos PK	Spausdintuvai, kopijuokliai, skeneriai, asmeniniai išmanūs įrenginiai, projektoriai ir išmanieji ekranai.	MS Windows OS, Android OS, iOS. Gali prisijungti tik įstaigos įgalioti darbuotojai. Naudotojo autentifikavimo ir dokumentų pasirašymo sistema naudojant elektroninį asmens sertifikatą.	1. Web platforma vatis.lt - Valstybės tarnautojų registras ir valstybės tarnybos valdymo informacinė sistema (VATARAS/VATIS). 2. Administracinių ir viešųjų elektroninių paslaugų portalas epaslaugos.lt
2.2	Pedagogų administravimas	Atskiras pedagogams ir mokiniams skirtas LAN potinklis.	Pedagogams skirti PK	Spausdintuvai, kopijuokliai, skeneriai, asmeniniai išmanūs įrenginiai, projektoriai ir išmanieji ekranai.	MS Windows OS, Android OS, iOS. Gali prisijungti tik įstaigos įgalioti darbuotojai	1. Web sistema pedagogai.emokykla.lt – pedagogų registras. 2. Švietimo ir mokslo institucijų registras smir.smm.lt .
3.	Mokinių administravimas	Atskiras, mokytojams ir mokiniams skirtas LAN ir WiFi.	Mokytojams ir mokiniams skirti PK Asmeniniai išmanūs įrenginiai PK		MS Windows OS, Android OS, iOS. Griežtesnis mokinių WiFi duomenų filtravimas. El. dienyno naudotojų prisijungimų valdymas, suteikiant slaptažodžius.	1. emokykla.lt – mokinių registras. 2. Švietimo ir ugdymo įstaigų valdymo Web sistema „Mano dienynas"
4.	Ugdymo proceso valdymas	LAN,NT				1. Pamokų tvarkaraščių sudarymo programa „Mimosa" arba aSc Timetables. 2. El. dienynas „Mano dienynas. 3. Švietimo valdymo informacinė sistema ŠVIS.
5.1	Vidiniai ir savivaldybės dokumentai	LAN, INT	Administracijos PK Nutolęs serveris		Tik registruotiems naudotojams su, naudojant prisijungimo vardą ir slaptažodį.	Dokumentų valdymo sistema @vilys.
5.2	Dokumentų archyvas	LAN, NT	Administracijos PK Nutolęs serveris		Tik registruotiems naudotojams su, naudojant prisijungimo vardą ir slaptažodį.	El. archyvo IS -eais-pub.archyvai.lt .

Eil. Nr.	Veiklos/ funkcijos	Techninė įranga ir kompiuterių tinklai			Programinė sisteminė įranga	Taikomoji programinė įranga
		Kompiuterių tinklai (WAN, LAN, WIFI, INT)	Kompiuterizuotos darbo ir mokymo vietos techninė įranga	Kita techninė įranga	Operacinės sistemos, Saugos sistemos	Taikomos programos ir WEB įrankiai

Organizacijos informacinių technologijų infrastruktūros sandara

Eil. Nr.	Veiklos/ funkcijos	Kompiuterių tinklai (WAN, LAN, WIFI, INT)	Kompiuterizuotos darbo ir mokymo vietos techninė įranga	Kita techninė įranga	Operacinės sistemos, Saugos sistemos	Taikomos programos ir WEB įrankiai
5.3	El. dokumentų pristatymas	LAN,INT	Administracijos PK		Tik registruotiems naudotojams su, naudojant prisijungimo vardą ir slaptažodį.	Nacionalinė el, siuntų pristatymo IS E. pristatymas – epristatymas.lt
6.	Finansų, biudžeto planavimas	LAN, INT	Administracijos PK		Tik registruotiems naudotojams su, naudojant prisijungimo vardą ir slaptažodį.	Strateginio planavimo informacinė sistema bvs.klaipėda.lt
7.1	Saugumo valdymas: Praėjimo kontrolė vaizdo stebėjimo sistema, lankomumo apskaitos sistemos	WAN, INT, Wi-Fi	Kortelė, biometrinis skaitytuvas, vaizdo stebėjimo kameros, antenos, Serveris.		MS OS; Mokinių ir darbuotojų kortelių nuskaitymo sistema. TCP/IP, sąsaja RS232 RFID žymos -kortelės, RFID skaitytuvas ir programinė įranga.	RFID metodas (eng. radio frequency identification).Automatinis objektų identifikacijos metodas, pagrįstas informacijos saugojimu ir nuotoliniu perdavimu radijo bangų pagalba. Gali būti sujungta su „Mano dienynas" tada bus stebimas ir pamokų lankomumas bei personalo darbo laikas.
7.2	Apsaugos ir priešgaisrinės signalizacijos sistemos.		Centralė, transformatorius, akumuliatorius, korpusas, davikliai, magnetiniai kontaktai, sirena, klaviatūra, išplėtimo moduliai.		MS Windows OS	Kameros ir pastato perimetras valdomi internetu iš „Ekskomisarų" biuro.
8.	Ilgalaikio materialaus turto apskaita ir eksploatacija					
8.1	Pastatų apskaitai	WAN, LAN, INT INT	Administracijos PK, Inventorizacijos Kompiuteris		MS Windows OS. Gali prisijungti tik įstaigos įgalioti darbuotojai	Registrų centro savitarna - registrucentras.lt/savitarna/
8.2	Ilgalaikio-trumpalaikio turto mokymo priemonių, IKT inventoriaus valdymas					Web platforma bvs.klaipeda.lt - strateginio planavimo informacinė sistema
8.3	Viešieji pirkimai	INT	Administracijos PK		MS Windows OS. Gali prisijungti tik įstaigos įgalioti darbuotojai	1. Centrinė viešųjų pirkimų sistema - pirkimai.eviesiejipirkimai.lt

Eil. Nr.	Veiklos/ funkcijos	Techninė įranga ir kompiuterių tinklai			Programinė sisteminė įranga	Taikomoji programinė įranga
		Kompiuterių tinklai (WAN, LAN, WIFI, INT)	Kompiuterizuotos darbo ir mokymo vietos techninė įranga	Kita techninė įranga	Operacinės sistemos, Saugos sistemos	Taikomos programos ir WEB įrankiai
						2. Elektroniniai centralizuoti viešieji pirkimai tiekėjams ir pirkėjams – cpo.lt
8.4	Bibliotekos administravimas	INT	Bibliotekos PK	Kodų skaitytuvas	MS Windows OS. Gali prisijungti tik įstaigos įgalioti darbuotojai	1. MOBIS programinė įranga yra skirta nedidelei mokyklos ar organizacijos bibliotekai – imobis.lt 2. Lietuvos Respublikos bibliotekų integralios informacijos sistema LIBIS – Ibiblioteka.lt
9.	Personalo ir mokinių sveikatos patikros kontrolės sistema	INT	Sveikatos specialisto PK		MS Windows OS. Gali prisijungti tik visuomenės sveikatos centro įgalioti darbuotojai.	Elektroninė sveikatos istorija pacientui ir gydytojui - esveikata.lt
10.	Darbuotojų apskaita	INT	Dokumentų koordinavimo specialistai, buhalterio PK		MS Windows OS.	„Personalo apskaitos" programa
11.	Darbuotojų atlyginimų apskaita	INT	Dokumentų koordinavimo specialistai, buhalterio PK		MS Windows OS.	Biudžetas VS

Norint naudotis gimnazijos belaidžiu tinklu reikia pasinaudoti LITNET teikiama internetine informacine sistema (IS), kurią galima rasti adresu https://epaslaugos.lm.lt/.

Šios informacinės sistemos dėka organizacija gali:

- Administruoti saugios belaidės prieigos (Wi-Fi) prie interneto naudotojus (mokytojus, mokinius, darbuotojus, įrenginius).
- Stebėti Wi-Fi zonas (maršrutizatorius, komutatorius, ir prieigos taškus).
- Filtruoti prieigas prie tam tikrų tinklapių.
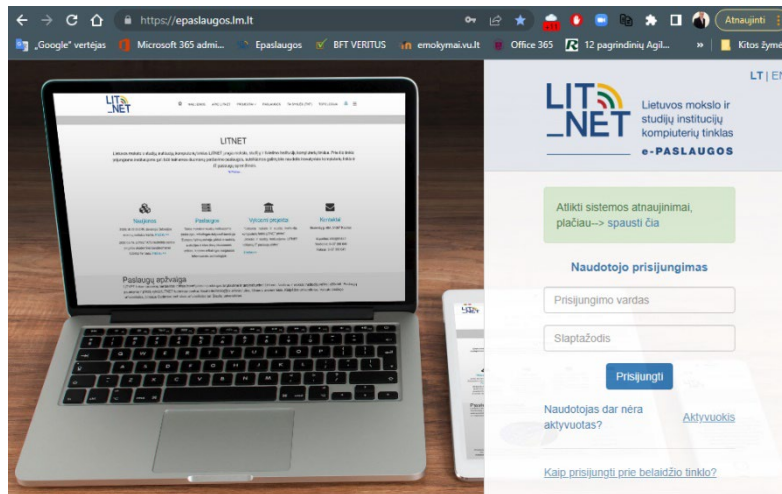
2 pav. LITNET teikiamos internetinės IS valdymo langas

LITNET internetinė IS leidžia organizacijos naudotojų administravimo lange atlikti naudotojų paiešką pagal vardą, pavardę arba prisijungimo prie Wi-Fi vardą. Taip pat yra galimybė eksportuoti naudotojų duomenis *.csv formatu ir juos atsidaryti MS EXCEL programoje. Tokių duomenų prireikia mokslo metų pradžioje, kai išdalinami prisijungimo duomenys naujiems pedagogams ir mokiniams.
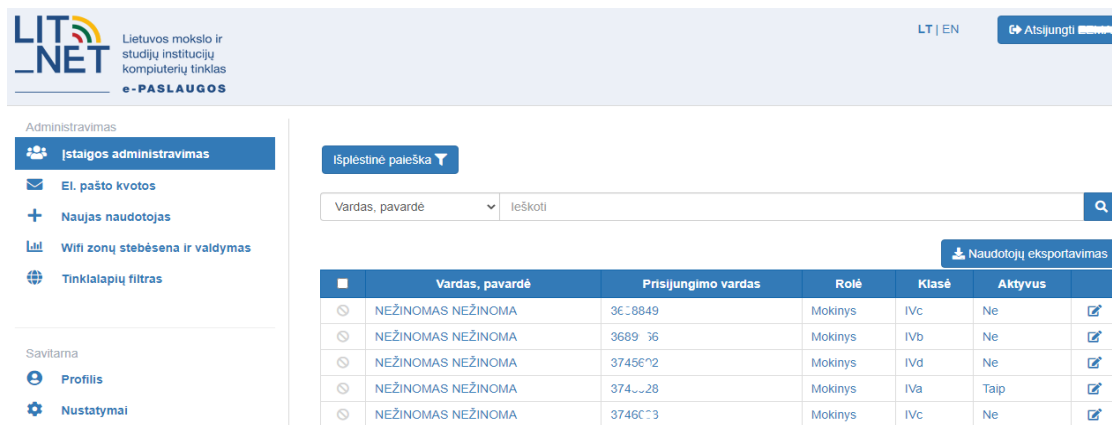
3 pav. LITNET internetinės IS naudotojų administravimo langas

Pagal naudotojus į IS galima importuoti *.xml formato failus, kurie gaunami eksporto būdu iš Pedagogų ir Mokinių registrų. Čia sprendžiama ir tam tikra problema, kai mokslo metų pradžioje užtrunka procesas, kol šalies Pedagogų ir Mokinių registrai atsinaujina. LITNET IS numatyta galimybė pasiūlyti vieną ar kitą interneto resursą įtraukti į juodą arba baltą sąrašą. Tuomet tinkle toks resursas gali būti blokuojamas arba atvirkščiai, sukuriama saugi el. erdvė. LITNET internetinė IS leidžia spręsti galimus incidentus dėl nesaugių ar žalingo turinio tinklapių lankymo (4 pav.).
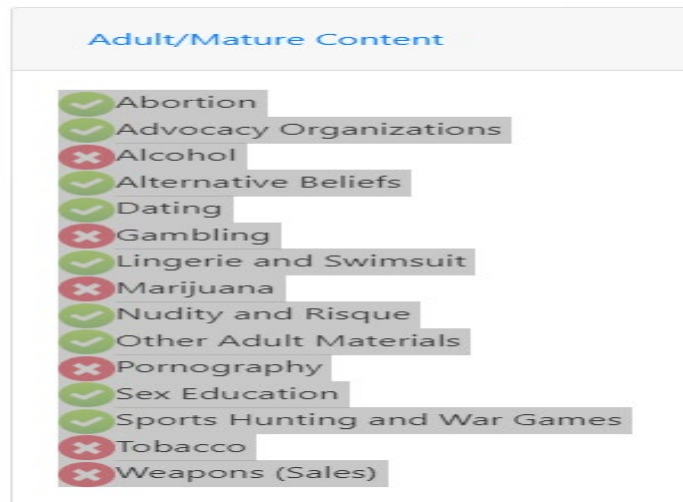
4 pav. Tinklalapių kategorijų apribojimo galimybės LITNET internetinėje IS

Turinio filtravimui yra naudojama LR Ryšių reguliavimo tarnybos aprobuota filtravimo priemonė "Fortigate su UTM programine įranga" (Fortigate, 2021).

IS leidžia atlikti nuolatinį naudojamų Wi-Fi zonų monitoringą (maršrutizatoriai, komutatoriai, ir prieigos taškai). Spalio 31 d. gimnazijoje buvo gautas skambutis telefonu iš LITNET, kad jų IS užfiksavo, jog mokyklos bibliotekoje nustojo tinkamai veikti Wi-Fi prieigos taškas, galima pastebėti minusą, kad pačios gimnazijos IKT specialisto ši IS neinformuoja automatiškai el. paštu ar kitomis komunikacinėmis priemonėmis.
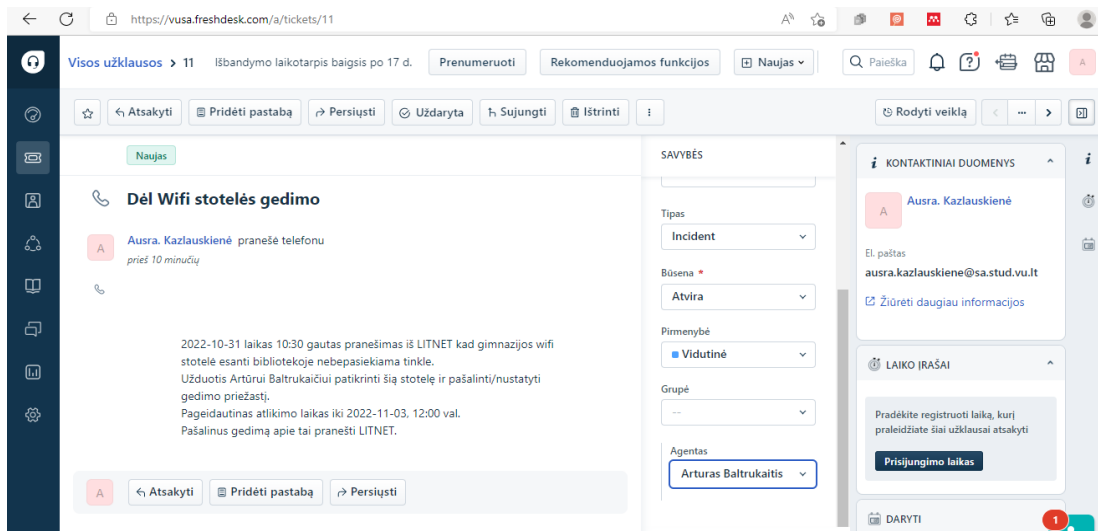
5 pav. Incidentų registravimo aplinkos valdymas FreshDesk sistemoje

Taikant FreshDesk pagalbos sistemą, nuspręsta šį incidentą susieti su minėtą platformą ir taip pat LITNET IS, kuri skirta WI-Fi tinklo stebėsenai. Tuo tikslu IKT specialistas buvo įtrauktas į reikiamą grupę FreshDesk pagalbos platformoje (6 pav.). FreshDesk pagalbos sistemoje registruotą pranešimą galima stebėti ir išmanaus telefono mobilioje aplikacijoje. Gedimo atsiradimo momentas ir numatomas jo pašalinimo terminas yra fiksuojamas sistemoje.
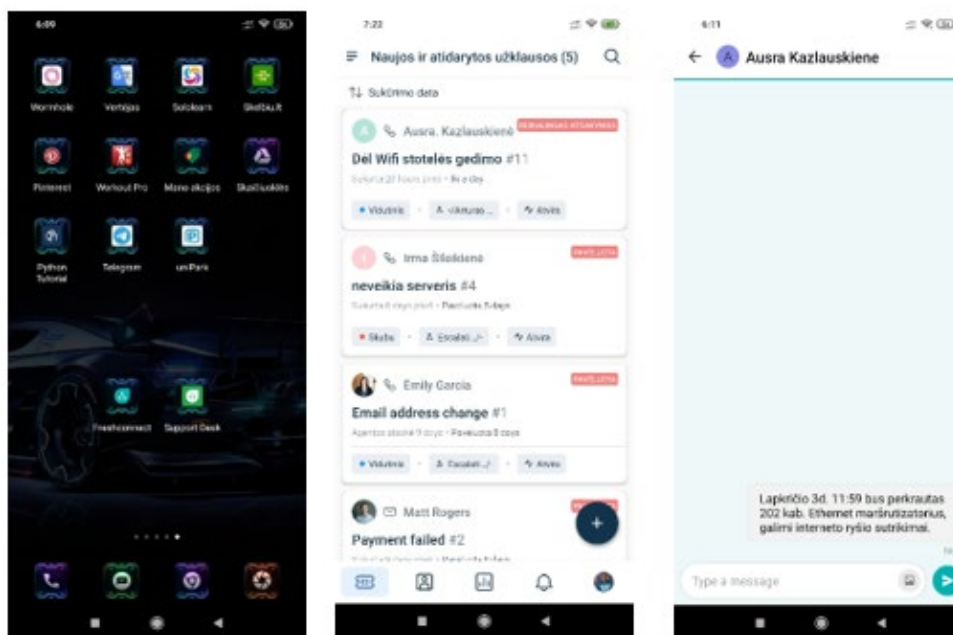
6 pav. FreshDesk užklausos langas matomas ir valdomas mobiliajame įrenginyje

Gavęs naują užklausą IKT specialistas turi galimybių prisijungia prie LITNET IS ir gali nustatyti - koks prieigos taškas konkrečiai yra sutrikdytas, t.y. nustatoma, kad nepasiekiamas yra M-304K indeksu pažymėtas Wi-Fi prieigos taškas (7 pav.).

7 pav. LITNET internetinės IS valdymo langas

Pateikiama keletas pavyzdžių kaip teikiamos LITNET IS funkcijos užtikrinančios prieigos taškų monitoringo paslaugas. Sistemoje galima matyti veikiančius komutatorius ir maršrutizatorius: jų modelius, IP adresus, serijinius numerius, veikiančius ir neveikiančius portus (8 pav.).
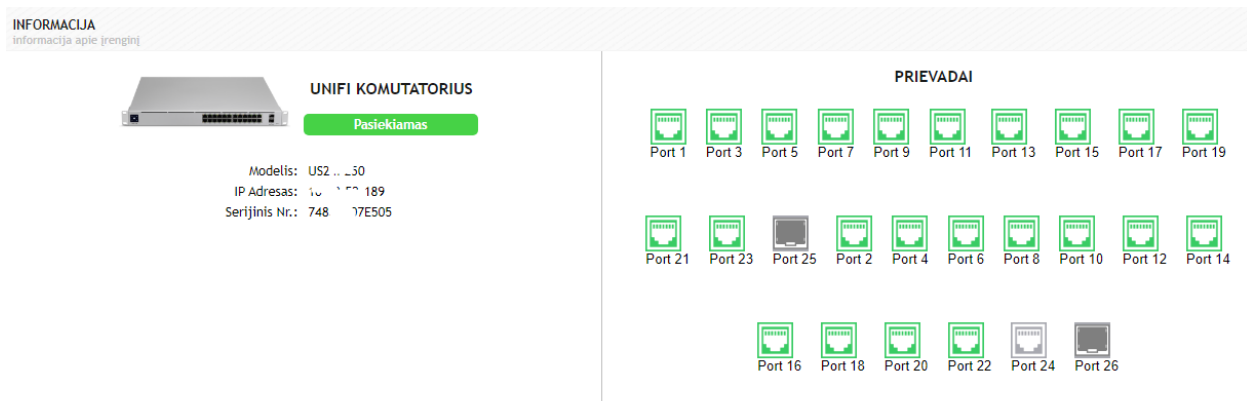
8 pav. LITNET IS teikiamų monitoringo paslaugų valdymas

Matomi Wi-Fi prieigos taškai: vieta, modelis, IP adresas, prisijungusių įrenginių skaičiai, duomenų srauto sparta, pasiekiamumas, konkrečius prisijungusius įrenginius, jų ryšio kokybė procentais, MAC adresai, prisijungimo vardai ir panaudotas duomenų srautas (9 pav.).
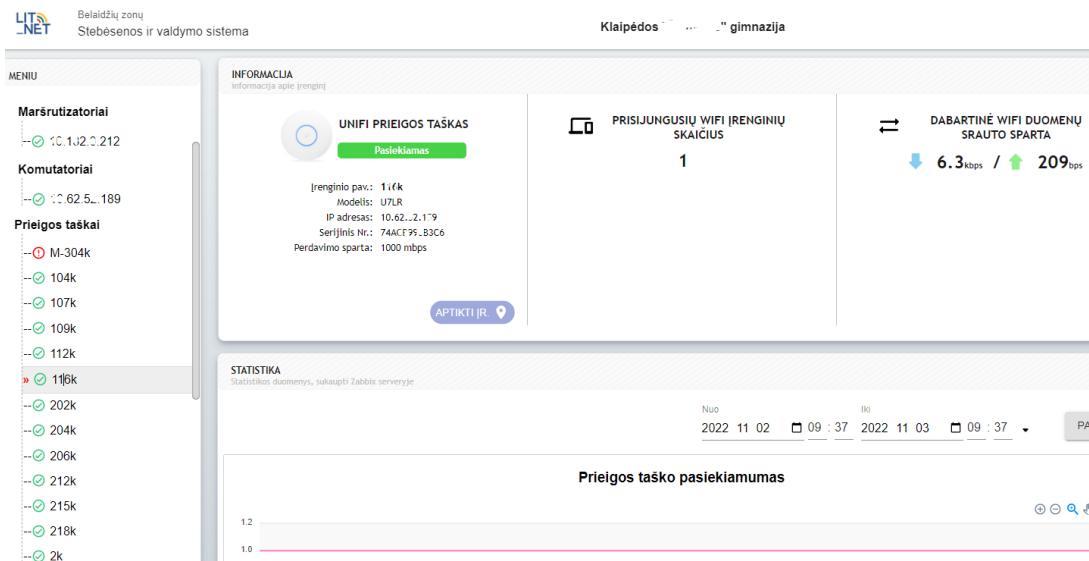
9 pav. Prieigos taško pasiekiamumo vadymas

Kadangi buvo numanoma, kad Wi-Fi prieigos taško incidentas gali būti susijęs su kabinete esančiu Ethernet maršrutizatoriumi, tai FreshDesk sistemoje buvo suformuota dar viena užduotis, kuri priskirta IKT specialistui ir tuomet abi užduotys apjungtos (10 pav.). Toks darbų apjungimas leidžia mažinti žmogiškųjų resursų sąnaudas.

10 pav. FreshDesk programos aplinkoje valdomos darbus apjungiančios užklausos

Po tam tikro laiko reikiama tinklo įranga buvo fiziškai atstatyta, perkrauta reikiama įranga ir Wi-Fi stotelė pradėjo veikti tinkamai.

Svarbu paminėti kad LITNET IS sistemoje galima WiFI srauto analizė.

11 pav. Prisijungusių įrenginių sąrašo stebesenos langas

Po atliktų veiksmų X gimnazijos WiFi įranga pradėjo veikti tinkamai.

Atliktų eksperimentinių darbų rezultatai demonstruoja, kaip galima jungti į visumą keletą labai svarbias IKT infrastruktūros valdymo paslaugas aptarnaujančių skirtingų sistemų darbą ir gauti tinkamą funkcionalumą.

6. IŠVADOS

Prieiga prie IKT valdymo paslaugų ir gebėjimas valdyti incidentus bei nenumatytus IKT gedimo atvejus reikalauja atitinkamų žinių, tinkamos ITIL metodologijos pasirinkimo ir tam tikslui skirtos programinės įrangos. Viena pagrindinių ITIL v4 metodologijos privalumų, kad tai daugelį savybių integruojanti IKT paslaugų valdymui skirta metodologija, kuria naudotis yra svarbu, siekiant efektyvaus IKT paslaugų teikimo ir organizacijos darbo vertės augimo. Efektyvus IKT paslaugų teikimas ir valdymas sudaro galimybes užtikrinti geresnį el. paslaugų prieinamumą, aukštesnį mokymo įstaigų skaitmenizacijos lygį, kuris kelia ir visos Europos pasiekimus.

IKT infrastruktūra ir jos aptarnavimo paslaugos tampa vis sudėtingesnės švietimo įstaigose. Todėl tinkamų specialistų parengimas, metodikų įsisavinimas įgalins IKT infrastruktūros valdymo paslaugų tinkamą atlikimą ir IKT infrastruktūros paslaugų kompiuterizuotų valdymo sistemų naudojimo plėtrą švietimo sektoriaus institucijose. Aktyvus bendradarbiavimas su kitomis valstybinėmis ir tarptautinėmis organizacijomis, turinčiomis šioje srityje didesnę patirtį turėtų paspartinti inovatyvių aptarnavimo sistemų diegimą.

ITIL paslaugų valdymo metodika paaiškina ir sukuria paslaugų valdymo procesų struktūrą, apibrėžiant aiškias praktikas, kurios leidžia efektyviai valdyti teikiamas paslaugas, šalinti paslaugų teikimo trikdžius.

Nemažesnę svarbą įgyja LITNET ir kitų internetinių resursų valdymo efektyvumas. Tam ypač reikalinga tinkama paslaugas atliepianti programinę įranga, kad interneto resursų blokavimo sistemą galėtų valdyti pati švietimo įstaiga ir įgalintų blokuoti nepageidaujamus tinklapius, bei sukruti saugią aplinką mokinių bei darbuotojų prieigai. Programinės priemonės IKT infrastruktūros valdymui ir paslaugų administravimui turi pakankamai daug funkcionalumų, kuriuos jungiant prie tinklų aptarnavimo programinės įrangos galimybių gauname optimizuojamas aptarnavimo galimybes. Straipsnyje demonstruojama kaip LITNET internetinė aptarnavimo IS galėtų būti papildyta „HelpDesk" sistemos sąsaja bei į FreshDesk programinės įrangos priemones kaip galima integruoti internetinio tinklo valdymo funkcijas. Siūlymai kaip turimą X gimnazijos prieigą prie LITNET IS, skirtą administruoti Wi-Fi tinklą, papildyti automatiniu pranešimų generavimo sistema, kuri praneštų apie užfiksuotus gedimus ir įgalintų juos spręsti yra demonstruojami straipsnyje.

Tokių priemonių integruotas taikymas įgalina efektyviau, centralizuočiau valdyti ir spręsti atsiradusius incidentus.

LITERATŪROS SĄRAŠAS

1. AXELOS Limited (2019). ITIL Foundation: ITIL v4 Edition. ISBN: 9780113316069.
2. Ališauskas, R., Brazdeikis, V. ir kt. (2000). IT diegimo Lietuvos švietime strategija. (v. 2000 09 11) https://www.lrs.lt/pls/inter/w5_show?p_r=855&p_d=7671.
3. COM (2021) 750 final. Europos Komisija. Briuselis, 2021 09 08. COM(2021) 750 final. Komisijos komunikatas Europos parlamentui ir tarybai. 2021 m. strateginio prognozavimo ataskaita. ES pajėgumas ir laisvė veikti https://lrv.lt/uploads/main/documents/files/2021m%20strateginio%20prognozavi mo%20ataskaita_LT_TXT.pdf.
4. DESI (2021) 2021m. skaitmeninės ekonomikos ir visuomenės indeksas (DESI). Lietuva.DESI_2021__Lithuania__lt_2BDSuCQhAL89xoeMg7hbqZjNArY_80592(1).pdf (lrv.lt).
5. Dzemydienė, D.; Dzemydaitė, G.; Gopisetti, D. (2022). Application of multicriteria decision aid for evaluation of ICT usage in business. Central European journal of operations research. New York: Springer. ISSN 1435-246X. vol. 30 (2022), p. 323-343.
6. Europos duomenų strategija. https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_lt#duomen-valdymas.
7. Fortigate. (2021). Fortigate su UTM programine įranga. https://www.rrt.lt/saugesnis-internetas/turinio-filtravimo-priemones/.

8. Freshworks. https://freshdesk.com/resources/ebooks/getting-started-with-freshdesk-guidek.

9. Ginevičius, R., Paliulis, N. K., Chlivickas, J., Merkevičius, J. (2006). XXI amžiaus iššūkiai: organizacijų ir visuomenės pokyčiai. Technika: Vilnius.

10. Informacinės visuomenė spaslaugų Įstatymo koncepcija, patvirtinta Lietuvos Respublikos Vyriausybės 2004 m. spalio 11d. nutarimu Nr. 1276 (Žin., 2004Nr. 151-5497).

11. IT diegimo Lietuvos švietime strategija. https://www.lrs.lt/pls/inter/w5_show?p_r=855&p_d=7671.

12. Lietuvos pažangos strategija. Lietuva 2030. (2022). http://e-seimas.lrs.lt.

13. LR Vyriausybės nutarimas „Dėl Viešųjų kompiuterių tinklų (interneto) prieigos vietose privalomų filtravimo priemonių naudojimo tvarkos aprašo patvirtinimo https://www.e-tar.lt/portal/lt/legalAct/TAR.BF4468B5E5C4/aFZEBknoOy.

14. LR Azartinių lošimų įstatymas, 201 str. 4 dalis. https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.133562/asr.

15. LR Vyriausybės įsakymas Nr. 615 (2006). Lietuvos informacinės visuomenės plėtros 2000-2008 metų programa, patvirtinta Lietuvos Respublikos Vyriausybės 2006 m. birželio 21d. įsakymu Nr. 615 (Žin., 2006, Nr. 71-2630).

16. Lietuvos švietimo strategija. https://www.lrs.lt/pls/inter/w5_show?p_r=855&p_d=7671.

17. Lietuvos Respublikos nepilnamečių apsaugos nuo neigiamo viešosios informacijos poveikio įstatymas, 7 str. 3 dalis; https://www.e-tar.lt/portal/lt/legalAct/TAR.817CC58C1A54/TAIS_410367 -.

18. Price, H. (2019). ITIL in education: A possible framework for IT service management. https://exclusive.multibriefs.com/content/itil-in-education-a-possible-framework-for-it-service-management/education.

19. Oficiali Europos Sąjungos interneto svetainė. Strateginis prognozavimas. https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight_lt.

20. Ožalienė A., Šaparnienė D. Elektroninių dokumentų valdymas viešajame sektoriuje: plėtros galimybių analizė. Šiaulių kolegija, Šiaulių universitetas Ekonomika ir vadyba: aktualijos ir perspektyvos. 2008. 3 (12). 199-205.

21. .Saugios belaidės prieigos (Wi-Fi) prie interneto naudojimo instrukcija https://wiki.litnet.lt/index.php/WIFI_gidas .

22. Saugios belaidės prieigos (Wi-Fi) prie interneto naudotojų administravimas https://wiki.litnet.lt/index.php/E-paslaugos_naudotoj%C5%B3_administravimas.

VIRTUALIŲ MOKYMOSI PRIEMONIŲ TAIKYMO POREIKIS IR GALIMYBĖS GEOGRAFIJOS MOKYME

Regina Dingelienė[1], Irena Patašienė[1], Martynas Patašius[1]

[1] *Kauno technologijos universitetas, Lietuva*

Santrauka. Geografijos mokymasis jungia gamtamokslinį ir socialinį raštingumą, suteikia galimybę sieti įvairių dalykų žinias. Su geografija susiję įgūdžiai galėtų būti priskiriama prie prioritetinių XXI amžiaus žmogui reikalingų įgūdžių. Erdvinio mąstymo ugdymas ypač svarbus šiuolaikiniam žmogui, nes tiesiog privalu orientuotis miestų, gyvenviečių planavime, navigacijoje ir kitose kasdieniniame gyvenime sutinkamose veiklose. Tokių žinių įsisavinimui puikiai tinka Geografinės informacinės sistemos (GIS). Jų kūrybiškas panaudojimas geografijos pamokose, pavyzdžiui, integruojant į virtualias mokymosi priemones padėtų moksleiviams pasiekti geresnio geografijos žinių įsisavinimo.
Raktiniai žodžiai: Virtuali mokymosi aplinka, geografija, GIS.

1. ĮVADAS

Mokykloje moksleiviai gauna geografijos žinias, yra ugdomi skirtingi jų gebėjimai, mokėjimas jas pritaikyti gyvenime. Sukauptos žinios sudaro pagrindą ir galimybės analizuoti per pamokas problemas įvairiuose srityse: klimato, aplinkosaugos, gyventojų skaičiaus augimo, pabėgėlių, prastos mitybos, ligų, pilietinių karų, anglies dioksido kitimo ir kt. (Feigin et al., 2018; Bradford et al., 2020; Jennerjahn, 2020). Geografija kuria savitą pasaulio vaizdą, kuriuo remiantis ugdoma mokinių pasaulėžiūra, jų santykis su artimiausia aplinka, gamtos pasauliu, visuomeniniais reiškiniais, kitais žmonėmis (Gerulaitis, Kairaitis, 2022). Tarptautinės geografų sąjungos Geografijos edukacinės komisijos Chartijoje (*International Charter on Geographical Education*) teigiama, kad geografija yra gyvybiškai svarbus XXI a. pasaulio piliečių žinių šaltinis, suteikiantis mums galimybių ieškoti atsakymų į klausimą – kaip galime šiuolaikiniame tarpusavio ryšiais susaistytame pasaulyje gyventi tvariai (https://www.geoedu.lt/wp-content/uploads/2020/06/2016-Charter-Fulltext-–-Lithuanian-pdf.pdf)

Mokinių mokymuisi daro įtaką įvairūs vidiniai ir išoriniai veiksniai. Vidinius veiksnius sudaro fiziniai, psichologiniai ir sveikatos veiksniai. Išorinius veiksnius sudaro šeima, mokykla ir bendruomenė (Tokan, 2019). Tokan atlikti tyrimai parodė, kad mokiniai, kurie turi aukštą mokymosi motyvaciją ir gerai mokosi, paprastai pasiekia reikiamus kompetencijų standartus. Tokių rezultatų pasiekimui mokytojai turi nuolat taikyti įvairius mokymo metodus, kurie pagelbėtų tobulinti savo mokymosi įgūdžius (Oweis, 2018). Geografijos mokymo pagrindas turi būti moksliniai tyrimai, būtina plačiau jais remtis pamokų metu. Tam privalu naudoti naujausias geografines technologijas, geriausius darbo įrankius, taikyti problemų sprendimu grįstas mokymosi strategijas (Gerulaitis,

Kairaitis, 2022). Atnaujintose programose akcentuojama, kad geografijos mokymas privalo remtis praktine mokinių veikla: darbu su įvairia kartografine, statistine medžiaga; geografinės aplinkos stebėjimais ir tyrimais; savarankiškais grupiniais ir individualiais darbais (Gerulaitis, Kynė, 2022).

XXI amžiaus X ir Y kartos vaikus stengiamasi susidominti naudojant virtualiąsias technologijas, kurios leidžia praturtinti ugdomąjį procesą ir pagerinti mokymosi rezultatus (padidinti mokymosi motyvaciją). Informacinės komunikacinės paradigmos tikslas – skaityti geografinę informaciją, ją suvokti, suprasti, analizuoti, interpretuoti ir perduoti / pasikeisti, įskaitant ir skaitmenines, GIS technologijas (Gerulaitis, Kairaitis, 2022). GIS panaudojimas, interaktyvių žemėlapių kūrimas padaro pamokas patrauklesnes, užklasinių veiklų organizavimas tampa įdomesnis (Alawamleh, et al., 2020). Geografijos mokymuisi naudojamos virtualiosios mokymosi platformos: Moodle, Google Classroom, „EDUKA klasė" ir kitos (Alawamleh et al., 2020).

Geografijos pamokų metu įgytos žinios ir gebėjimai praverčia kitų dalykų užsiėmimuose, pavyzdžiui, pavyzdžiui, evakuacijos planavimas, geoproporcingų duomenų tyrinėjimas ir analizė, navigacija, erdvinių duomenų kokybės vizualizavimas ir miestų planavimas (Tokan et.al., 2019).

Šio darbo tikslas yra išnagrinėti skaitmeninių kompetencijų panaudojimo galimybes geografijos pamokose teoriniu aspektu ir ištirti esamą padėtį pasirinktose Lietuvos mokyklose.

2. SKAITMENINIŲ KOMPETENCIJŲ GILINIMO GALIMYBĖS GEOGRAFIJOS PAMOKOSE

Informacinių technologijų panaudojimas tampa ypač aktualus dirbant pagal atnaujintas bendrąsias programas, kur didelis vaidmuo tenka mokinių motyvacijai. Su motyvacija yra susijusios komunikavimo, pažinimo ir skaitmeninė kompetencijos. V. Targamadzė (2015) teigia, kad kompiuterinės technologijos keičia naujosios (Z) kartos komunikaciją – ji tampa kompiuterine komunikacija. Kompiuterinės komunikacijos kompetenciją sudaro motyvacija, žinios ir gebėjimai prisitaikyti prie besikeičiančios situacijos. Kompiuterinės komunikacijos kompetencijos ugdymą skatina bendrųjų programų skaitmeninė kompetencija – tai motyvacija ir gebėjimas naudotis skaitmeninėmis technologijomis atliekant užduotis, sprendžiant problemas, bendraujant ir bendradarbiaujant. Tam būtina gebėti efektyviai ir saugiai valdyti informaciją, mokėti ne tik pasirinkti duomenis, bet ir dalintis skaitmeniniu turiniu (Salloum et al., 2019). Informacinės technologijos leidžia mokymui naudoti šiuolaikiškus mokymo būdus ir metodus, todėl šiuolaikiniai moksleiviai sunkiai įsivaizduoja savo kasdienį gyvenimą ir mokymąsi be informacinių technologijų, todėl mokytojui būtina derinti tradicinį mokymą su virtualiuoju (Aliman et al., 2019). Skaitmeninių kompetencijų ugdymo svarba akcentuojama ir Europos sąjungos dokumentuose.

Informacinių technologijų naudojimas geografijos pamokose leidžia didinti klasėje atliekamo darbo apimtį, gerinti žinių kontrolę, racionaliai organizuoti ugdymo procesą, ugdyti tiriamuosius įgūdžius, daugiau dėmesio skirti mokiniams. veikla klasėje, dirbti savarankiškai, lavinti mokslinį mąstymą, treniruotis aukštu estetiniu ir emociniu lygiu. Mokymosi platformos skiriasi savo patogumu, galimybėmis, tačiau "Google Classroom" ir Moodle yra populiariausios ir masiškiausiai naudojamos sistemos (Syvyi et.al., 2022).

Svarbia mokymosi motyvacijos kėlimo galimybe yra moksleivių bendravimas, bendradarbiavimas dirbant ir atliekant darbą grupėse taikant virtualiasias mokymosi platformas. Č. Šašinka su bendraautoriais (2018) atlikti tyrimai parodė, kad virtualiosios aplinkos skatina motyvaciją, nes motyvacija didėja labiau mokiniams bendradarbiaujant nei mokantis individualiai. Dirbant poromis, grupėmis ar komandomis pasak autoriaus bendradarbio buvimas padeda mokiniui išlikti susikaupusiam ties užduotimi ir suteikia jam galimybę pasitikrinti dalyko supratimą.

Viena iš skaitmeninių priemonių, skatinančių mokinių susidomėjimą geografija yra GIS. Tai skatina erdvinį mąstymą, gerina įgūdžius, kelia motyvaciją. Sistema leidžia savarankiškai nuspręsti, kaip bus atlikta užduotis. Ši priemonė suteikia moksleiviams galimybę rengti individualius projektus ir individualius darbus, tyrinėti artimąją aplinką, kuriant žemėlapių aplikacijas. Mokiniai juos gali naudoti kaip pristatymo priemonę, kaip įrankį žiniatinklio žemėlapių sudarymo ir duomenų tvarkymo įgūdžiams lavinti, kaip būdą patraukliai įgyti naujos patirties ir įgūdžių (Vojtekova et.al., 2022).

Prie efektyvių mokymosi priemonių priskiriama virtualios realybės technologija grįstos priemonės, kurios gali sukurti veiksmingo ir kokybiško mokymo orientuoto į praktiką ir produktyvumą pagrindą (Shakirova et al., 2020).

Švietimo portalas https://www.emokykla.lt/ 9-10 klasių mokiniams siūlo geografijos mokymui skirtą skaitmeninę priemonę (SMP) ir įmonės Hnit-Baltic pasiūlytą žemėlapių kūrimo priemonę „ArcGIS mokykloms". Abu šie produktai yra pagalbinės priemonės pamokoje arba tinka tam tikrų temų savarankiškam mokymuisi. Naudojant šiuos du produktus mokytojui sudėtinga sudaryti vientisą aplinką, kurią pats galėtų keisti pagal besikeičiančius poreikius.

Norint pasiūlyti ir kurti lankstų produktą buvo atliktas moksleivių esamos padėties vertinimas, o taip pat buvo tiriamas virtulių priemonių naudojimo poreikis.

3. TYRIMAS APIE VIRTUALIŲ PRIEMONIŲ TAIKYMO GEOGRAFIJOS PAMOKOSE POREIKĮ

Tyrimu buvo siekiama išsiaiškinti veiksnius, kurie daro įtaką moksleivių mokymuisi, požiūrį į geografijos svarbą šiandieniniame pasaulyje ir virtualiųjų mokymosi priemonių taikymo geografijos pamokose poreikį. Buvo sukurtas 24 klausimų klausimynas. Tyrimui pasirinkta 8 – IIG klasių moksleiviai. Tyrime dalyvavo 66 respondentai. 44 respondentai mokosi Vilniaus „Santaros" gimnazijoje, 22 - Plungės „Saulės" gimnazijoje.

Išanalizavus sukauptus duomenis paaiškėjo, kad didžioji dauguma respondentų labiau domisi tiksliaisiais mokslais (43,9 %), socialiniai mokslai taip pat buvo populiarūs (40,9 %), ir tik 15,2 % respondentų buvo labiau linkę į humanitarinių kitų mokslų sritis. Atliekant tyrimą buvo prašoma respondentų įvertinti domėjimąsi geografija vertinant 10 balų skalėje. Žemiau pateiktame paveiksle pateikta respondentų domėjimosi geografija priklausomumas nuo jų polinkio atitinkamai mokslo sričiai.
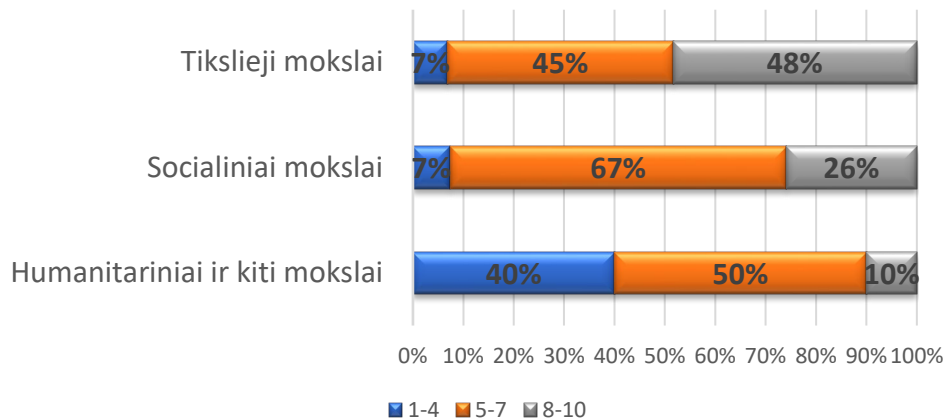

1 pav. Respondentų domėjimosi geografija lygis pagal patinkančią mokslo sritį

Net 48 % priskyrusių save tiksliųjų mokslų sričiai domėjimąsi geografija įvertino balais nuo 8 iki 10, o Socialinių mokslų srities atstovai domėjimąsi tokiais aukštais balais priskyrė tik 26 %, bet balais nuo 5-7 savo domėjimąsi vertino net 67 % Socialinių mokslų srities respondentų. Net 40 % humanitarinių ir kitų mokslų sričiai save prisiskyrusieji respondentai geografija nesidomi arba domisi nedaug.

Buvo pasidomėta respondentų geografijos metiniais balais. Žemiau pateiktame paveiksle pateikta respondentų geografijos metinių vertinimų priklausomumas nuo jų polinkio atitinkamai mokslo sričiai.

Diagramoje matosi, kad geriausiai geografijos žinias sekasi įsisavinti tiksliųjų mokslų respondentams. Net 79 % tiksliųjų mokslų atstovų geografijos metinis įvertinimas buvo nuo 8 iki 10 balų, 63 % socialinių mokslų srities respondentų ir 60 % humanitarinių ir kitų mokslų srities atstovų gavo analogiškus vertinimus.
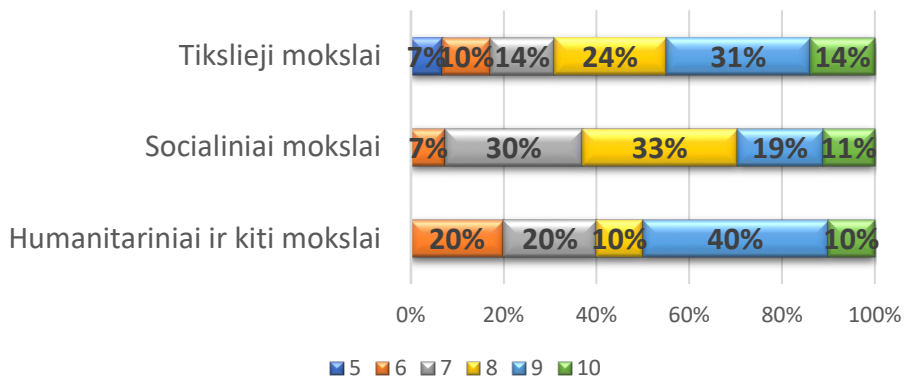
2 pav. Respondentų geografijos įvertinimas pagal patinkančią mokslo sritį

Respondentų buvo teiraujamasi, ar pagerėtų motyvacija mokytis geografijos, jei būtų sukurtas vientisas kursas, kur būtų taikomos virtualios mokymosi priemonės. Tokį geografijos pamokų organizavimo būdą palaikė 56 % visų respondentų. Net 69 % tiksliųjų mokslų, 52 % socialinių mokslų ir 30 % humanitarinių mokslų atstovų šiai idėjai pilnai pritarė. Apie 10% visų respondentų nepritarė ir likusieji neturėjo nuomonės.

Buvo nagrinėtos atsakymų susijusių su geografijos mėgimu koreliacijos pagal Pirsono koreliacijos koeficientą. Tai parodyta 3 paveiksle.
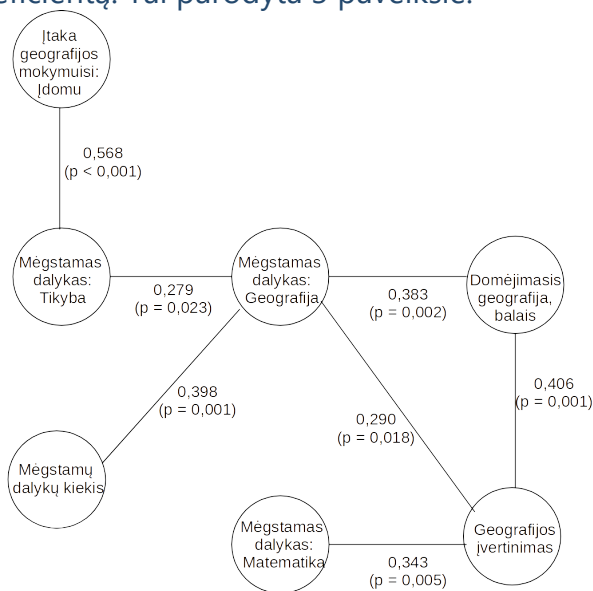
3 pav. Koreliacijos pagal mėgstamus dalykus

Nurodymas, kad geografija yra vienas iš mėgstamų dalykų labiausiai koreliavo su nurodymu, kad vienas iš mėgstamų dalykų yra tikyba (Pirsono koreliacijos koeficientas 0,279, p = 0,023). Jis taip pat koreliavo su dalykų, pasirinktų kaip mėgstami, kiekiu (Pirsono koreliacijos koeficientas 0,398, p = 0,001).

4 paveiksle pateiktos respondentų nuomonės domėjimosi geografija koreliacijos su veiksniais, kurie turi įtakos geografijos mokymuisi.
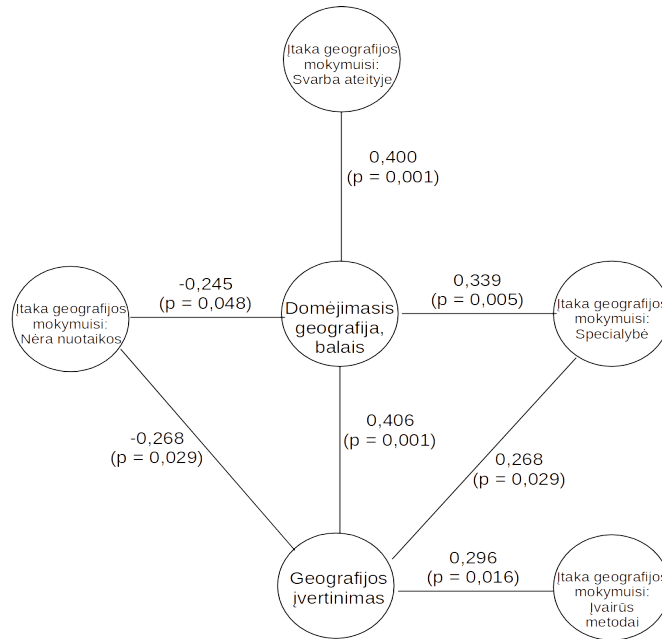
4 pav. Koreliacijos pagal mokinių nuomonę, kas turi įtakos geografijos mokymuisi

5 paveiksle pateiktos koreliacijos pagal geografijos pamokose naudotas technologines priemones.
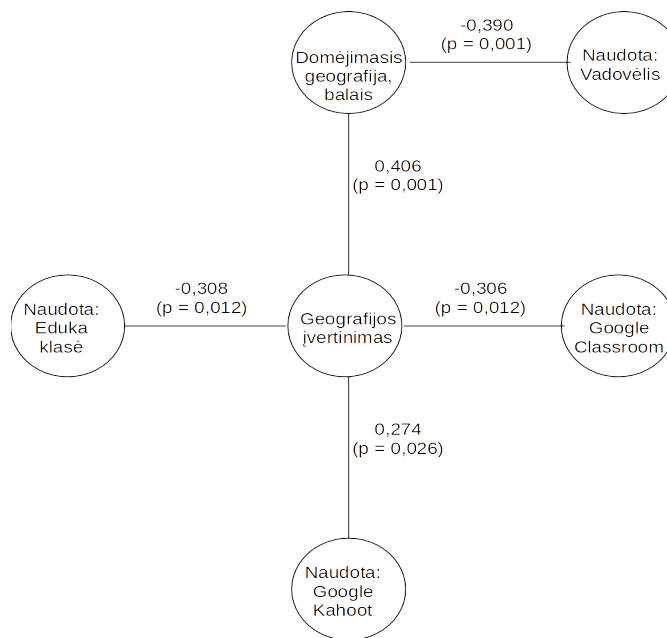
5 pav. Koreliacijos pagal geografijos pamokose naudotas technologines priemones

Tyrimo rezultatai parodė, kad moksleiviai naudoja daug įvairių skaitmeninių technologijų fragmentų, bet statistiškai reikšmingų koreliacijų nebuvo tiek daug.

4.   IŠVADOS

Galima pastebėti, kad, nors (kaip ir galima buvo tikėtis) domėjimasis geografija ir geografijos įvertinimas buvo gana stipriai koreliuoti, daug kas buvo koreliuota tik su vienu iš šių dalykų. Be to, įdomu, kad ne visų technologinių priemonių naudojimas buvo teigiamai koreliuotas su įvertinimu („Eduka klasė" ir „Google Classroom" naudojimas buvo koreliuotas neigiamai).

Iš tyrimo apribojimų paminėtina, kad imtis buvo palyginus maža ir nereprezentatyvi, tad rezultatai dar turėtų būti patvirtinti tolesniais tyrimais. Nežiūrint to virš pusės respondentų tikisi, kad geografijos mokymosi kokybę ir patrauklumą suteiktų virtualių mokymo priemonių taikymas.

LITERATŪROS ŠALTINIAI

1. Aliman, M., Sumarmi, B., Ikomang, A., ..., Arif, M. (2019). The Effect of Earthcomm Learning Model and Spatial Thinking Ability on Geography Learning Outcomes. Journal of Baltic Science Education, 2019, 18.3: 323-334.
2. Alawamleh, M., Al-Tvait, L. M., Al-Saht, G.R. (2020). The effect of online learning on communication between instructors and students during Covid-19 pandemic. Asian Education and Development Studies, 2020.
3. Barauskienė, L., Bukantis., A., Gerulaitis., Š., Kairaitis, Z.,..., Šalna, R. (2021). Geografijos bendrosios programos įgyvendinimo rekomendacijos.
4. Bradford, J.B., Schlaepfer, D. R., Lauenroth, W. K., Palmquist, K. A., (2020). Robust ecological drought projections for drylands in the 21st century. Global change biology, 26.7: 3906-3919.
5. Feigin, V., Norrving, Bo, Sudlow, C. L. M., Sacco. R. L. (2018). Updated criteria for population-based stroke and transient ischemic attack incidence studies for the 21st century. Stroke, 49.9: 2248-2255.
6. Gerulaitis, Š. & Kairaitis, Z. (2022). Pagrindinės mokyklos geografijos ugdymo turinio atnaujinimas: metodologinės prieigos ir metodologiniai posūkiai. Geografija ir edukacija, 10, 110-126.
7. Gerulaitis, Š., Kynė, G. (2022). Geografijos bendroji programa: kompetencijų ugdymo link. *Geografija ir edukacija*, 10: 99-109.
8. Hnit Baltic group. Esri: Official Distributor [interaktyvus]. [žiūrėta 2022 m. lapkričio 20 d.]. Prieiga per internetą https://www.gisbaltic.eu/en-gb/home.
9. International Charter on Geographical Education. (2016). Beijing: IGU Commission on geographical education. https://www.geoedu.lt/wp-content/uploads/2020/06/2016-Charter-Fulltext-–-Lithuanian-pdf.pdf.

10. Jennerjahn, T. C. (2020). Relevance and magnitude of 'Blue Carbon' storage in mangrove sediments: Carbon accumulation rates vs. stocks, sources vs. sinks. Estuarine, Coastal and Shelf Science, 247: 107027.
11. Oweis, T. I. (2018). Effects of using a blended learning method on students' achievement and motivation to learn English in Jordan: A pilot case study. Education research international, https://doi.org/10.1155/2018/7425924.
12. Šaškina, Č., Stachon, Z., Sedlak, M., Chmielik, J., ..., Jurik, V. (2018). Collaborative immersive virtual environments for education in geography. ISPRS International Journal of Geo-Information, 8.1: 3.
13. Salloum, S. A., Mostafa A., Khaled, S., Ali. T. (2019). Factors affecting the E-learning acceptance: A case study from UAE. Education and Information Technologies, 2019, 24.1: 509-530.
14. Syvyi, M., Mazbayev, O., Varakuta, O., Panteleeva, N., Bondarenko, O. (2022). Distance learning as innovation technology of school geographical education. arXiv:2202.08697, https://doi.org/10.48550/arXiv.2202.08697.
15. Targamadzė, V., Girdzijauskienė, S., Šielionienė, A., Pečiuliauskienė, P., Nauckūnaitė, Z. (2015). Naujoji (Z) karta–prarastoji ar dar neatrastoji. Naujosios (Z) kartos vaiko mokymosi procesų esminių aspektų identifikavimas, Šiauliai, 118.
16. Tokan, M. K., Imakulata, M. M. (2019). The effect of motivation and learning behaviour on student achievement. South African Journal of Education, 39.1.
17. Vojtekova, J., Žoncová, M., Tirpáková, A., Vojtek, M. (2022). Evaluation of story maps by future geography teachers. Journal of Geography in Higher Education, 46.3: 360-382.

INFORMACINIŲ KOMUNIKACINIŲ TECHNOLOGIJŲ TAIKYMO GALIMYBĖS SPECIALIAJAME UGDYME

Lina Sakienė[1,2], Ramūnas Kubiliūnas[1]

[1]Kauno technologijos universitetas, Lietuva
[2]Telšių lopšelis-darželis „Eglutė", Lietuva

Santrauka. Pedagogai ir tėvai vis dar patiria įvairaus pobūdžio sunkumų ugdant raidos sutrikimus turinčius vaikus. Nepakankama pedagogų motyvacija dirbti su specialiųjų poreikių vaikais, nerandama tinkamų skaitmeninių mokymosi priemonių, trūksta metodikos ir rekomendacijų, kaip ugdyti šiuos vaikus. Be to, pedagogai ir tėvai turi mažai informacijos apie nuotolinio mokymosi naudą specialiųjų ugdymo(si) poreikių vaikų ugdyme. Tačiau ugdyme naudojant informacines komunikacines technologijas ir kompiuterinę įrangą daugėja neįgaliųjų mokymo(si), ugdymo(si), bendravimo galimybių. Tai lemia, kad specialiojo ugdymo procese visada naudojamos informacinės ir komunikacinės technologijos. Šiame straipsnyje siekiama atskleisti nuotolinio mokymosi informacinių technologijų panaudojimo specialiajame ugdyme galimybes.
Raktiniai žodžiai: Specialusis ugdymas, specialieji ugdymo(si) poreikiai, informacinės technologijos, nuotolinis mokymasis.

1.   ĮVADAS

Specialiosios pagalbos teikimo sistema iš esmės pasikeitė nuo 1991metų, kai šalis tapo nepriklausoma. Anksčiau mokiniai, turintys raidos sutrikimų buvo priskiriami specialiojo ugdymo sričiai, dabar, laikomasi nuostatos, kad kitoks, savitas, unikalus yra kiekvienas vaikas. Vaiko raida – progresuojantis ir nuoseklus motorinių, kognityvinių, socialinių, kalbos ir kitų sričių vystymasis [2]. Šie sutrikimai gali pasireikšti emocinio, socialinio, fizinio, kognityvinio pobūdžio atsilikimu arba funkcijos pablogėjimu [1]. Išskiriama, kad raidos sutrikimai gali būti skirstomi į tris kategorijas: raidos atsilikimas, raidos nuokrypis, raidos disociacija [8;5].

Organizuojant ugdymą(si) nuotoliniu būdu, rekomenduojama vadovautis *Nuotolinio mokymo(si)/ ugdymo(si) vadove* (2020) pateikiama metodine medžiaga, nukreipta į visų besimokančiųjų gebėjimų ugdymą ir įgūdžių lavinimą bei ugdymosi poreikių užtikrinimą [11]. Ikimokyklinio ugdymo metodinėse rekomendacijose 2015 metais buvo įvardinta, kad vaikų ugdymo procese būtų atsižvelgiama į „interneto amžiaus" vaikų ypatumus ir turi būtų diegiamos technologijos vaikų ugdymosi poreikiams tenkinti. Atsižvelgiant į buvusią pandemijos situaciją, bei aplinkos pokyčius, kai didžioji mokymosi proceso dalis buvo persikėlusi į virtualią erdvę, problema tapo naudojamų priemonių pritaikymas ir naujų kūrimas nuotoliniam ugdymui. Trūko informacijos apie ikimokyklinio ir priešmokyklinio amžiaus vaikų specialiųjų ugdymo(si) poreikių (SUP) tenkinimą naudojant įvairias nuotolinio mokymosi priemones. Todėl aktualu išsiaiškinti, kokias nuotolines informacines komunikacines technologijas (toliau IKT) naudoja švietimo pagalbos specialistai/mokytojai, bei kokių nuotolinio mokymosi IKT pasigendama. Šiame straipsnyje

nagrinėjama problema, susijusi su tuo, kad Lietuvoje raidos sutrikimų turintiems mokiniams vis dar kyla ugdymo(si) sunkumų.

Tikslas – atskleisti nuotolinio mokymosi informacinių technologijų, naudojamų nuotoliniame mokymesi, panaudojimo specialiajame ugdyme galimybes.

Uždaviniai:

- Išanalizuoti specialiajame ugdyme naudotinas IKT priemones ir jų veiksmingumą.

- Išanalizuoti IKT panaudojimo raidos sutrikimus turintiems vaikams galimybes Telšių rajono ikimokyklinėse įstaigose.

- Pristatyti specialiųjų ugdymo(si) poreikių mokinių ugdymui skirtą metodiką „Sklandi kalba".

Tyrimo metodai: mokslinių ir metodinių šaltinių analizė, interneto šaltinių analizė, anketinė apklausa.

2. IKT PANAUDOJIMO SPECIALIAJAME UGDYME GALIMYBĖS

Specialiojo ugdymo procese IKT užima svarbią vietą. Jos ypatingai naudingos neįgaliems asmenims, turintiems judesio ir padėties, intelekto, kalbos ir komunikacijos bei kitų sutrikimų. Anot LR Terminų banko informacinės komunikacinės technologijos reiškia „informacines technologijas, papildytas ryšio priemonėmis". Ypatingas dėmesys skiriamas kompiuterių tinklams, informacijos perdavimo būdams. [4]. IKT apima (skaitmeninių) būdų ir priemonių visumą, kuriomis ugdymo tikslais kuriama, renkama, saugoma, transformuojama ir skleidžiama informacija.

Šiame straipsnyje pateikiami dažniausiai naudojami terminai, susiję su specialiųjų ugdymo(si) poreikių tenkinimo situacija.

Specialieji ugdymosi poreikiai - pagalbos ir paslaugų reikmė, atsirandanti dėl to, kad ugdymo ir saviugdos reikalavimai neatitinka specialiųjų poreikių asmens galimybių [13].

Specialusis ugdymas - bendrosios programos pritaikymas, individualizavimas, atsižvelgiant į nustatytus mokinio specialiuosius ugdymosi poreikius, mokinio, tėvų (globėjų, rūpintojų) pageidavimus ir vadovaujantis pedagoginės psichologinės tarnybos arba švietimo pagalbos tarnybos išvadomis ir rekomendacijomis [13].

Specialiųjų poreikių mokinys - mokinys, kurio galimybės mokytis ir dalyvauti visuomenės gyvenime yra ribotos dėl įgimtų ar įgytų sutrikimų [13].

Specialioji pedagoginė pagalba - pedagoginių priemonių sistema, padedanti užtikrinti veiksmingą specialiųjų poreikių asmenų ugdymą [13].

Specialiosios mokymosi priemonės - vaizdinės, techninės, demonstracinės, skaitmeninės mokymo priemonės, žaislai, daiktai, medžiagos, literatūra ir pratybų sąsiuviniai, (toliau- SMP), parengtos ar pritaikytos mokiniams, turintiems specialiųjų ugdymosi poreikių [12].

Lietuvos pažangos strategijoje 2030 pabrėžiama, kad dabar yra ypatingai spartaus technologijų klestėjimo amžius ir tam būtina pažinti įvairovę pasitelkiant šiuolaikines

pažinimo priemones. Strategijoje rašoma, kad „besimokanti visuomenė yra moderni ir dinamiška, pasirengusi ateities iššūkiams ir gebanti veikti nuolat kintančiame pasaulyje"[7]. Švietimo ir mokslo ministerija pateikia rekomendacijas ugdymo organizavimui nuotoliniu būdu, kurios padeda mokytojui pasirinkti mokymosi turinį, veiklos formas ir metodus. Vadovaujantis *Mokymo nuotoliniu būdu proceso organizavimo kriterijų aprašu* (2020), specialiųjų ugdymosi poreikių turinčių mokinių mokymui(si) ugdymo procese rekomenduojama naudoti tam pritaikytas priemones: klaviatūrą motorikos sutrikimų turintiems asmenims, planšetinį kompiuterį turintį vaizdo perdavimo funkciją kuri leidžia bendrauti gestų kalba, simbolių skaitymo įrenginį – priemonė rašytiniam tekstui skaityti ir transformuoti į alternatyvią vaizdinę, garsinę ir/ar tekstinę informaciją [6].

Internetinėje svetainėje www.vnvgrupe.lt yra pateikta nemažai kompensacinės technikos, kuri naudojama užsiėmimuose, ugdant mokinius, turinčius specialiųjų ugdymosi poreikių. Viena iš kompensacinių technikos priemonių yra "Sara CE". Tai skaitymo priemonė silpnaregiams ir neregiams, skirta įgarsinti spausdintą tekstą iš knygos, pratybų ir panašiai. Uždėjus ant "Sara CE" įrenginio atverstą tekstą, kamera automatiškai nuskenuoja ir perskaito jį. Ugdymo procese gali būti taikoma ir "Mountbatten Writer Plus" techninė priemonė. Tai elektroninė Brailio rašto mašinėlė, skirta neregiams mokytis rašyti, skaityti bei spausdinti ant popieriaus Brailio raštu. Mokinys, rašydamas Brailiu, girdi klavišų paspaudimus ir gali pasitikrinti popieriuje. Įvairiose ugdymo veiklose kartais naudojami komunikatoriai. "Komunikatorius – tai subjektas, kuris siunčia pranešimą gavėjui. Jis gali daryti įtaką žinios suvokimui, pasirinkdamas komunikacijos kanalus, keisdamas komunikavimo toną ar kontekstą". [6] Vienas iš komunikatorių yra "Quick Talker". Tai daugiafunkcinis nešiojamas komunikatorius, skirtas vaikams su kalbos ar intelekto sutrikimais. Komunikatoriaus dėka mokinys, turintis specialiųjų ugdymosi poreikių, paspaudžia mygtuką ir aktyvuoja garsinį pranešimą, taip išreikšdamas nuomonę ar išsakydamas poreikius. Naudojant "QuickTalker", vaikai įtraukiami į bendravimo procesą ir darbą klasėje.

## 3.   IKT NAUDOJIMO GALIMYBĖS SPECIALIAJAME UGDYME TYRIMAS

Norint išsamiau išanalizuoti IKT naudojimą specialiajame ugdyme atliktas tyrimas, o jam atlikti sudarytas klausimynas „Informacinių komunikacinių technologijų naudojimas specialiajame ugdyme".

Tyrime dalyvavo 43 Telšių apskrities pedagogai, švietimo pagalbos specialistai. 74,4 % švietimo pagalbos specialistai (logopedai, specialieji pedagogai, socialiniai pedagogai), ikimokyklinio ugdymo mokytojai 16,3 %, priešmokyklinio ugdymo mokytojai 9,3 %, pradinių klasių mokytojas 1 %. Grupėse/klasėse 93 % pedagogų dirba su raidos sutrikimų turinčiais vaikais, kai klasėje/grupėje yra vaikų ir neturinčių jokių raidos

sutrikimų. 3 pedagogai klasėje/grupėje neturi specialiųjų ugdymosi poreikių ugdytinių, tačiau turi vaikų, kuriems reikalinga individuali pedagogo pagalba.

Mokinių sutrikimai ir specialieji ugdymosi poreikiai dažnai būna labai skirtingi, todėl tokių mokinių ugdymas ir jiems teikiama švietimo pagalba reikalauja individualizuoto, diferencijuoto, ir lankstaus požiūrio. Šiuo klausimu buvo naudinga sužinoti, kokie yra vaikų specialieji ugdymosi poreikiai, ir kiek jų yra bendroje ugdomoje klasėje/grupėje (1 pav.).
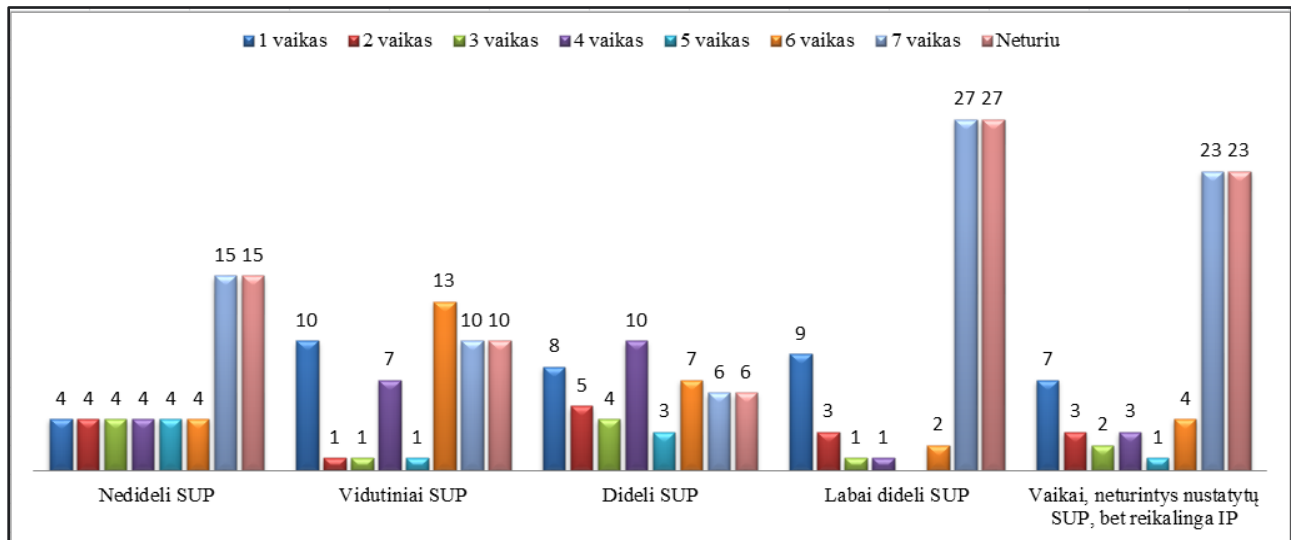
2 pav. Vaikų, turinčių SUP, grupėje kaičius

Pateikti duomenys iliustruoja (1 pav.), kad visi pedagogai/švietimo pagalbos specialistai bendroje klasėje/grupėje turi įvairių specialiųjų ugdymosi poreikių vaikų.

IKT naudojimas specialiajame ugdyme. 74 % tyrime dalyvavusių pedagogų į ugdymo procesą įtraukia įvairias informacines komunikacines technologijas. Pamokėlėse/pratybose IKT tik kartais naudoja 9 pedagogai. Visiškai IKT nesinaudoja 2 pedagogai, pabrėždami, kad neturi pakankamai žinių, neorganizuoja jokių nuotolinių užsiėmimų. Pedagogai yra susipažinę su mokykloje esančia technika ir visi pedagogai įvardino įvairias technines priemones, kurias mokykla turi ir gali naudoti ugdymo tikslais, tik skiriasi jų naudojimo dažnumas (2 pav.).
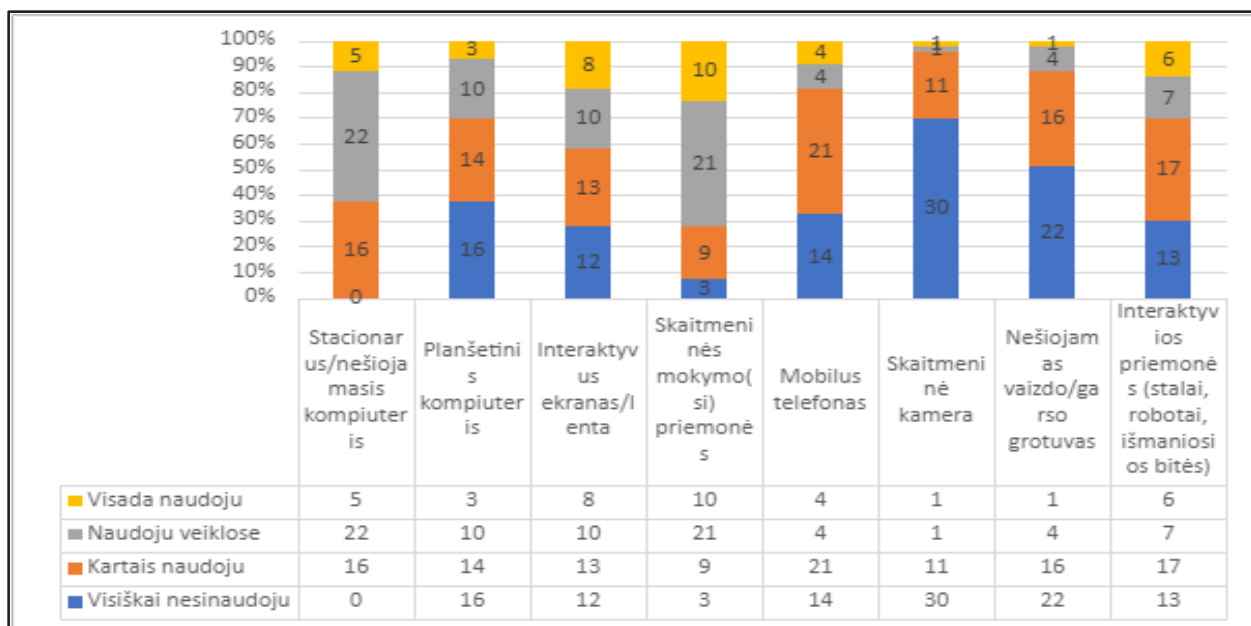
3 pav. IKT naudojimas SUP vaikų ugdyme

Apibendrinant, galima daryti išvadą, kad pedagogai dalyvavę tyrime yra pakankamai kvalifikuoti taikyti IKT, nebijo naudotis šiuolaikinėmis technologijomis ir yra imlūs naujovėms.

Pedagogų teiginiai apie IKT naudojimą specialiajame ugdyme. Pedagogų, švietimo pagalbos specialistų nuomonė apie IKT naudojimą specialiajame ugdyme: *Vaikai labiau įsitraukia į ugdomąjį procesą. Puikus būdas ugdymo paįvairinimui, sudominimui. Padeda sukoncentruoti dėmesį ilgesniam laikui, įtraukia, labai motyvuoja SUP vaikus. Suteikia papildomos informacijos. Naudoju kasdien, pati kuriu IKT priemones. Pasiteisina: vaikas pats tampa aktyvus savo sunkumų įveikimo dalyvis. Teigiamai vertinu, nes jų dėka ugdymas įgauna daugiau vaizdumo jos palengvina ugdymo procesą. Labai padeda ugdant SUP. IKT labai tinka šiuolaikinių vaikų ugdyme. Mokiniams patinka atlikti užduotis planšetėje. Šiandien dažnas vaikas geriau įsisavina žinias per vaizdą, kurį padeda perteikti technologijos. Inovatyvios priemonės mokymosi motyvacijai didinti, mokymosi spragoms įveikti.*

Iš pedagogų teiginių apie IKT naudojimą aiškėja, kad nuotolinės ugdomosios veiklos daugumai neįsivaizduojamos be technologijų. Jei tiek daug pedagogų išskyrė šį privalumą, galima daryti prielaidą, kad IKT yra naudingos specialiajame ugdyme.

Nuotoliniam mokymui organizuoti naudojamos priemonės. Tyrime siekta nustatyti kokias dažniausiai el. mokymosi turinio valdymo priemones pedagogai naudoja specialiajame ugdyme. Tai įvairūs priminimai, pranešimai apie artėjančius įvykius, veiklas, turinio administravimo įrankiai, pasiekimų išskyrimas ir pan. [11]. Tyrimas atskleidė, kad daugiausiai pedagogai (42) naudoja elektroninį dienyną ("Tamo", "Mano dienynas", "Eduka", "Mūsų darželis"). Nemaža dalis naudoja Microsoft for Education "Microsoft

Teams(38), Moodle" (29), Google Suite for Education "Google Classroom" (22). Naudoja sinchroninio ir asinchroninio bendravimo priemones "Zoom" (1), "Google Meet" (5), Moodle įrankį „Pokalbių kambarys", "Gmail" (42). Bendradarbiavimui su specialiųjų ugdymosi poreikių turinčiais mokiniais ir jų tėvais 10 pedagogų naudoja "Padlet" virtualią aplinką. Vienas respondentas visiškai nenaudoja nuotoliniam mokymui organizuoti skirtų įrankių, pasak tiriamojo, nemoka, ir nenori jomis naudotis.

IKT naudojimo specialiajame ugdyme kompetencijos. Pedagogų kompetenciją taikyti IKT parodo gebėjimai kurti įvairiomis kompiuterinėmis programomis interaktyvias priemones, užduotis. Atsakiusieji teigia, kad dažniausiai IKT taiko įvairiais tikslais: skaidrėms rengti, informacijai (lentelės, schemos) pamokose perteikti (40 pedagogų). Pagal dažnumą (42 pedagogai) informacines technologijas naudoja vaizdinėms priemonėms kurti. Didelė dalis pedagogų (39) redaguoja garso/vaizdo įrašus, ruošia metodinę medžiagą (41), el. dokumentus (37). Populiariausia tarp mokytojų naudojamų programų yra "Canva" (www.canva.com). Naudojasi 20 pedagogų. Kita dažnai naudojama priemonė "Liveworksheets" (www.liveworksheets.com), ja naudojasi 6 pedagogai. Taip pat specialiajame ugdyme pedagogai ieško ir naudojasi užsienio autorių sukurtais darbais. Duomenys rodo, kad viena populiariausių internetinių svetainių, kurią įvardijo mokytojai, skirta skaitmeninių knygų kūrimui yra „Bookcreator" (www.bookcreator.com). Du pedagogai įvardijo, kad naudojasi „Plickers" (www.plickers.com) programa. Apibendrinus gautus duomenis, galime daryti išvadą, kad specialiosiose pratybose dažnai naudojamos internetinės programos ir mokomieji kompiuteriniai žaidimai, kuriuos pedagogai naudoja per pamokas. Gauti duomenys tik įrodo, kad pedagogai geba naudotis IKT ir turimas žinias pritaikyti praktikoje, naudojant jas ugdymo tikslais.

Žaidimų programėlių naudojimas specialiajame ugdyme. Tiriamųjų buvo klausiama, kokias programas taiko specialiosiose pratybose/pamokose. 23 apklaustųjų pažymėjo, kad aktyviai naudoja lietuvišką mokomąją programėlę „Žiburėlis", tačiau pabrėžia, kad daugelis užduočių yra mokamos. 13 pedagogų ugdymo procese taiko „Saulytučių" programos užduotis. 10 pedagogų naudoja programą „Gudrutis Dutis", „Pupa" (6), „Žaliasis tyrinėtojas" (3). Vis dėlto, net 22 pedagogai teigia, kad neranda raidos sutrikimų turintiems vaikams tinkamų žaidimo programų.

IKT priemonių trūkumas SUP mokiniams. Atsižvelgiant į duomenis, gautus iš tyrimo "Informacinių komunikacinių technologijų naudojimas specialiajame ugdyme" galima teigti, kad pedagogai naudojasi kitų pedagogų sukurtomis interaktyviomis užduotimis, tačiau jas tenka koreguoti, individualizuoti, kad priemonė tiktų ir atitiktų vaiko individualius poreikius. Dešimt pedagogų teigia, kad trūksta priemonių nekalbantiems vaikams, taip pat vaikams, turintiems žymius kalbėjimo ir kalbos sutrikimus. Trūksta informacijos, programų, žaidimų, ankstyvajai vaiko kalbos raidai ugdyti. Nerandama lietuviškos simbolių sistemos, ar paprastų lietuviškų interaktyvių žaidimų pritaikytų raidos sutrikimus turintiems vaikams.

4. METODIKOS "SKLANDI KALBA" POREIKIS

SUP turinčių mokinių ugdymas labai savitas, jų tempas nuo bendraamžių labai skiriasi. Atsižvelgiant į tyrimo metu išryškėjusius rezultatus, apie nuotolinio mokymosi IKT priemonių specialiajam ugdymui trūkumą, sukurta metodika "Sklandi kalba" skirta specialiųjų ugdymosi poreikių turintiems vaikams ugdyti. Siekiant įgyvendinti sukurtą metodiką, parengta internetinė svetainė pavadinimu „Sklandi kalba". Svetainei parengti panaudota "Wordpress" sistema. Metodikos tikslas - palengvinti pedagogams ir tėvams raidos sutrikimų turinčių vaikų ugdymą, naudojant priemones, tinkamas metodikai įgyvendinti.

Metodiką sudaro sukurtos interaktyvios priemonės ir jų naudojimo rekomendacijos, kurios bus prieinamos internetu sukurtoje svetainėje. Interaktyvios priemonės – tai interaktyvios ir patrauklios užduotys, kurias sudaro: galvosūkiai, dėlionės, žaidimai, viktorinos, paveikslėliai. Žaidimai kuriami taip, kad žadintų intelektinį mokinių smalsumą, entuziazmą ir skatintų/palaikytų jų motyvaciją. Žaismingos priemonės padės SUP vaikams didinti specialiųjų poreikių lygį, ugdys asmeninius gebėjimus. Visos užduotys kuriamos su "H5P", "TinyTap", "Wordwall", "Liveworksheets", "LearningApps", "Educandy" priemonėmis. Šios priemonės pasirinktos dėl suteikiamo interaktyvumo, paprasto naudojimo(si), bei suteikiančios galimybę įsivertinti pasiekimus.

Siekiant, kad prie interaktyvių užduočių kūrimo prisidėtų kuo daugiau švietimo pagalbos specialistų, nuo 2023 m. kovo mėnesio veikiančioje svetainėje „Sklandi kalba" bus kuriamas interaktyvių užduočių bankas, pavadinimu „Žaidimai". (3 pav.).

4 pav. Svetainės „Sklandi kalba" struktūra

Šioje dalyje, bus talpinamos, švietimo pagalbos specialistų sukurtos, interaktyvios priemonės, skirtos raidos sutrikimų turinčių vaikų ugdymui. Šiomis užduotimis laisvai galės naudotis mokytojai ir tėvai.

5.   IŠVADOS

Remiantis mokslinės literatūros analize nustatyta, kad raidos sutrikimus turintiems vaikams ugdyti ypatingai naudinga naudoti įvairias IKT priemones. Priemonės skatina mokinių motyvaciją, pasitikėjimą savimi, didina specialiųjų ugdymosi poreikių lygį, ugdo asmeninius gebėjimus. Pagal rekomendacijas ugdymo procese pedagogai naudoja pritaikytas IKT priemones ir kompiuterinę įrangą.

Pedagogai susiduria su įvairaus pobūdžio sunkumais ugdant raidos sutrikimus turinčius vaikus: neranda tinkamų skaitmeninių mokymosi priemonių, ugdymosi rekomendacijų, nežino kaip dirbti su šiais vaikais. Ribotas šių priemonių naudojimas bei pedagogų noro stoka lemia nepakankamą informacinių komunikacinių technologijų veiksmingumą šių mokinių ugdyme.

Sukurta metodika "Sklandi kalba" pagerins ugdymo galimybes pagal kiekvieno vaiko individualius gebėjimus. Parengtos tinkamos rekomendacijos padės pedagogams efektyviai ugdyti specialiųjų ugdymo(si) poreikių vaikus.

LITERATŪRA

1.Ališauskas A. (2002) Vaikų raidos ypatingumų ir specialiųjų ugdymo(si) poreikių įvertinimas, Šiauliai.
2. Giedrienė, R (2015). Raidos sutrikimai ir vaiko socializacija, Vilnius: Lietuvos edukologijos universiteto leidykla. ISBN: 9786094710377.
3. Hallahan D. P., Kauffman J.M. (2003). Ypatingieji mokiniai. Specialiojo ugdymo įvadas. Alma litera
4. „Informacinės komunikacinės technologijos" Prieiga per: http://terminai.vlkk.lt/terminas/1450332.
5. Kaffemanienė, I., Tereikienė, V (2003). Ikimokyklinio amžiaus vaikų emocinės raidos ir elgesio sutrikimų korekcija. Specialusis ugdymas, 1(8), 15–30 ISSN 1392-5369 -Prieiga per internetą- https://etalpykla.lituanistikadb.lt/object/LT-LDB-0001:J.04~2003~1367187102750/J.04~2003~1367187102750.pdf (žiūrėta 2021/09/25)
6. „Komunikatorius". Prieiga per: https://zodynas.vz.lt/komunikatorius.
7. Lietuvos pažangos strategija „Lietuva 2030" 2023. Prieiga per: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.425517.
8. Mikulėnaitė L. Vaikų, turinčių raidos sutrikimų, gydymas ir abilitacija, Vilnius, 2007 Prieiga per: https://pdfslide.tips/documents/laimamikulenaite-vaikuturinciuraidossutrikimugydymasirabilitacija2007ltbtt-team.html?page=1
9. „Mokinių, turinčių specialiųjų ugdymosi poreikių, grupės" Prieiga per: https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.404013

10. Monkevičienė, O. ir kt. (reng.). (2015). Ikimokyklinio ugdymo metodinės rekomendacijos. Vilnius: Švietimo aprūpinimo centras.
11. Nuotolinio mokymo(si) ugdymo(si) vadovas.(2020) Prieiga per internetą: https://www.emokykla.lt/upload/nuotolinis/Nuotolinio_mokymo(si)_vadovas_visas_08-20.pdf.
12. NŠA "Specialiosios mokymo priemonės". Prieiga per: https://www.nsa.smm.lt/itrauktis-ugdyme/specialiosios-mokymo-priemones/
13. „Specialiojo ugdymo įstatymas". Prieiga per: https://e-seimas.lrs.lt/rs/legalact/TAP/TAIS.69372/.
14. „Švietimo pagalba specialiųjų ugdymosi poreikių turintiems mokiniams" Prieiga per: https://smsm.lrv.lt/lt/veiklos-sritys-1/smm-svietimas/svietimas-pradinis-ugdymas/svietimo-pagalba-specialiuju-ugdymosi-poreikiu-turintiems-mokiniams?lang=lt.
15. „Sklandi kalba" svetainė. Prieiga per: https://www.sklandikalba.lt/ .

PATIKIMUMAS IR KIBERNETINIS SAUGUMAS MOKYME

Regina MISEVIČIENĖ[1], Dalius MAKACKAS[2] ir Vidmantas RIMAVIČIUS[1]

[1]Kauno technologijos universitetas
[2]Marijampolės kolegija

Santrauka. Kibernetinio saugumo grėsmės išaugo eksponentiškai, todėl organizacijoms tenka didelė našta. Aukštojo mokslo institucijos yra ypač pažeidžiamos, o jų kibernetinio saugumo problemos sulaukia vis didesnio dėmesio. Nors šiuo metu egzistuojanti programinė įranga bei įrankiai nuo kenkėjiškų veiksmų yra labai svarbi, tačiau to nepakankama, kad patikimai būtų apsaugota informacija. Kiekvienas asmuo, kuris naudojasi technologijomis, turi turėti bent elementarias bazines žinias, kaip apsisaugoti nuo įsilaužimo į įrenginį ar duomenų vagystės. Šiame straipsnyje išnagrinėtuose mokslinės literatūros šaltiniuose keliamos aukštųjų mokyklų kibernetinio saugumo problemos bei pateikti elementariausi kibernetinio saugumo higienos reikalavimai, siekiant apsaugoti duomenis gaunamus iš internetinės erdvės.

Reikšminiai žodžiai: švietimas, aukštosios mokyklos, kibernetinis saugumas, patikimumas.

1.   ĮVADAS

Technologijomis paremtoje visuomenėje grėsmės informacinių sistemų saugumui ypač išaugo daugeliui veiklos sričių persikėlus į internetinę erdvę. Internetinė erdvė yra kintanti, ji nuolat plečiama ir papildoma naujausiomis technologijomis, todėl ją būtina stebėti bei analizuoti vartotojų įgūdžius, kaip šie naudojasi internete teikiamomis paslaugomis. Saugumo agentūros dažnai perspėja apie grėsmes internetinėje erdvėje, tokias kaip sukčiavimas, kenkėjiškos programos, galimi programinės įrangos gedimai ar saugumo pažeidimai komunikacijos platformose (tokiose kaip Microsoft Teams ar Zoom). Dauguma kibernetinio saugumo spragų susiję su nepatikimomis internetinėmis saugyklomis ir nepakankamu interneto vartotojų išprusimu. Kibernetinių atakų keliama rizika nuolat kinta, todėl kibernetinio saugumo švietimas yra nuolat kintanti sritis, kurią kartais sunku išmokyti. Be to, kibernetinio saugumo poveikis priklauso ir nuo pakankamo specialistų skaičiaus ir jų kompetencijos.

Nors kibernetinis saugumas iš pirmo žvilgsnio gali pasirodyti aktualus tik įmonėms, tačiau aukštosios mokyklos taip pat nėra išimtis. Šiuo metu universitetų darbuotojai ar studentai sudaro svarbią atskirą interneto vartotojų grupę, turinčią prieigą prie institucinių skaitmeninių išteklių. Nors šiuo metu egzistuojanti programinė įranga bei įrankiai nuo kenkėjiškų veiksmų yra labai svarbi, tačiau to nepakankama, kad patikimai būtų apsaugota informacija. Kiekvienas asmuo, kuris naudojasi technologijomis, turi turėti bent bazines žinias, kaip apsisaugoti nuo įsilaužimo į įrenginį ar duomenų vagystės.

Šio straipsnio tikslas išnagrinėti mokslinės literatūros šaltiniuose keliamas aukštųjų mokyklų kibernetinio saugumo problemas ir pateikti elementariausius kibernetinio saugumo higienos reikalavimus, siekiant apsaugoti duomenis gaunamus iš internetinės erdvės.

Toliau šiame straipsnyje analizuojama mokslinė literatūra, aptariama kibernetinio saugumo praktika, aprašomi kibernetinio saugumo procesai bei pateikiami elementarūs įpročiai bei programinės priemonės, būtinos apsaugant kompiuterį bei informaciją nuo netikėtų grėsmių.

2. MOKSLINĖS LITERATŪROS ŠALTINIŲ ANALIZĖ

Kibernetinio saugumo grėsmės išaugo eksponentiškai, todėl organizacijoms tenka didelė našta. Aukštojo mokslo institucijos yra ypač pažeidžiamos, o jų kibernetinio saugumo problemos sulaukia didesnio dėmesio.

Straipsnyje (Cheng, E. C., & Wang, T., 2022) apžvelgiamos, kibernetinio saugumo naujausios tendencijos bei prognozės. Siūlomas strategijų rinkinys, kaip aukštosios mokyklos galėtų geriau kovoti su kibernetinio saugumo grėsmėmis ateityje.

Kitame straipsnyje (AlDaajeh, S., Saleous, H., Alrabaee, S., Barka, E., Breitinger, F., & Choo, K. K. R., 2022) nagrinėjama, kaip sukurti švietimo ekosistemą, kuri apimtų svarbiausius dalykus tikslinės auditorijos, kurios reikia lavinti kibernetinio saugumo įgūdžius. Straipsnyje pasiūlytoje paradigmoje, apibrėžti trys pagrindiniai kibernetinio saugumo strateginiai tikslai: saugių skaitmeninių ir informacinių technologijų infrastruktūros plėtra ir paslaugos, apsauga nuo sudėtingų kibernetinių grėsmių ir asmenų kibernetinio saugumo branda ir sąmoningumas

Straipsnyje (Blažič, 2022) autoriai pateikia tyrimo, rezultatus, siekiant nustatyti, kiek švietimo įstaigų ir pramonės sektoriaus kibernetinio saugumo švietimo sistema atitinka kibernetinio saugumo įgūdžius. Tyrimas remiasi duomenimis, surinktais iš Europos kompetencijos centrų. Tyrimo išvados rodo, kad aukšto mokslo institucijose mažai įtraukta kibernetinio saugumo temų į mokymosi programas ir kad reikia iš naujo formuoti jų turinį.

Kitame savo straipsnyje (Blažič, B., & Blažič, A., 2022) yra analizuojama Europos aukštųjų mokyklų studentų kibernetinio saugumo įgūdžių ir žinių būklė, renkant duomenis devyniose Europos šalyse. Surinktos informacijos analizė atskleidė reikiamas temas iš kibernetinio saugumo srities, kurias reikia diegti į aukštųjų mokyklų ugdymo programas. Surinktų duomenų tyrimas parodė, kad kibernetinio saugumo ugdymas aukštosiose mokyklose reikalauja naujoviškų ir interaktyvių metodų, kurie ugdytų reikiamus įgūdžius (pvz., vaizdo įrašų ir rimtų žaidimų, susijusių su kibernetiniu saugumu).

Straipsnyje (Khan, M. A., Merabet, A., Alkaabi, S., & Sayed, H. E., 22) siūlomas žaidimais pagrįstą mokymosi platformą, kuri pagerintų kibernetinio saugumo švietimą. Platforma taiko motyvacinį modelį kurti ir įvertinti įvairius iššūkius. Jis apima virtualią studentams skirtą laboratoriją su būtinomis praktikos priemonėmis ir interneto portalu, kuriame talpinami visi iššūkiai ir mokymosi medžiaga. Mokymasis vykdomas sprendžiant smagius galvosūkius ir lavinamuosius žaidimus kibernetinio saugumo srityje.

Apžvalgoje (AL-Nuaimi, 2022) tiriami žmogiškieji ir kontekstiniai veiksniai, turintys įtakos kibernetinio saugumo elgsenai organizacijose darant pasekmes kibernetiniam saugumui aukštojo mokslo institucijose.

Straipsnyje (Pirta-Dreimane, R., Brilingaitė, A., Roponena, E., & Parish, K., 2022) pažymima, kad esamos ir kuriamos kibernetinio saugumo kompetencijų sistemos orientuotos į dalykinių įgūdžių ugdymą. Tačiau kibernetinis saugumas yra tarpdisciplininis dalykas, reikalaujantis suprasti žmogaus elgesį ir kasdienėje rutinoje elgtis saugiai skaitmeninėje erdvėje. Todėl į ugdymo programas reikėtų integruoti keletą dimensijų, padedančių ugdyti esmines kompetencijas, įskaitant dalykinius įgūdžius ir žinių sritis, bendruosius įgūdžius ir elgesio pokyčius.

Išanalizuoti naujausi pastarųjų metų moksliniai straipsniai pažymi, kad esami kibernetinio saugumo tyrimai yra riboti ir yra dažniausiai yra orientuoti į technologijas. Nors publikacijose pristatoma geriausia praktika, kuri įtraukia naujoviškus ir interaktyvius metodus, tačiau dažnai trūksta visos sistemos perspektyvų aukštųjų mokyklų kibernetinio saugumo srityje.

3. KIBERNETINIO SAUGUMO PRAKTIKA

Internetinėje erdvėje vykdomas informacinių sistemų, kompiuterių tinklų ar asmeninių kompiuterių pažeidimas įvairiomis kenkėjiškomis priemonėmis apibrėžiamas kaip kibernetinės atakos. Šių atakų tikslas yra pažeisti, pakeisti ar užvaldyti pasirinktą šaltinį. (Vikipedia, 2023).

Kibernetinis saugumas, kitaip vadinamas skaitmeniniu saugumu, yra „*skaitmeninės informacijos, įrenginių bei išteklių apsaugos procesai*". (Microsoft, 2023)

Kaip teigia ESET Lietuva kibernetinio saugumo ekspertas Gediminas Mikelionis (Mikelionis, 2022), dažnai pasitaiko tokie kibernetinių atakų būdai:

- Nepageidaujamos reklamos, kurioje yra kenkėjiškos programos, siūlymas;
- Nuotolinis kompiuterių ar kompiuterių tinklų puolimas;
- Kenkėjiškos virusinės programos;
- Sukčiavimas, kai siekiama išvilioti konfidencialius asmeninius duomenis;
- Programinės įrangos pažeidžiamumas, kai siekiama gauti nuotolinę prieigą prie kompiuterių resursų.
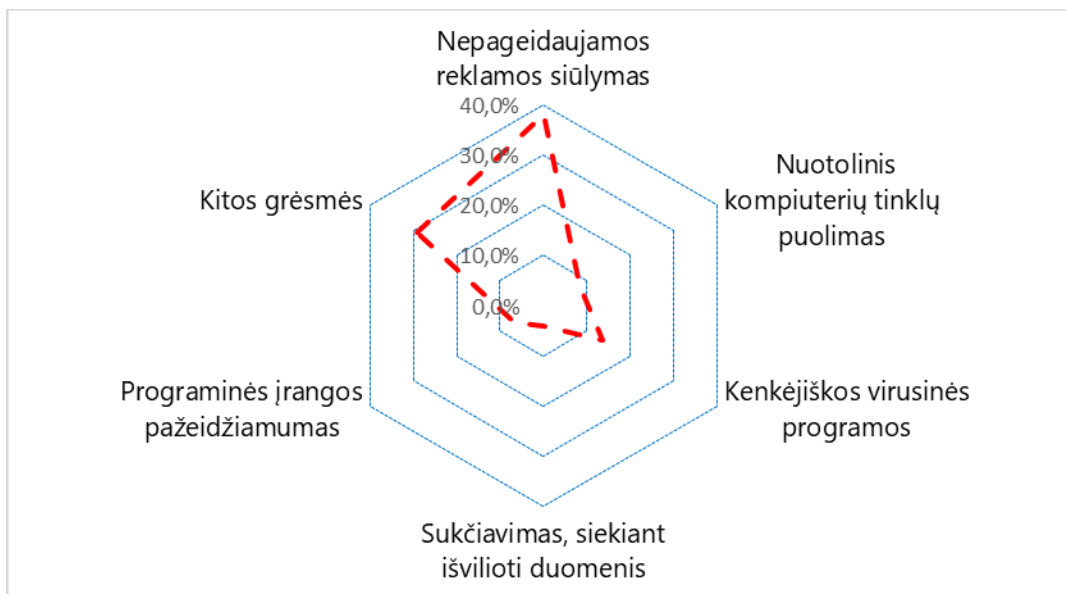
5 pav. Kibernetinio saugumo grėsmės 2022 metais Lietuvoje

Iš 1 pav. matyti, kad daugiausia paplitęs yra nepageidaujamos reklamos siūlymas.

Nors šiuo metu egzistuojanti programinė įranga bei įrankiai nuo kenkėjiškų veiksmų yra labai svarbi, tačiau to nepakankama, kad būtų užtikrintas duomenų saugumas tiek asmeniniuose įrenginiuose, tiek ir internetinėje erdvėje. Kibernetiniam saugumui siūloma taikyti apibrėžtus procesus bei praktiką. Tai gali būti (Microsoft, 2023):

- Informacijos atsarginių kopijų saugojimas saugioje vietoje, kad būtų galima atkurti prarastus duomenis, jeigu kažkas atsitiktų nenumatyto.
- Pastovus tiek operacinės sistemos tiek ir naršyklės programinės įrangos atnaujinimas iš patikimo tiekėjo.
- Unikalių, sudėtingų bei skirtingų slaptažodžių naudojimas ir atnaujinimas įvairiose paskyrose. Patariama naudoti kelių lygių identifikavimą, kad duomenys būtų saugūs.
- Neatidarinėti siūlomų reklaminių priedų ar saitų, kurie atsiunčiami elektroniniu paštu ar kitomis elektroninėmis priemonėmis.

4. PROGRAMOS, PADEDANČIOS ĮVERTINTI KOMPIUTERIO PATIKIMUMĄ

Nesudėtingų programų naudojimas taip pat gali padėti apsaugoti kompiuterį bei informaciją nuo netikėtų grėsmių. Pateikiama keletas iš jų, kurias gali panaudoti bet kuris vartotojas:

- **IP scanner**. Patikimas ir nemokamas tinklo skaitytuvas LAN analizei. Programos pagalba galima pamatyti visus tinklo įrenginius, suteiktą prieigą prie bendrinamų aplankų, valdyti kompiuterius per nuotolį ir netgi nuotoliniu būdu išjungti kompiuterius. Ją lengva

naudoti ir veikia kaip nešiojamasis leidimas. Tai turėtų būti pirmasis kiekvieno tinklo vartotojo pasirinkimas.
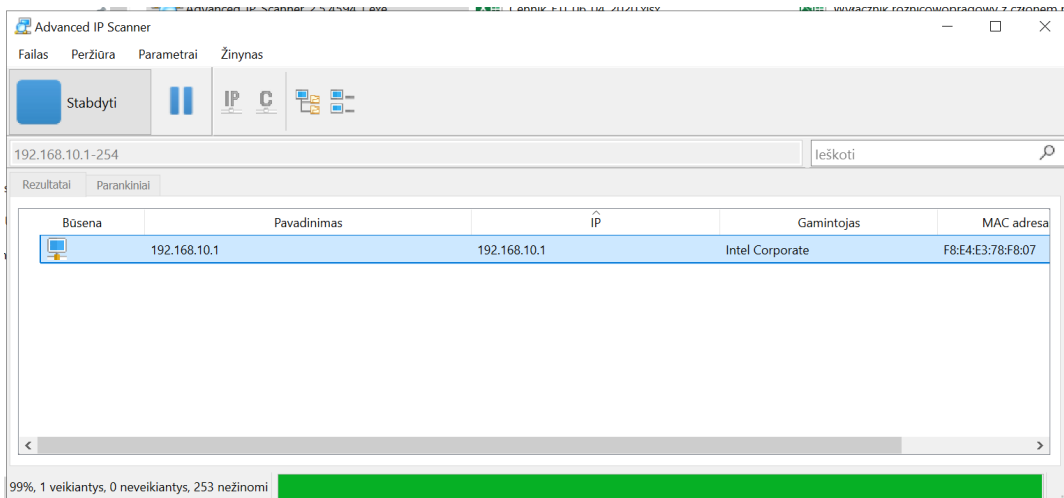
6 pav. Tinklo skaitytuvas IP scanner

• **WiFi Analyzer** gali padėti nustatyti „Wi-Fi" problemas, rasti geriausią kanalą ar geriausią vietą maršruto prieigos taškui, paversdama kompiuterį, planšetinį kompiuterį ar mobilųjį įrenginį belaidžio tinklo analizatoriumi.
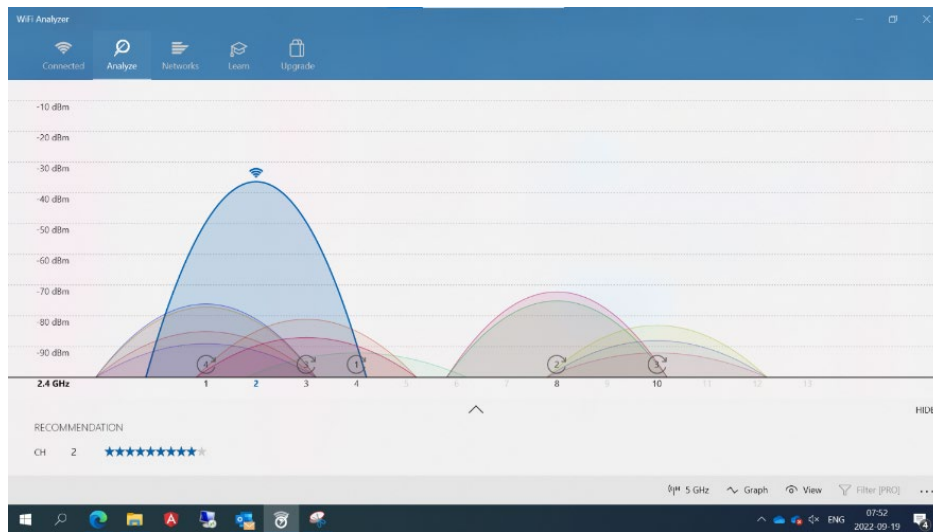
7 pav. Belaidžio tinklo analizatorius WiFi Analyzer

• **Tracert** programa skirta patikrinti per kokius tinklo mazgus keliauja duomenų paketas tarp siuntėjo ir adresato. Tai leidžia pasitikrinti ar neatsirado naujų tarpininkų, kurie galėtų kenkėjiškai veikti perimdami ir pakeisdami paketus. Tai gana aktualu bevieliuose tinkluose.

8 pav. Tinklo mazgų trasavimo programa Tracert

• **Ipconfig** programa skirta kompiuterio tinklo parametrų (ip adreso, kaukės ir vartų adreso) peržiūrai. Labai dažnai naudojama DHCP paslauga automatiniam ip adreso ir susijusių parametrų suteikimui iš naujo prisijungusiam tinklo mazgui. Kas sudaro prielaidas optimizuoti sąnaudas atsirandančias administruojant tinklo dalyvius. Koks adresas priskirtas kompiuteriui su Windows operacine sistema nuo seno galima pasižiūrėti su komandinės aplinkos programa ipconfig (analogas Linux OS - ifconfig).

9 pav. Tinklo parametrų peržiūros programa Ipconfig

• Su **netstat** komandine programa galima pamatyti kiek programų laukia ar jau yra užmezgusių ryšių su kitais tinklo mazgais. Tame tarpe galima pasitikrinti ar neatsiranda

kenkėjiškų programinių modulių, kurie gali laukti komandų iš išorės ir pradėti dirbti kaip servisai ar būti miegančiais "botais" (ang. bot). Tai gali išduoti pranešimų laukiantys portai.

```
C:\Users\Lenovo>netstat /an

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            0.0.0.0:0              LISTENING
  TCP    0.0.0.0:445            0.0.0.0:0              LISTENING
  TCP    0.0.0.0:5040           0.0.0.0:0              LISTENING
  TCP    0.0.0.0:49664          0.0.0.0:0              LISTENING
  TCP    0.0.0.0:49665          0.0.0.0:0              LISTENING
  TCP    0.0.0.0:49666          0.0.0.0:0              LISTENING
  TCP    0.0.0.0:49667          0.0.0.0:0              LISTENING
  TCP    0.0.0.0:49668          0.0.0.0:0              LISTENING
  TCP    0.0.0.0:49670          0.0.0.0:0              LISTENING
  TCP    0.0.0.0:50128          0.0.0.0:0              LISTENING
  TCP    158.129.47.242:139     0.0.0.0:0              LISTENING
  TCP    158.129.47.242:62538   20.199.120.151:443     ESTABLISHED
  TCP    158.129.47.242:62541   20.199.120.182:443     ESTABLISHED
  TCP    158.129.47.242:62581   40.99.148.178:443      ESTABLISHED
  TCP    158.129.47.242:62644   20.199.120.151:443     ESTABLISHED
  TCP    158.129.47.242:62659   40.114.211.182:443     ESTABLISHED
  TCP    158.129.47.242:62847   104.18.115.97:443      CLOSE_WAIT
  TCP    158.129.47.242:62848   188.114.96.3:443       CLOSE_WAIT
  TCP    158.129.47.242:62984   142.250.179.197:443    TIME_WAIT
  TCP    158.129.47.242:64038   93.184.220.29:80       CLOSE_WAIT
  TCP    158.129.47.242:64039   152.199.19.161:443     CLOSE_WAIT
```

10 pav. Netstat komandinė programa

5.   IŠVADOS

Pagal mokslinių straipsnių analizę kibernetinio saugumo srityje pastebėta, kad esami kibernetinio saugumo tyrimai yra riboti ir yra dažniausiai yra orientuoti į technologijas. Nors publikacijose pristatoma geriausia praktika, kuri įtraukia naujoviškus ir interaktyvius metodus, tačiau dažnai trūksta visos sistemos perspektyvų aukštųjų mokyklų kibernetinio saugumo srityje.

Kiekvienas asmuo, kuris naudojasi technologijomis, turi turėti bent elementarias bazines žinias, kaip apsisaugoti nuo įsilaužimo į įrenginį ar duomenų vagystės. Elementarūs įpročiai ar nesudėtingų programų naudojimas gali padėti apsaugoti kompiuterį bei informaciją nuo netikėtų grėsmių.

LITERATŪROS ŠALTINIAI

1. AlDaajeh, S., Saleous, H., Alrabaee, S., Barka, E., Breitinger, F., & Choo, K. K. R. (2022). The Role of National Cybersecurity Strategies on the Improvement of Cybersecurity Education. Computers & Security, 102754, 1-21.

2. AL-Nuaimi, M. N. (2022). Human and contextual factors influencing cyber-security in organizations, and implications for higher education institutions: a systematic review. Cyber-security. Global Knowledge, Memory and Communication, 1-23.
3. Blažič, B. J. (2022). Changing the landscape of cybersecurity education in the EU: Will the new approach produce the required cybersecurity skills? Education and Information Technologies, 27(3), 3011-3036.
4. Blažič, B., & Blažič, A. (2022). Cybersecurity Skills among European High-School Students: A New Approach in the Design of Sustainable Educational Development in Cybersecurity. Sustainability, 14(8), 4763., 1-23.
5. Cheng, E. C., & Wang, T. (2022). Institutional Strategies for Cybersecurity in Higher Education Institutions., 192. Information, 13(4), 1-14.
6. Khan, M. A., Merabet, A., Alkaabi, S., & Sayed, H. E. (22). Game-based learning platform to enhance cybersecurity education. Education and Information Technologies, 1-25.
7. Microsoft. (2023 m. 01 20 d.). Kas yra kibernetinis saugumas? Nuskaityta iš Microsoft: https://support.microsoft.com/lt-lt/topic/kas-yra-kibernetinis-saugumas-8b6efd59-41ff-4743-87c8-0850a352a390.
8. Mikelionis, G. (2022 m. 09). Kibernetinis saugumas namuose. Nuskaityta iš Youtube: https://www.youtube.com/watch?v=O_zgy92Z-ZQ.
9. Pirta-Dreimane, R., Brilingaitė, A., Roponena, E., & Parish, K. (2022). Multi-dimensional Cybersecurity Education Design: A Case Study. Dependable, Autonomic and Secure Computing (p. 1-8). Riga: IEEE.
10. Vikipedia. (2023 m. 01 20 d.). Kibernetinė ataka. Nuskaityta iš Vikipedia: https://lt.wikipedia.org/wiki/Kibernetin%C4%97_ataka.

VAIZDO KONFERENCIJŲ ZOOM IR MICROSOFT TEAMS RAIDA IR PALYGINIMAS

Anastasija Martynova

Kauno technologijos universitetas, Lietuva

Santrauka. Straipsnyje pristatomos dvi konferencijų platformos *Zoom* ir *Micrasoft Teams*, apžvelgiama jų įkūrimo istorija ir vystymosi galimybės. Šios dvi platformos yra palyginamos pagal iškeltus kriterijus. Atlikus apklausą, pateikiami jos rezultatai apie vaizdo konferencijų priemonių naudojimą nuotoliniame mokymesi. Išanalizavus literatūros šaltinius, galima teigti, kad renkantis vaizdo telekomunikacijos priemonę susiduriama su įvairiais iššūkiais, o pagrindinis aspektas – vartojo poreikis ir jo turimos kompiuterinės įrangos bei finansinės galimybės.
Raktiniai žodžiai: Zoom, Microsoft Teams, vaizdo konferencijos, virtualūs susitikimai.

1. ĮVADAS

2020 metų pradžioje prasidėjus COVID–19 pandemijai švietime buvo ypač plačiai įvestas nuotolinis mokymas. Pačioje pradžioje pedagogams reikėjo rasti sprendimą, kaip užtikrinti mokymo(si) kokybę nuotoliniu būdu, palaikant su mokiniu tiesioginį bendravimą, išlaikant galimybę perteikti garsą ir vaizdą, naudotis pokalbių langu, skaidrių demonstravimu, „balta lenta" ir pan. Pedagogai naudojo skirtingas vaizdo konferencijų programas, kurios jiems buvo geriau žinomos ar rekomenduotos jų mokymo įstaigose. Šiuo metu, įgyvendinant švietimo ir mokymo programas, mokymo įstaigoms yra teikiamos novatoriškos ir finansiškai palankios platformos [1]. Pastaraisiais metais didėja tarpregioninio bendravimo ir bendradarbiavimo veiklos švietime naudojant vaizdo konferencijas. Skirtingų šalių, rajonų, miestų mokymo įstaigos gali kurti ir plėtoti naujus ryšius ir skatinti bendradarbiavimą, pasitelkiant vaizdo konferencijas, kartu organizuojant mokymą ir jį vykdant [1].

Nuotolinio vaizdo konferencijų platformų yra daug ir labai įvairių: *Zoom*, *Microsoft Teams*, *Adobe Connect*, *Google Meet Myownconference* ir pan. Šiame darbe bus apžvelgtos dvi programos ir jų galimybės bei atliktas jų palyginimas pagal iškeltus kriterijus.

2. VAIZDO KONFERENCIJŲ PLATFORMA „ZOOM"

Zoom platformos įkūrėjas Eric Yuan, buvęs *Cisco Webex* viceprezidentas [2] 2011 m. balandžio mėnesį paliko *Cisco* kompaniją, kad įkurtų savo naują įmonę [3], kurią pavadino *Saasbee* [4]. Tuo metu įmonė patyrė sunkų laikotarpį, nes buvo sudėtinga rasti investuotojus, kadangi daugelis žmonių manė, kad vaizdo telefonijos rinka yra perpildyta [4]. 2011 m. birželį įmonė surinko 3 mln. JAV dolerių startinio kapitalo, prie kurio prisidėjo *WebEx* įkūrėjas Subrah Iyar, *Cisco* įmonės buvęs vyriausiasis viceprezidentas, generalinis

Cisco advokatas Dan Scheinman ir *Cisco* rizikų kapitalistas Matt Ocko, TSVC (pirmoji ankstyvosios stadijos giliųjų technologijų rizikos kapitalo įmonė) ir Bill Tai (rizikos kapitalistas, sportininkas ir docentas) [4].

2012 m. gegužės mėnesį įmonė pakeitė savo pavadinimą į *Zoom*, pavadinimas buvo įkvėptas autoriaus Thacher Hurd knygos vaikams *Zoom City* [4]. 2012 m. rugsėjį pristatė beta versiją, kurioje buvo galimybė rengti konferencijas su 15 dalyvių naudojant vaizdo pokalbio (tuo metu taip vadinta vaizdo konferencija) galimybę [5]. 2012 m. lapkritį bendrovė pasirašė sutartį su Stenfordo universitetu, kuris buvo pirmasis oficialus klientas [4]. Vaizdo konferencijos paslauga pradėta teikti jau 2013 m. sausio mėnesį, kai bendrovė gavo 6 mln. JAV dolerių iš *Qualcomm Ventures* ir *Yahoo* įkūrėjo Jerry Young bei *WebEx* įkūrėjo Subrah Iyar ir buvusio *Cisco* viceprezidento bei generalinio advokato Dan Scheinman [6]. Pristatyta 1.0 programos versija, leidžianti vaizdo konferencijoje dalyvauti iki 25 dalyvių [7]. Jau tada *Zoom* paslauga turėjo daugiau nei 400 000 vartotojų, naudotojai buvo surengę apie 140 000 susitikimų ir ja naudojosi maždaug 1000 įmonių [7].

2020 metais *Zoom* mobilioji aplikacija buvo atsisiųsta 485 milijonus kartų, kompanija turi 504 900 verslo klientų, o metinių susitikimų *Zoom* platformoje skaičius viršija 3,3 trilijono minučių. Kasmet *Zoom* kuriama (angl. hosted) 45 milijardai minučių internetinių seminarų. Praėjusį 2021 metų ketvirtį *Zoom* uždirbo 1,021 mlrd.. JAV dolerių, tai net 54 % daugiau pajamų nei 2020 metais [8].

Naudotis *Zoom* programa galima per kompiuterį, planšetinį kompiuterį ar mobilųjį telefoną.

Norint prisijungti į vaizdo konferenciją kaip dalyviui, nebūtina įdiegti aplikacijos ar kurti *Zoom* paskyrą, pakanka paspausti konferencijos rengėjo atsiųstą nuorodą ir galima jungtis į susitikimą. Esant poreikiui rengti susitikimus privaloma turėti *Zoom* profilį, kurį sukurti galima pagrindiniame tinklalapyje paspaudus *Sign in, it's free* piktogramą.

Užsiregistravus kaip naujam vartotojui, iš karto galima planuoti ir rengti *Zoom* susitikimus naudojant interneto naršyklę arba įdiegus *Zoom* aplikaciją kompiuteryje. Su interneto puslapyje https://zoom.us sukurta paskyra galima prisijungti ir aplikacijoje bei pradėti ją naudoti.

Zoom platforma suteikia daugiafunkcines galimybes: vaizdo (angl. Video) ir garso (angl. Audio) naudojimas (galima naudoti abu vienu metu ar vieną iš norimų/reikiamų); Matyti ir valdyti dalyvių sąrašą (angl. Participants); Pokalbių langas; Pokalbių išsaugojimas; Failų siuntimas / gavimas; Ekrano pasidalinimas su kitais susitikimo dalyviais (galimas prezentacijų kaip fono (angl. Back ground) naudojimas); Susitikimo vaizdo ir / ar garso įrašymas; Rankos pakėlimo galimybė (angl. Raise Hand) ir reakcijų naudojimas; Kitų aplikacijų pritaikymas susitikimo metu; Baltos lentos naudojimas; Pokalbio lango išskirstymas į atskirus / uždarus pokalbių kambarėlius. *Zoom* turi nemokamo naudojimo galimybę ir apmokestinamus planus.

2.1. Vaizdo konferencijų platforma „Microsoft Teams"

Kompanija *Microsoft* pirmą kartą apie *Teams* paskelbė renginyje Niujorke, o pačią paslaugą visame pasaulyje pristatė 2017 m. kovo 14 d. Tuo metu *Microsoft* viceprezidentas buvo Brian MacDonald, vaizdo konferencijų programa buvo sukurta įmonės būstinėje per vidinį hakatoną [9].

Microsoft programų ir paslaugų viceprezidentas Qi Lu (programinių įrangų inžinierius) vadovavo bandymams įsigyti *Slack*, bet tais pačiais metais, pasitraukus Lu *Microsoft* paskelbė visuomenei apie *Teams*, kaip tiesioginį *Slack* konkurentą [9].

2017 m. gegužės 3 d. *Microsoft* paskelbė, kad *Microsoft Teams* pakeis *Microsoft Classroom* (anksčiau *Office 365 for Education*). 2017 m. rugsėjo 7 d. pastebėtas pranešimas *Skype for Business* priklauso *Microsoft Teams*, informacija patvirtintą tų pačių metų rugsėjo 25 d. kasmetinėje *Ignite* konferencijoje [9].

2018 m. liepos 12 d. paskelbta *Microsoft Teams* nemokama versija, dauguma platformos komunikacijos parinkčių – nemokamos, bet ribotas vartotojų skaičius ir failų saugojimo talpa [9].

2019 m. sausio mėn. *Microsoft* išleido naujinimus, skirtus mažmeninės prekybos darbuotojams, siekdama pagerinti *Microsoft Teams* skirtingų kompiuterių suderinamumą [10].

2019 m. rugsėjį *Microsoft* paskelbė apie *Skype* verslui laipsnišką nutraukimą, nes tai naudinga *Teams*. Perimtas *Skype for Business Online* naudojimas nutrauktas naujiems *Office 365* klientams ir 2021 m. liepos 31 d. buvo visiškai nutrauktas visiems vartotojams [11].

2019 m. liepos mėnesį *Teams* turėjo 13 mln. aktyvių vartotojų, o tų pačių metų lapkričio mėnesį pasiekė 20 mln. aktyvių vartotojų skaičių [12].

2020 m. pradžioje paskelbta *WalkieTalkie* funkcija, kuri naudoja tiesioginį ryšį išmaniuosiuose telefonuose ir planšetiniuose kompiuteriuose per *Wi-Fi* arba mobiliojo ryšio duomenis. Funkcija skirta naudotojams, kurie vykdo kasdienines operacijas ir / ar bendrauja su klientais [13].

2020 m. kovo 19 d. *Microsoft* paskelbė, kad *Teams* kasdieną pasiekia 44 milijonus vartotojų, interpretuojama, kad prie to prisidėjo COVID-19 pandemija [14]. Tų pačių metų balandžio mėn. *Teams* kasdieną pasiekiamų vartotojų skaičius išaugo iki 75 mln. vartotojų [15].

2021 m. gegužės 17 d. *Microsoft* pristatė asmeninę *Teams* versiją. Be pagrindinių funkcijų tokių kaip pokalbiai, failų bendrinimas, vaizdo skambučiai, vartotojai taip pat gali dalyvauti grupiniuose vaizdo skambučiuose su 300 vartotojų iki 24 val. trukmės.

Microsoft Teams platforma galima naudotis kompiuteriu, telefonu ir planšetiniu kompiuteriu. *Teams*, kaip minima, sukurta siekiant suteikti geriausias garso, vaizdo ir turinio dalijimosi galimybes. Esant nepakankamam interneto ryšio „pralaidumui" *Teams* pirmenybę teikia garso, bet ne vaizdo kokybei. Esant stabiliam interneto ryšiui *Teams*

optimizuoja medijos kokybę, įskaitant didelio tikslumo (angl. high – fidelity) garsą, iki 1080p vaizdo raišką ir iki 30 kadrų per sekundę vaizdo įrašams ir turiniui. HD vaizdo kokybę galima užtikrinti iki 1.5 Mbps. Faktinis interneto ryšio naudojimas skiriasi kiekviename garso ir vaizdo skambutyje, priklausomai nuo šių veiksnių: vaizdo išdėstymo (angl. Video layout), vaizdo skiriamosios gebos (angl. Video resolution) ir kadrų per sekundę (angl. Video frames per second). Norint užtikrinti geriausius rezultatus svarbiausia yra stabilus interneto ryšys [16].

Esant poreikiui planuoti susitikimus, privaloma susikurti *Microsoft Teams* paskyrą. Tam tikslui reikia per interneto naršyklę nueiti adresu: https://microsoft.com/microsoft-teams. Pirminiame puslapyje siūlomos pagrindinės galimybės: *Prisiregistruokite nemokamai* ir *Prisijunkite*. Pasirinkus *Prisiregistruokite nemokamai* galima susikurti paskyrą. Toliau būtina pasirinkti *Kaip norite naudoti Teams*?, ar kaip *mokymo įstaigai*, *draugams ir šeimai* ar *darbui organizacijoms*.

Sukūrus vartotojo paskyrą, matomas pradinis paskyros puslapis. Kairėje pusėje įrankių juostoje matoma *aktyvumo*, *pokalbių*, *kalendoriaus*, *pagalbos* parinktys, o pačioje apačioje pateikta piktograma skirta atsisiųsti ekrano aplikacijai (angl. Download desktop app). Sukūrus asmeninę paskyrą galime planuoti *Teams* susitikimus tiek naudojantis interneto naršykle, tiek aplikaciją.

Teams suteikia daugiafunkcines galimybes: vaizdo ir garso pokalbiai (galima naudoti abi arba vieną iš funkcijų); Matyti ir valdyti susitikimo dalyvius; Pokalbių langas; Reakcijos ir rankos pakėlimo funkcija; Failų siuntimas; Balta lenta; Susitikimų įrašymas (tik mokamose versijose); Kitų aplikacijų pritaikymas susitikimuose; Išskirstymas į atskirus / uždarus pokalbių kambarėlius.

Microsoft Teams turi nemokamą programos versiją ir apmokestinamus planus.

2.2. *Zoom* ir *Microsoft Teams* vaizdo konferencijų palyginimas

Apžvelgus dvi vaizdo konferencijų programas, galima palyginti jų nemokamos versijas pagal iškeltus tam tikrus kriterijus (žr. 5 lentelę).

LENTELĖ 1. *ZOOM* IR *MICROSOFT TEAMS* PROGRAMŲ PALYGINIMAS

Eiles nr.	Kriterijus	ZOOM	MICROSOFT TEAMS
1.	Paprastumas naudojime	Paprasčiau nei MT	Lyginant su Zoom sudėtingiau
2.	Vaizdo pokalbio trukmė (nemokama versija)	Iki 40 min.	60 min. (įprastai)
3.	Susitikimo įrašymo galimybė	+	-
4.	Dalyvių skaičius	Iki 100	Iki 300
5.	Susitikimų metu naudojami vaizdo filtrai	Galimi filtrai išvaizdai ir apšvietimui	-

Janette Novak ir Rob Watts palygina *Zoom* ir *Microsoft Teams* programas nurodydami, kad šios programos yra populiariausi vaizdo konferencijų pasirinkimai šiandien [17]. Šiame straipsnyje teigiama, jog tinkamas vaizdo konferencijų pasirinkimas priklauso nuo verslo (mokymų, seminarų ir pan.) poreikių ir iškeltų naudojimo kriterijų [17].

Palyginus šias dvi programas, galima daryti išvadą, kad priklausomai nuo individualių poreikių galima pasirinkti vartotojui labiausiai tinkamą variantą. Esant poreikiui įrašyti vaizdo susitikimą, nemokama *Zoom* versija tokią galimybę suteikia. Jeigu esminis kriterijus – laikas, tai 60 min. trukmės pokalbis nemokomoje *Microsoft Teams* programoje – vartotojui bus tinkamesniu pasirinkimu.

3.   SOCIOLOGINIS TYRIMAS *ZOOM* IR *MICROSOFT TEAMS* NAUDOJIMAS

2021 m. gruodžio mėn. buvo atliktas sociologinis tyrimas, siekiant ištirti *Zoom* ir *Microsoft Teams* naudojimą tarp įvairaus amžiaus ir skirtingas profesijas dirbančių asmenų. Tyrimu siekta išsiaiškinti kokias vaizdo konferencijų programas naudoja vartotojai, kuri programa yra paprastesnė naudojime, kokie kriterijai svarbiausi ir su kokiomis problemomis susiduriama.

Apklausą atlikti pasirinkta *Google Forms* programa. Apklausoje dalyvavo 54 respondentai.

Tyrime dalyvavusių amžius labai įvairus: 38,9 % 25–35 metų , 31,5 % 36–45 amžiaus, 24,1 % 46 – 55 metų kategorija ir 5,6 % virš 56 metų amžiaus.

Į klausimą kokias vaizdo konferencijų programas naudojate, buvo aiškus pasiskirstymas į dvi kategorijas, viena iš jų 59,3 % naudoja nemokamas vaizdo konferencijų paslaugas, o 40,7 % naudoja licencijuotas (nustatytas ir apmokestintas pagal darbo įstaigas), nei vienas iš dalyvių nėra individualiai asmeniniam poreikiui įsigijęs vartojimo licencijos (žr.: 1 pav.):

Kokias vaizdo konferencijų versijas naudojate?
54 atsakymai

- Nemokamas versijas
- Licenzijuotas (nustatytas ir apmokestintas Jūsų darbo įstaigos)
- Esu įsigijęs vartojimo licenziją, pagal asmeninį poreikį

40,7%

59,3%
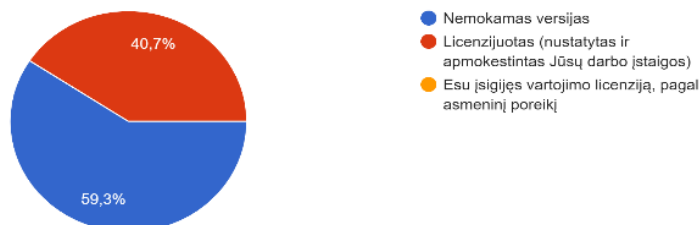
**1 pav. Nemokamų ir licencijuotų vaizdo konferencijų naudojimasis tarp vartotojų**

Į klausimą, kokias konkrečias vaizdo konferencijų programas respondentai naudoja buvo atsakyta, kad *Microsoft Teams 79*,6 %, 77,8 % nurodė, kad naudojasi *ZOOM*, taip pat buvo palikta galimybė įrašyti kitas naudojamas vaizdo konferencijų programas, iš kurių įvardijo kaip 5,7 % *Google Meet*, 3,8 % *Adobe Connect*, taip pat 3,8 % nurodo *BBB* ir po 1,9 % apklaustųjų teigė, kad naudoja *Skype, Cisco, Slack* (žr. 2 pav.):

2 pav. Naudojamos vaizdo konferencijų platformos

Kadangi, darbo tikslas yra palyginti dvi esmines platformas, į pateiktą klausimą, kuria programa lengviau naudotis, 51,9 % respondentų nurodė, kad *Zoom* ir 48,1 % *Microsoft Teams*.

Į klausimą kokie pagrindiniai vaizdo konferencijų įrankiai yra svarbiausi 87% nurodo, kad vaizdo ir garso kokybė, 81,5 % respondentų teigia, kad paprastas naudojimas, 57,4 % svarbi yra vaizdo susitikimo trukmė, 51,9 % pažymi, kad yra svarbi galimybė įrašyti vaizdo konferenciją ir po 18,5 % teigia, kad svarbu interneto sąnaudos bei galimybė naudotis filtrais išvaizdai ir apšvietimui (žr. 3 pav.):
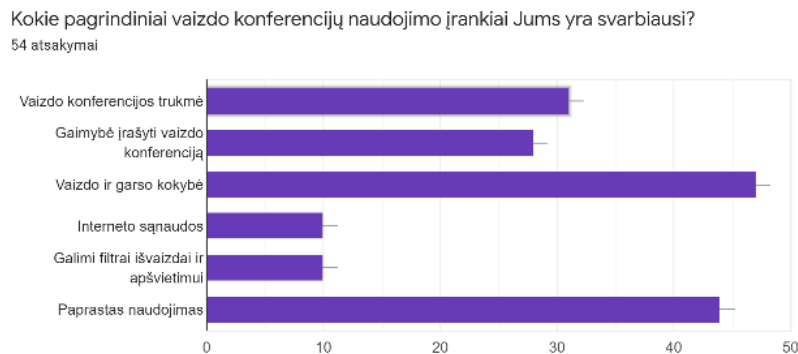
3 pav. Svarbiausi vaizdo susitikimų kriterijai

Taip pat užduotas atviras klausimas, kokių problemų kyla naudojantis vaizdo konferencijų platformomis, ir net 36,1 % nurodo, kad interneto ryšio trikdžiai, 13,3 % atsako, kad nekyla, taip pat respondentaiteigia, kad kitų dalyvių elgesys, didelė vaizdo susitikimų programų apimtis kuri lėtina darbo procesą, gebėjimas valdyti sistemą, trukmė (kuomet neturima vartojimo licencijos), dalinantis ekranu įjungti garsą (kaip papildomas nustatymas), menki įgūdžiai, garso ir vaizdo kokybės nebuvimas, problemos prisijungiant, negebėjimas nustatyti garso ir vaizdo nustatymų, kitų dalyvių ryšio ar techninės problemos, kai negirdime jų ar nematome.

4. IŠVADOS

Apžvelgtos dvi vaizdo konferencijų programos *Zoom* ir *Microsoft Teams*. Šios programos leidžia organizuoti virtualius susitikimus panaudojant vaizdo ir garso perdavimą realiu laiku. Šiose platformose yra galimybė dalintis ekrano vaizdu, siųsti failus ir įrašyti susitikimą. Taip pat galima naudoti papildomas aplikacijas, kurios paįvairins susitikimo metu pateiktą medžiagą ar pan. Palyginus *Zoom* ir *Microsoft Teams* vaizdo konferencijų programas pagal devynis iškeltus kriterijus, padaryta išvada, kad šios programos turi panašumų: turi nemokamas versijas, yra galimybė naudotis programėlėmis telefonu ir / ar planšetiniais kompiuteriais, sudaryta galimybė dalyvauti susitikimuose neturint naudotojo paskyros, galima dalintis ekranu ir demonstruoti *Baltą lentą* susitikimo metu. Esminiai skirtumai: *Zoom* nemokamoje versijoje susitikimo limitas 40 min., o *Microsoft Teams* 60 min.; *Zoom* nemokamoje versijoje yra vaizdo konferencijos įrašymo galimybė, o *Microsoft Teams* vaizdo konferencijos įrašymas galimas tik mokamoje versijoje; dalyvių skaičius nemokamoje versijoje *Zoom* iki 100 dalyvių, *Microsot Teams* iki 300 dalyvių; susitikimų metu galimybė naudoti vaizdo filtrus turi tik *Zoom*. Paprasčiau naudojama *Zoom* programa, nes ekrano apačioje pateikta valdymo juosta yra aiški, o *Microsoft Teams* sudėtingesnė, dėl programos naudojimo parinkčių išdėstymo.

Atlikus apklausą paaiškėjo, kad dauguma respondentų naudojasi nemokamais vaizdo konferencijų paketais (59,3 %). Labiausiai naudojamos vaizdo konferencijų programos *Microsoft Teams* (79,6 %) ir *Zoom* (77.8 %). Abiem vaizdo programomis yra nesudėtinga naudotis: *Zoom* (51,9 %) ir *Microsot Teams* (48.1 %). Svarbiausi naudojimo kriterijai, įrankiai: vaizdo ir garso kokybė (87 %), paprastas naudojimas (81,5 %), vaizdo susitikimo trukmė (57,4 %) ir galimybė įrašyti susitikimą (51,9 %). Pagrindinės problemos naudojantis vaizdo konferencijomis, tai interneto ryšio trikdžiai (36,1 %).

Remiantis tyrimo rezultatais galima daryti išvadą, kad *Microsoft Teams* ir *Zoom* yra labiausiai paplitusios vaizdo konferencijų programos Lietuvoje, respondentai abi programas vertina kaip lengvai naudojamas. Su programų naudojimu problemomis susiduriama esant įgūdžių stokai ir menkiems vartotojų įgūdžiams.

LITERATŪROS SĄRAŠAS

1. Tenveo administracija „Vaizdo konferencijos turi daugybę privalumų, kad nuotolinis švietimas taptų realybe", 2018-09-05. Prieiga per internetą: http://lt.tenveo-video-conference-jp.com/news/video-conferences-have-many-advantages-to-help-17930601.html [žiūrėta 2021-11-19].
2. Ary Levy, CNBC „Zoom's CEO emigrated from China 22 years ago and spoke little English – now he's worth almost 3 billion", 2019-04-19. Prieiga per internetą: https://web.archive.org/web/20190807172131/https://www.cnbc.com/2019/04/18/zoom-ceo-eric-yuan-worth-3-billion-after-ipo-profile.html [žiūrėta 2021-11-19].
3. Yitzi Weiner „The Inspiring Back story of Eric S. Yuan, Founderand CEO of Zoom", 2017-10-02. Prieiga per internetą: https://web.archive.org/web/20190423220431/https://medium.com/thrive-global/the-inspiring-backstory-of-eric-s-yuan-founder-and-ceo-of-zoom-98b7fab8cacc [žiūrėta 2021-11-19].
4. Steven Loeb „When Zoom was young: the early years", 2020-03-26. Prieiga per internetą: https://vator.tv/news/2020-03-26-when-zoom-was-young-the-early-years [žiūrėta 2021-11-19].
5. Walter S. Mossberg, The Wall Street Journal „A Chance To Call 15 Friends To Video Chat in High Def", 2012-08-21. Prieiga per internetą: https://www.wsj.com/articles/SB10000872396390444435045776033832386164 26 [žiūrėta 2021-11-19].
6. Tom Huddleston Jr., CNBC „Zoom's founder left a 6-figure job because he wasn't happy – and following his heart made him a billionaire", 2019-08-21. Prieiga per internetą: https://www.cnbc.com/2019/08/21/zoom-founder-left-job-because-he-wasnt-happy-became-billionaire.html [žiūrėta 2021-11-19].
7. Darrell Etherington „Zoom Raises $6M Series A, Launches Version 1.0 Of Its Radically Different Virtual Conferencing Tool", 2013-01-28. Prieiga per internetą: https://techcrunch.com/2013/01/28/zoom-raises-6m-series-a-launches-version-1-0-of-its-radically-different-virtual-conferencing-tool/?guccounter=1&guce_referrer=aHR0cHM6Ly9lbi53aWtpcGVkaWEub3JnLw&guce_referrer_sig=AQAAACsawOabgumjCXI49C8rYrfTKNEuVKqnbR8nANS0l0e651_VjDfHIO_oJ-uc0y84D8PTjOCVdWxglnbN8qj5gMG9iNo_l4WR6PEvke_lsyvROJqZIzkVp_fMwktjl4RVipRJyidOUiyxuF1Eu8SWKRDDX3hcNCpAmjvRN6TK6_DF [žiūrėta 2021-11-19].
8. Brian Dean „Zoom User Stats: How Many People Use Zoom in 2021?", 2021-10-27. Prieiga per internetą: https://backlinko.com/zoom-users [žiūrėta 2021-11-19].
9. Administration of Microsoft Teams „Microsoft Teams" at Microsoft Wiki, 2021. Prieiga per internetą: https://microsoft.fandom.com/wiki/Microsoft_Teams [žiūrėta 2021-11-19].

10. Richard Speed „Microsoft winstoday'sbuzzword bingo with empowering set of updates to Teams", 2019-12-09. Prieiga per internetą: https://www.theregister.com/2019/01/09/microsoft_teams_empowering_users/ [žiūrėta 2021-11-19].

11. Mary Jo Foley „Microsoft will drop Skype for Business Online on July 31, 2021", 2019-07-03. Prieiga per internetą: https://www.zdnet.com/article/microsoft-will-drop-skype-for-business-online-on-july-31-2021/ [žiūrėta 2021-11-21].

12. Reuters Staff „Microsoft Teams surpasses 20 milion daily active users; rival Slack shares slip", 2019-11-19. Prieiga internete: https://www.reuters.com/article/microsoft-teams-idINKBN1XT22O?edition-redirect=in [žiūrėta 2021-11-21].

13. Tom Warren „Microsoft Teams is getting a Walkie Talkie feature so you can reach colleagues all day long", 2020 -01-09. Prieiga per internetą: https://www.theverge.com/2020/1/9/21058313/microsoft-teams-walkie-talkie-push-to-talk-feature-preview [žiūrėta: 2021-11-19].

14. Thexyz Staff „Microsoft Office 365 Usage Statistics", 2020-09-18. Prieiga per internetą: https://www.thexyz.com/blog/microsoft-office-365-usage-statistics/ [žiūrėta 2021-11-21].

15. Aaron Tilley, The Wall Street Journal „Microsoft Takes On Zoom and Slackin a Battle for Your Work Computer" , 2020-06-02. Prieiga per internetą: https://www.wsj.com/articles/microsoft-aims-to-dominate-technology-at-work-starting-with-those-video-calls-11591108757 [žiūrėta 2021-11-21].

16. Microsoft Teams administration „Prepare your organization's network for Microsoft Teams", 2021-09-20. Prieiga per internetą: https://docs.microsoft.com/en-us/microsoftteams/prepare-network [žiūrėta 2021-11-21].

17. Janette Novak and Rob Watts, Forbes „Microsoft Teams Vs. Zoom", 2022-09-11. Prieiga per internetą: https://www.forbes.com/advisor/business/software/microsoft-teams-vs-zoom/ [žiūrėta 2022-10-14].

LSMU DĖSTOMŲ BIOSTATISTIKOS DALYKŲ ĮVERTINIMŲ PALYGINIMAS PRIEŠ COVID-19 PANDEMIJĄ IR PANDEMIJOS LAIKOTARPIU

Vita Špečkauskienė, Ingrida Grabauskytė, Renata Paukštaitienė, Jūratė Tomkevičiūtė

Lietuvos sveikatos mokslų universitetas, Medicinos akademija, Medicinos fakultetas, Fizikos, matematikos ir biofizikos katedra, Lietuva

Santrauka. Tyrimas atliktas Lietuvos sveikatos mokslų universitete siekiant palyginti studijų dalykų, kuriuose dėstomi biostatistikos pagrindai, galutinius įvertinimus prieš Covid-19 pandemiją ir pandemijos laikotarpiu. Tyrimo metu lyginti studentų, studijavusių skirtingais mokymosi būdais (kontaktiniu, nuotoliniu ir mišriuoju) galutiniai įvertinimai. Taip pat buvo lyginami lietuvių kalba studijavusių studentų įvertinimai su anglų kalba studijavusių studentų įvertinimais. Statistiškai reikšmingų skirtumų tarp studijų dalykų žinių, įgytų studijuojant skirtingais mokymosi būdais, įvertinimų (tiek lietuvių, tiek anglų kalba studijavusių studentų) nenustatyta. Statistiškai reikšmingai skyrėsi lietuvių ir anglų kalba studijavusių studentų žinių įvertinimai kontaktiniu ir mišriuoju būdu (lietuvių kalba studijavusių studentų įvertinimai aukštesni). Stebėtas reikšmingai didesnis perlaikiusių dalyko egzaminą studentų procentas studijuojant anglų kalba kontaktiniu ir lietuvių kalba mišriuoju būdu. Apibendrinant galima teigti, kad mokymosi būdas reikšmingos įtakos studentų žinių įvertinimams neturėjo.

Raktiniai žodžiai: biostatistika, studijų dalykų įvertinimai, Covid-19 pandemija.

1. ĮVADAS

Lietuvos sveikatos mokslų universitete (LSMU) kaip ir visuose universitetuose Covid-19 pandemijos metu pasikeitė mokymosi būdas: iš kontaktinio į nuotolinį, o vėliau iš nuotolinio į mišrų. Pats mokymosi būdo pokytis, organizuojant studijų procesą, nebuvo toks didelis iššūkis, kaip įgytų studentų žinių patikrinimo organizavimas ir vertinimas. Pastarasis ilgą laiką kėlė dėstytojų nerimą ir diskusijas dėl akademinio sąžiningumo ir objektyvumo vertinant žinias – ar galutiniai įvertinimai nėra pernelyg aukšti dėl studentų galimybės atsiskaitymų metu naudotis visa studijų medžiaga, pateikta nuotolinių studijų aplinkoje Moodle ir internete. Šias įžvalgas aptaria autoriai Walker, N. ir kt. (2021), Rodríguez-Planas N. (2022), Supriya K. ir kt. (2021).

Nepaisant universiteto administracijos sukurtos atsiskaitymo tvarkos ir suteiktos techninės įrangos dėstytojams, akademinis sąžiningumas atsiskaitymų metu didele dalimi priklausė nuo studentų motyvacijos mokytis, pareigingumo bei atsakomybės. Grįžimas prie kontaktinio mokymo, tyrimo autorius paskatino palyginti galutinius studijų rezultatus prieš Covid-19 pandemiją ir pandemijos laikotarpiu.

Straipsnyje aptariamų fakultetų studentai biostatistikos pagrindų dalykus studijuoja pirmame kurse. Studijų metu studentai supažindinami su pagrindiniais statistinės analizės metodais ir programiniais paketais MS Excel bei IBM SPSS Statistics.

Tyrimo metu analizuoti medicinos fakulteto studijų programų ir farmacijos fakulteto studijų programos tiek lietuvių, tiek anglų kalba studijavusių studentų galutiniai biostatistikos pagrindų dalykų įvertinimai. Minėtos programos pasirinktos dėl analogiškų dalyko temų ir kreditų skaičiaus.

Atlikto tyrimo tikslas – palyginti studijų dalykų, kuriuose dėstomi biostatistikos pagrindai galutinius įvertinimus prieš Covid-19 pandemiją ir pandemijos laikotarpiu. Tikslo įgyvendinimui iškelti uždaviniai: palyginti studentų, studijavusių kontaktiniu, nuotoliniu ir mišriuoju būdu, galutinius dalykų įvertinimus bei turėjusių perlaikyti egzaminą proporcijas; skirtingais pjūviais palyginti lietuvių ir anglų kalba studijavusių studentų rezultatus.

2.   TYRIMO METODAI

Tyrimo metu analizuoti 1377 LSMU studentų, studijavusių medicinos (n = 1213; 88,1 proc.) bei farmacijos (n = 164; 11,9 proc.) fakultetuose, galutiniai biostatistikos dalykų įvertinimai. Studentai, kurių žinių įvertinimai analizuoti, studijavo trimis skirtingais būdais: kontaktiniu (n = 168; 12,2 proc.), nuotoliniu (n = 746; 54,2 proc.) ir mišriuoju (n = 463; 33,6 proc.). Tyrimo metu palyginti lietuvių kalba (n = 894; 64,9 proc.) ir anglų kalba (n = 483; 35,1 proc.) studijavusių studentų įvertinimai. Taip pat domėtasi, ar neperlaikančių (n = 1255; 91,1 proc.) ir perlaikančių (n = 122; 8,9 proc.) egzaminą studentų pasiskirstymas homogeniškas tarp studijavusių kontaktiniu, nuotoliniu ir mišriuoju būdais, bei atskirai tarp studijavusių tiek lietuvių, tiek anglų kalbomis.

Statistinė duomenų analizė atlikta naudojant IBM SPSS Statistics 27.0 programų paketą. Taikytas Kolmogorovo-Smirnovo kriterijus normalumo prielaidai biostatistikos pagrindų dalykų įvertinimui lyginamose grupėse patikrinti. Tyrimo duomenys netenkino normalumo prielaidos visose lyginamosiose grupėse, todėl dviem nepriklausomoms imtims taikytas Mano-Vitnio kriterijus, daugiau nei dviem imtims – Kruskalo-Voliso kriterijus, poriniams palyginimams taikytas Bonferonio kriterijus. Kokybiniai kintamieji analizuoti taikant Chi-kvadrato homogeniškumo kriterijų bei z kriterijų su Bonferonio pataisa poriniams palyginimams. Kiekybiniai kintamieji aprašomi mediana ir mažiausia bei didžiausia reikšmėmis, kokybiniai kintamieji – dažniu ir santykiniu dažniu (proc.). Skirtumai tarp lyginamų grupių laikomi statistiškai reikšmingais, jei $p < 0,05$.

3.   REZULTATAI

Atliktos statistinės analizės rezultatai parodė, kad studentų, studijavusių kontaktiniu (Me = 7; [4-10]), nuotoliniu (Me = 7,7; [2-10]) ir mišriuoju (Me =7,45; [4,5-10]) būdu galutiniai įvertinimai statistiškai reikšmingai nesiskyrė (p = 0,072) (1 pav.).
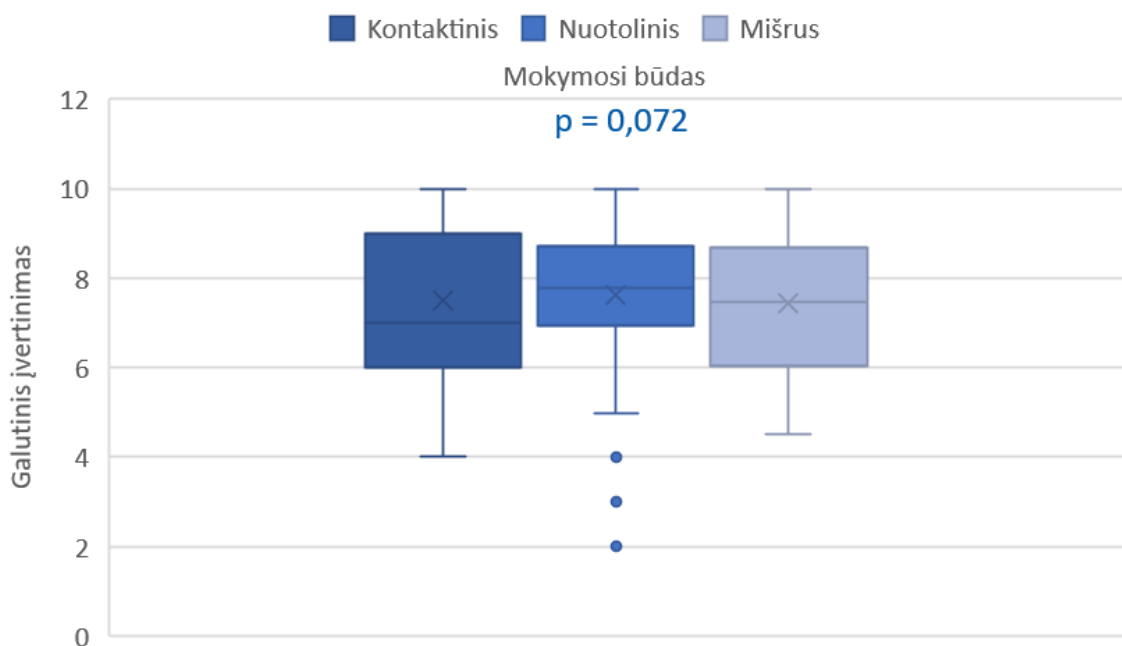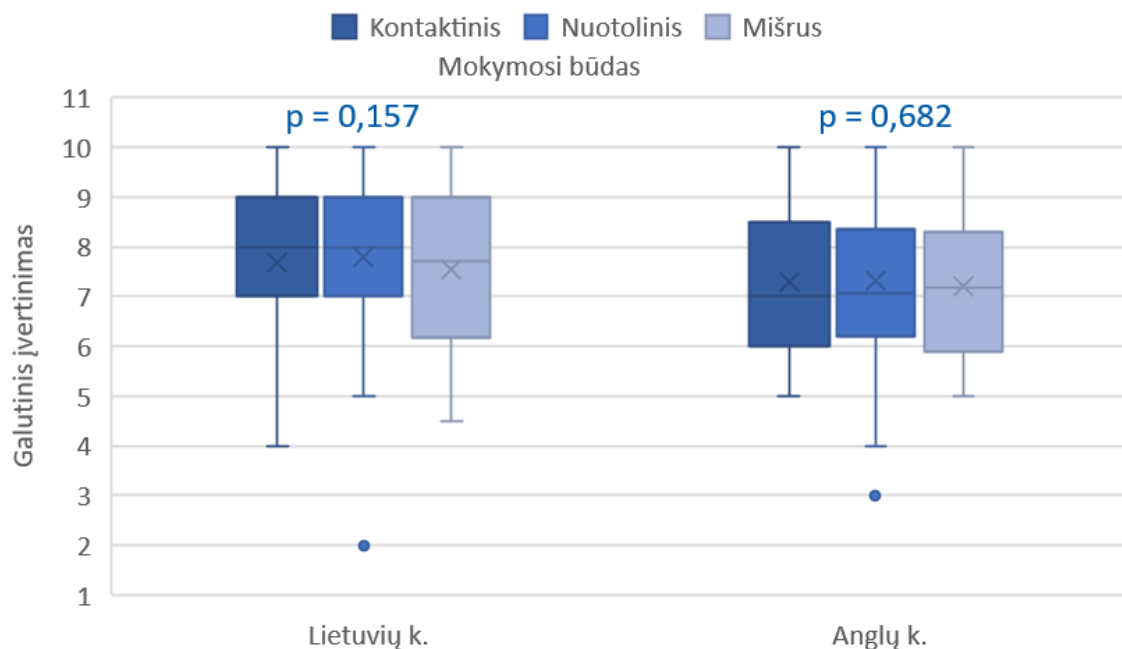

1 pav. Galutinių įvertinimų palyginimas pagal mokymosi būdą

Pastaba: grafike linija viduryje stačiakampio žymi medianą, o kryžiukas – vidurkį, stačiakampiai – tarpkvartilinį plotį, ūseliai – minimalią ir maksimalią reikšmes, o taškai – išskirtis.

Detalesnė analizė atlikta atskirai palyginus tiek lietuvių, tiek anglų kalba studijavusių studentų galutinius įvertinimus pagal mokymosi būdą (2 pav.). Rezultatai rodo, kad studentų, studijavusių lietuvių kalba kontaktiniu (Me = 8; [4-10]), nuotoliniu (Me = 8; [2-10]) ir mišriuoju (Me =7,7; [4,5-10]) būdais galutinių įvertinimų palyginimas reikšmingai nesiskyrė (p = 0,157).
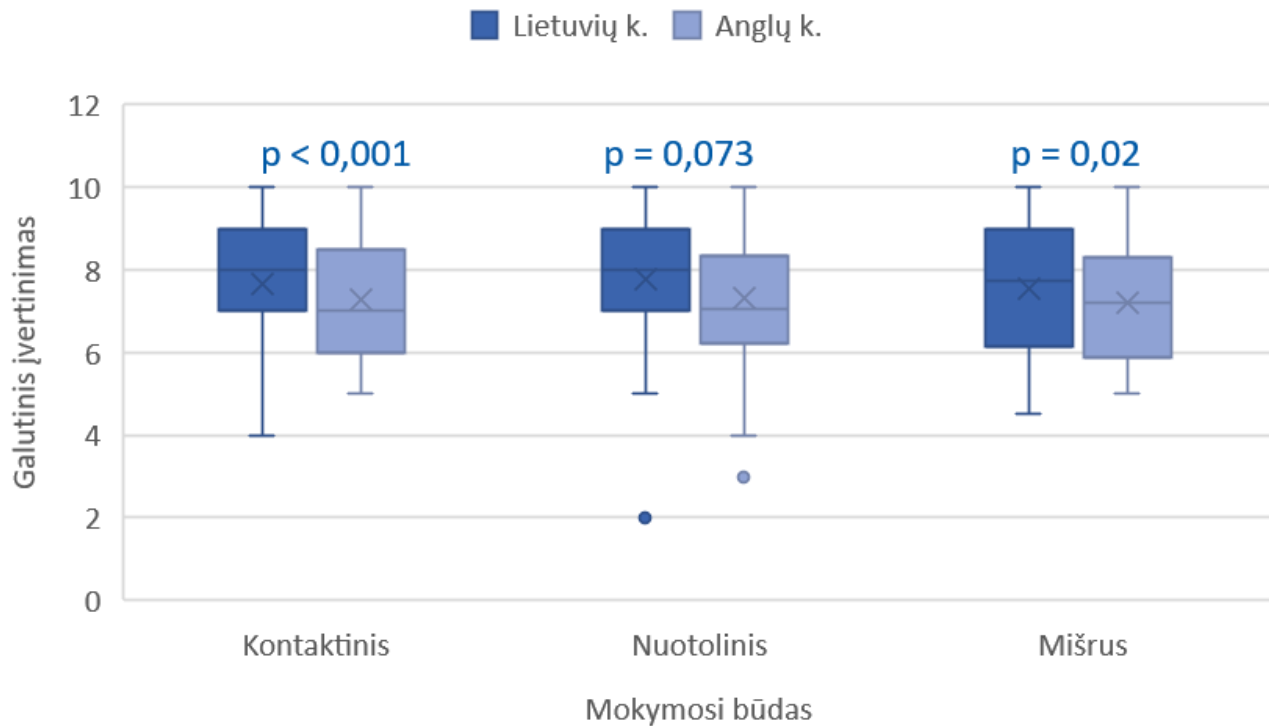
2 pav. Galutinių įvertinimų palyginimas pagal mokymosi būdą studijuojant skirtingomis kalbomis

Taip pat statistiškai reikšmingo skirtumo nerodė ir studentų, studijavusių anglų kalba galutinių įvertinimų statistinis palyginimas studijuojant kontaktiniu (Me = 7; [5-10]), nuotoliniu (Me = 7,1; [3-10]) ir mišriuoju (Me =7,2; [5-10]) būdu (p = 0,682).

Tyrimo rezultatai rodė statistiškai reikšmingus skirtumus atlikus studentų, studijavusių lietuvių ir anglų kalbomis, tarpusavio įvertinimų palyginimą (3 pav.).

3 pav. Galutinių įvertinimų palyginimas pagal studijų kalbą studijuojant skirtingais mokymosi būdais

Studentų studijavusių lietuvių ir anglų kalba įvertinimai statistiškai reikšmingai skyrėsi mokantis kontaktiniu būdu (Me = 8; [4-10] vs. Me = 7; [5-10]; p < 0,001) bei mišriuoju būdu (Me = 7,7; [4,5-10] vs. Me = 7,2; [5-10]; p = 0,02). Abu palyginimai rodo geresnius lietuvių kalba studijavusių studentų rezultatus. Ta pati tendencija stebima ir nuotolinių studijų metu, tačiau skirtumas nėra statistiškai reikšmingas (Me = 8; [2-10] vs. Me = 7,1; [3-10]; p = 0,073).

Kita statistinės analizės dalis atlikta įvairiais pjūviais lyginant studentų, turėjusių perlaikyti egzaminą, proporcijas. Analizuojant visų studentų duomenis bendrai, tyrimo rezultatai (4 pav.) parodė, kad studijuojant kontaktiniu, nuotoliniu ir mišriuoju būdais studentų, perlaikiusių egzaminą, proporcijos statistiškai reikšmingai nesiskyrė (p = 0,584).
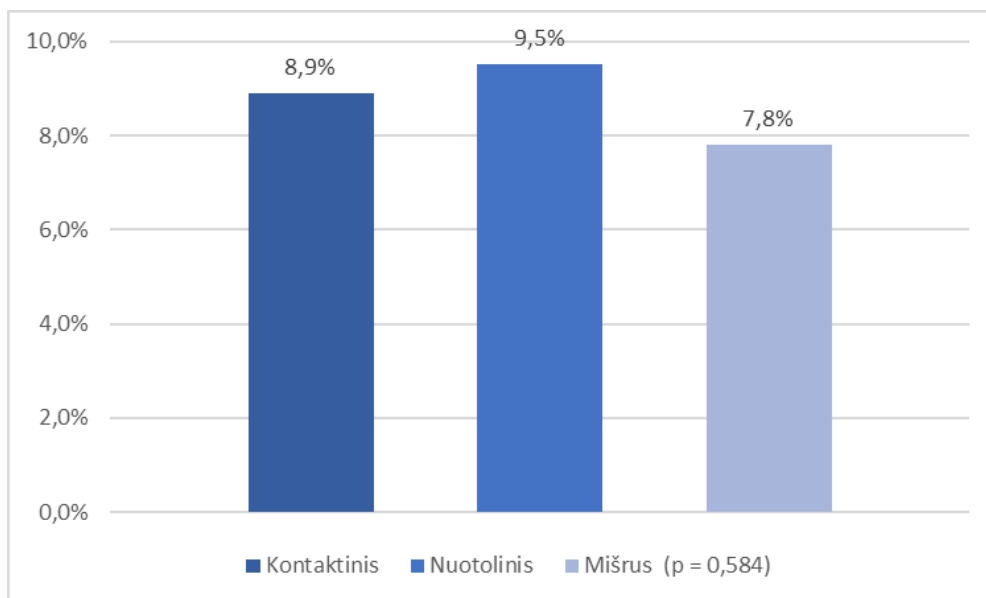
4 pav. Egzaminą perlaikiusių studentų proporcijų palyginimas studijuojant skirtingais mokymosi būdais

Bendras lietuvių kalba studijavusių studentų, kuriems nereikėjo perlaikyti egzamino, skaičius buvo 819 (91,6 proc.), o studentų, kuriems reikėjo perlaikyti – 75 (8,4 proc.), tuo tarpu bendras anglų kalba studijavusių studentų, neturėjusių perlaikyti egzamino, skaičius buvo 436 (90,3 proc.), o jį perlaikiusiųjų – 47 (9,7 proc.). Lietuvių ir anglų kalba studijavusių studentų, kurie turėjo perlaikyti egzaminą, proporcijos reikšmingai nesiskyrė (p = 0,403).

Palyginus lietuvių kalba studijavusių studentų, turėjusių perlaikyti egzaminą, proporcijas esant skirtingiems mokymosi būdams, tyrimo rezultatai (5 pav.) rodė kiek mažesnį perlaikančių procentą kontaktinio mokymosi metu, tačiau stebimi skirtumai tarp mokymosi būdų nebuvo statistiškai reikšmingi (p = 0,571) .
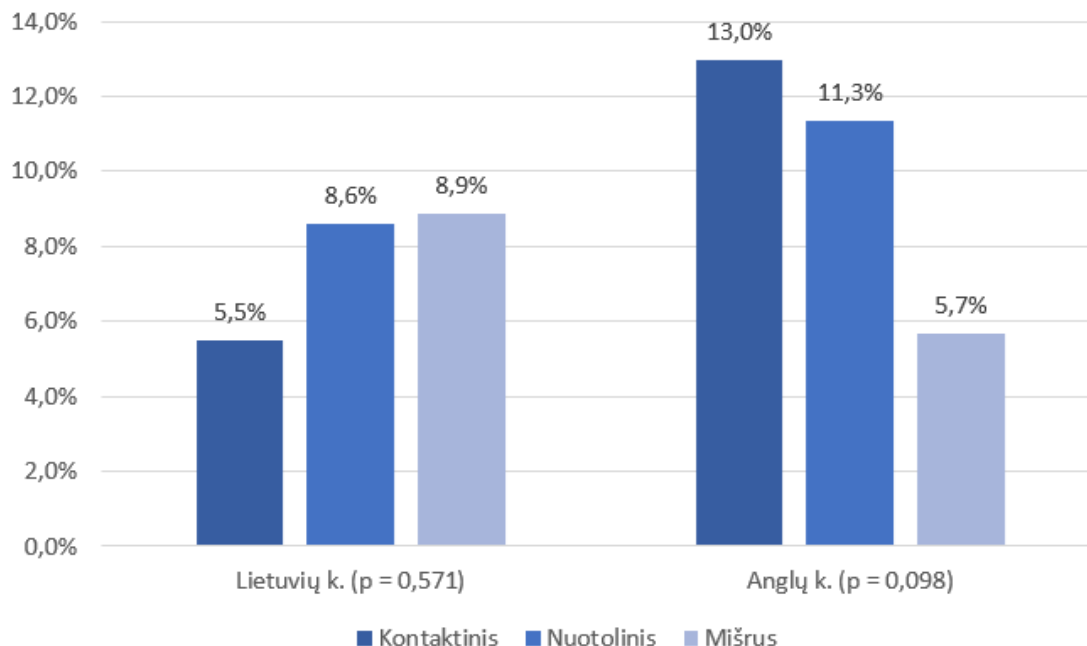
5 pav. Lietuvių ir anglų kalba studijavusių studentų, perlaikiusių egzaminą, proporcijos studijuojant skirtingais mokymosi būdais

Palyginus anglų kalba studijavusių studentų, turėjusių perlaikyti egzaminą, proporcijas esant skirtingiems mokymosi būdams, tyrimo rezultatai (5 pav.) rodo kiek mažesnį perlaikiusių anglų kalba studijavusių studentų skaičių mišriuoju mokymosi būdu, tačiau stebimi skirtumai taip pat nebuvo statistiškai reikšmingi (p = 0,098).

Taip pat palygintas tik turėjusių perlaikyti egzaminą lietuvių kalba ir anglų kalba studijavusių studentų pasiskirstymas studijuojant skirtingais mokymosi būdais (6 pav.). Atlikto palyginimo rezultatai rodo, kad šis pasiskirstymas statistiškai reikšmingai skyrėsi, t. y. nebuvo homogeniškas mokymosi būdų atžvilgiu (p = 0,02).
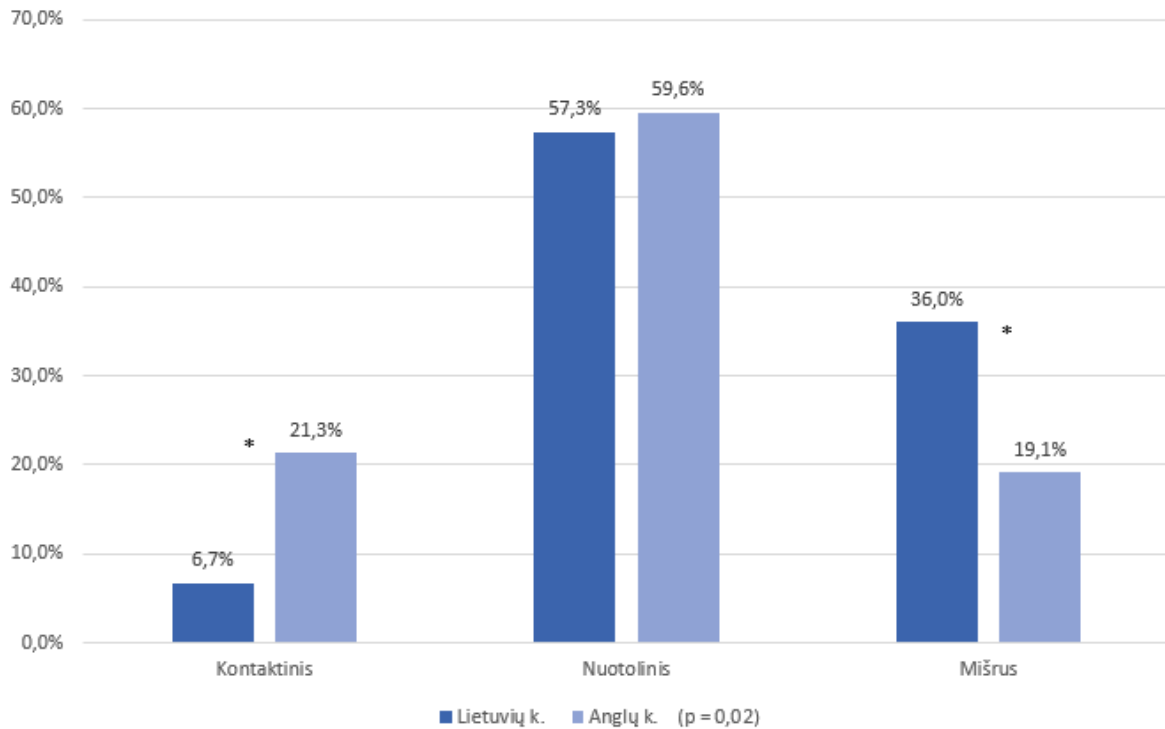
* p < 0,05 poriniuose palyginimuose pagal z kriterijų su Bonferonio pataisa

6 pav. Perlaikiusių studentų pasiskirstymo palyginimas pagal studijų kalbą studijuojant skirtingais mokymosi būdais

Poriniai palyginimai rodo, kad esant kontaktiniam mokymosi būdui perlaikiusių anglų kalba studijavusių buvo statistiškai reikšmingai daugiau nei lietuvių kalba studijavusių studentų, tuo tarpu esant mišriajam mokymosi būdui perlaikiusių egzaminą statistiškai reikšmingai daugiau buvo lietuvių kalba studijavusių studentų (abiem poriniams palyginimams p < 0,05).

4. DISKUSIJA IR IŠVADOS

Tyrimo metu analizuoti studentų biostatistikos dalykų akademiniai pasiekimai. Nors studentų žinių vertinimo forma studijuojant kontaktiniu, nuotoliniu ir mišriuoju būdu išliko tokia pati ir buvo tikimasi, kad vertinimai studijuojant nuotoliniu būdu pagerės, tačiau tyrimo rezultatai parodė, jog galutiniai įvertinimai statistiškai reikšmingai nepakito. Panašios tendencijos stebimos ir kituose tyrimuose, analizuojančiuose studentų pasiekimus ir mokymosi būdus: Al-Shaibani, T ir kt. (2020); Staneviciene, E. ir kt. (2020). Tačiau šie rezultatai nesutampa su rezultatais, gautais autorių Gonzalez T. ir kt. (2020) bei Semenets A. ir kt. (2021), kurie stebėjo reikšmingai aukštesnius galutinius studijų dalykų įvertinimus.

Įvertinus atliktos statistinės analizės rezultatus galima suformuluoti tokias išvadas:

- statistiškai reikšmingų skirtumų tarp studijų dalykų, įgytų studijuojant skirtingais mokymosi būdais, galutinių įvertinimų (tiek bendrai, tiek atskirai lietuvių arba anglų kalba studijavusių studentų) neaptikta;
- statistiškai reikšmingai skyrėsi lietuvių ir anglų kalba studijavusių studentų žinių galutiniai įvertinimai kontaktiniu ir mišriuoju būdu (lietuvių kalba studijuojančių studentų įvertinimai aukštesni);
- stebėta didesnė perlaikančių dalyką studentų proporcija studijuojant nuotoliniu būdu, tačiau skirtumas nėra statistiškai reikšmingas;
- stebėta statistiškai reikšmingai didesnė perlaikančiųjų anglų kalba kontaktiniu būdu studentų proporcija, lyginant su perlaikančiais studijuojant lietuvių kalba, bei reikšmingai didesnis perlaikančiųjų anglų kalba mišriuoju būdu studentų procentas, lyginant su perlaikančiais studijuojant lietuvių kalba.

Apibendrinant galime teigti, kad studijų būdas reikšmingos įtakos galutiniams biostatistikos studijų dalykų įvertinimams neturėjo. Tokius rezultatus galėjo lemti santykinai trumpos nuotolinės studijos, kurios sąlygojo studentų motyvaciją mokytis ir greitai adaptuotis prie pakitusio studijų būdo. Tokias išvadas pateikia autoriai Esra, M. E. Ş. E. ir kt. (2021) bei Hamdan, K. ir kt. (2022), savo tyrimuose aptarę nuotolinio mokymosi įtaką studentų motyvacijai.

LITERATŪRA

1. Al-Shaibani, T., Naguib, Y., Abdul Razzak, R., Ali, F. (2020). Impact of COVID-19 pandemic on students' performance in a problem-based learning system: comparative study between face-to-face-and virtual learning. 10.21203/rs.3.rs-114856/v1.
2. Esra, M. E. Ş. E., & Sevilen, Ç. (2021). Factors influencing EFL students' motivation in online learning: A qualitative case study. Journal of Educational Technology and Online Learning, 4(1), 11-22.
3. Gonzalez, T., De La Rubia, M. A., Hincz, K. P., Comas-Lopez, M., Subirats, L., Fort, S., & Sacha, G. M. (2020). Influence of COVID-19 confinement on students' performance in higher education. PloS one, 15(10), e0239490.
4. Hamdan, K., & Amorri, A. (2022). The Impact of Online Learning Strategies on Students' Academic Performance. E-Learning and Digital Education in the Twenty-First Century. doi: 10.5772/intechopen.94425.
5. Rodríguez-Planas N. (2022). COVID-19, college academic performance, and the flexible grading policy: A longitudinal analysis. J Public Econ. doi: 10.1016/j.jpubeco.2022.104606.

6. Semenets, A., & Vakulenko, D. (2021). A year of the COVID-19 Lockdown: comparative analysis of Distance Learning approaches in TNMU.

7. Staneviciene, E., & Buksnaitis, V. (2020). Impact of the COVID-19 Pandemic on Student Performance in Higher Education. ALTA'20: Advance Learning Technologies and Applications: Short Learning Programmes: Annual International Conference for Education: Conference Proceedings, 2nd of December, 2020 = Pažangios Mokymosi Technologijos Ir Aplikacijos: Trumpos Mokymosi Programos: Tarptautinė Konferencija Skirta Švietimui: Konferencijos Pranešimų Medžiaga, 2020 m. Gruodžio 2 d, 22–27.

8. Supriya K., Mead C., Anbar A. D., Caulkins J. L., Collins J. P., Cooper K. M., LePore P. C., Lewis T., Pate A., Scott R. A., Brownell S. E. (2021). Undergraduate Biology Students Received Higher Grades During COVID-19 but Perceived Negative Effects on Learning. Frontiers in Education. doi: 10.3389/feduc.2021.759624.

9. Walker, N., & Grimm, M. (2021). Descriptive analysis of the impact of COVID-19 on grades at the University of Oregon. Online: https://scholarsbank.uoregon.edu/xmlui/handle/1794/26482.

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