DIGITAL TOOLS IN ACTIVE LEARNING ACTIVITIES: MOTIVATING AND ENGAGING HIGHER EDUCATION STUDENTS

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Abstract:

Today's higher education system faces enormous challenges. Students in general have very particular characteristics that make the teaching-learnin such as being very dependent on technology, lacking motivation for expositive teaching, and lacking attention for various reasons and for certain p teacher needs to develop the student's skills for the future profession, and at the same time teacher needs to adapt the content of the course to pr In this context, the following question arises: How can teachers engage and attract students' interest and motivation for learning in the classroom in same time that articulates both content and skills to the profession?

To engage and motivate the students´ participation in the learning process, several active learning strategies using digital technology were introduce Communication course, with the students of Multimedia Bachelor at Bragança Polytechnic University. The students used free online tools such as Me Google Slides. They also used computers and mobile phones. The active learning activities were accomplished individually and collaboratively during of time. It also used interactive video.

The result of this pedagogical activity was very interesting. Students were very motivated and committed by the learning process in the different m students participated individually and collaboratively in groups of three or four students. The activities were controlled by a timer. At first, the st comfortable with the time required to complete the activity, but at the end of the activity, they realized that this way they were able to complete classroom period and that it reflects learning in a professional environment. Some important workplace skills were developed, such as critical thinkir teamwork, oral and written communication, listening, and observing.

Keywords:

Active Learning, Digital tools, Critical Thinking, Problem-Solving, Teamwork, Oral and Written Communication, Listening, Observing.

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Abstract

Today's higher education system faces enormous challenges. Students in general have very particular characteristics that make the teaching-learning process very difficult, such as being very dependent on technology, lacking motivation for expositive teaching, and lacking attention for various reasons and for certain periods. Additionally, the teacher needs to develop the student's skills for the future profession, and at the same time teacher needs to adapt the content of the course to professional practice. In this context, the following question arises: how can teachers engage and attract students' interest and motivation for learning in the classroom in higher education at the same time that articulates both content and skills to the profession?

To engage and motivate the students´ participation in the learning process, several active learning strategies using digital technology were introduced in the Organizational Communication course, with the students of Multimedia Bachelor at Bragança Polytechnic University. The students used free online tools such as Mentimeter, Jamboard and Google Slides. They also used computers and mobile phones. The active learning activities were accomplished individually and collaboratively during short and long periods of time. It also used interactive video.

The result of this pedagogical activity was very interesting. Students were very motivated and committed by the learning process in the different moments of the class. All students participated individually and collaboratively in groups of three or four students. The time for activities were controlled by a timer. At first, the students didn't feel very comfortable with the time required to complete the activity, but at the end of the activity, they realized they were able to complete the activity within the classroom period and that it reflects learning in a professional environment. Some important workplace skills were developed, such as critical thinking and problem-solving, teamwork, oral and written communication, listening, and observing.

Keywords: Active Learning, Digital tools, Critical Thinking, Problem-Solving, Teamwork, Oral and Written Communication, Listening, Observing.

1 INTRODUCTION

The hegemony of technology has generally had repercussions on society's behavior [1]. Education field is no exception, and the teaching-learning process changes have been, and will be, increasingly significant in the coming years. In addition, the impact of artificial intelligence on society, and specifically on educational systems, brings new challenges for educational agents [2].

A new paradigm of communication and teacher-student interaction has therefore emerged, which has an impact on the teaching-learning process [3, 4]. Gradually, higher education systems were challenged in order to balance all what is required of them, and therefore have become in a more unstable and complex environment [5, 6].

In the case of Higher Education, students in general have very particular characteristics, fundamentally in their dependence on technology, their lack of motivation in the face of traditional expository teaching, and consequently their lack of attention. This is a generation in which technology is present in their daily lives, and for considerable periods, and whose exposure to technological tools and digital applications has become exponentially more pronounced [7].

At the same time, governmental and non-governmental guidelines have been based on strengthening digitization alongside adult education and learning, which is accompanied by greater teacher training in the pursuit of a more advanced integration of digital technologies in education [8, 9].

Higher education, by definition, has always been, and should continue to be, about focusing on students and their skills, as well as encouraging them to solve complex challenges and problems [10, 11]. Among the skills that are encouraged in higher education are, for example, active participation, communication skills, collaboration skills, critical thinking and creative thinking, problem-solving skills and self-management skills [12].

In addition, teachers, based on this thinking, should stimulate students' skills, preparing them for their future profession while adapting the course content to professional practice.

Teachers have therefore been expected to adopt innovative teaching methods, models and content, which serve to improve students' critical and creative thinking [7, 9, 12].

According to the Center for Curriculum Redesign (CCR), in 2024, the idea remains that students should develop four dimensions, based on a 4D structure, also called 4-Dimensional (Figure 1) [9]: Knowledge, Skills, Character and Meta-Learning. These purposes converge in a predisposition for better professional performance, as well as better performance in the face of society's challenges.

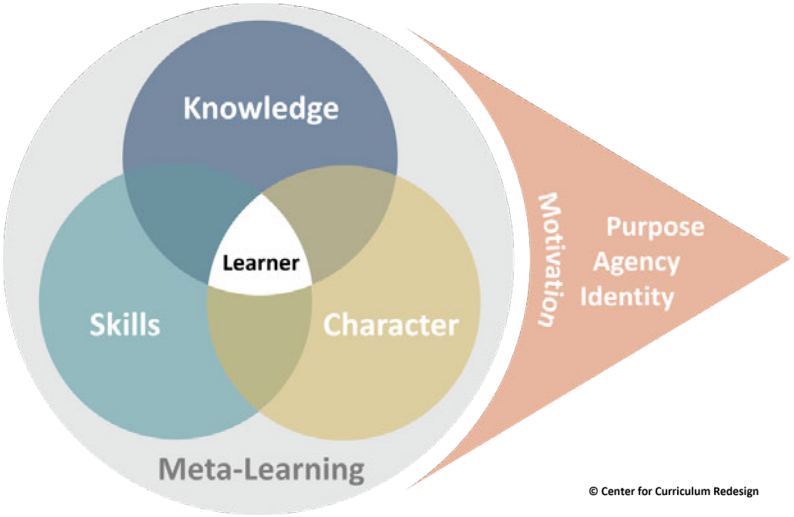

Figure 1: Framework 4D or 4-Dimensional (2019, 2024).

The framework combines the new focus on artificial intelligence and its impact on society, highlighting the multidimensional purposes of learning Knowledge, Skills, Character and Meta-Learning [9].

Contemporaneity and experiences of technological challenges, as well as the characteristics of the students, therefore, lead to creative actions and innovative strategies [7], which converge in a collaborative dynamic.

On the other hand, the theory of creativity competencies and organizational innovation suggests that the external environment, the organizational climate, as well as individual self-efficacy are the critical elements for increasing creativity [12].

In this context, active learning strategies using digital technology are beneficial in terms of increasing student involvement, motivation, and participation in the learning process [13, 15]. Active learning is described as a mainly collaborative learning format, based on the teacher as a facilitator in the process of creating knowledge with the students, to the detriment of the traditional content explainer [13].

[14] describes active learning methodologies as a principle that places the “student” at the “center of the educational process”, making them the “core of their learning. The student interacts with the content and constructs their knowledge, i.e. they do not passively receive the learning content” [14].

Concerning lifelong learning and active learning, the European Union has taken a leading role by launching a set of guidelines (for 2025 and/or 2030), which are based on the application of more active, collaborative and unifying methods, namely: “A New Skills Agenda for Europe,” “Education and Training 2020” “Key Competences for Lifelong Learning” [16, 17; 8].

Several approaches and strategies have been adopted over the years in the context of higher education, based on active learning methodologies, namely [13]:

1 More conventional actions such as class debates based on themes, or decision-making and discussions based on case studies;

2 Dynamic approaches using augmented reality (AR) and virtual reality (VR).

And, to paraphrase Barrows, Aslan, Thomas & Kim *in* [15]:

1 Problem-based learning: based on real cases, students work in groups to propose solutions to the problems identified and analyzed;

2 Project-based learning: projects involving research, planning and collaboration, applying skills and knowledge from different areas;

3 Cooperative learning: working in groups to achieve common goals, fostering peer learning and experiences;

4 Flipped Classroom;

5 Game-based learning: learning based on games. Learning specific skills and concepts in a playful and interactive way;

6 Challenge-based learning: students are presented with challenges so that they can solve complex problems and make decisions. In teams, students must research and apply knowledge from different areas;

7 Discovery learning: students are encouraged to discover knowledge for themselves through experimentation. Although teachers provide guidance, students are responsible for building their own knowledge.

Considering the above, we can say that active learning methodologies, in conjunction with digital technologies, have been widely applied in educational and academic contexts, and can "play an innovative role in the classroom and should be inserted as a teaching resource for pedagogical purposes in the students' learning process" [14].

Using digital audience response tools in the teaching-learning process, such as Mentimeter, Jamboard and Google Slides, aim to increase the students' engagement and enjoyment during that process.

For instance, Mentimeter is an online website, free and available on all web browsers. Teachers can use it to create interactive presentations and provide real-time students' input. Cooperatively, teachers and students can access it by using a computer or mobile phone. Teachers can create questions, *e.g.* quizzes, …[18].

Jamboard is a Google platform that simulates a virtual whiteboard. A collaborative tool and available for mobile phones or the right web browser, the application was designed for teaching-learning processes – virtual or in-person classes. The whiteboard platform allows to take notes with different types of digital pens, drop images, and pull assets directly from the web while collaborating with students [19, 20].

2 METHODOLOGY

The present paper describes the active learning strategies of class implementation using digital audience response tools such as Mentimeter, Jamboard and Google Slides and presents the results obtained.

The students were enrolled in the second year of Multimedia Bachelor at Bragança Polytechnic University, in the Organization Communication course. A total of 20 students were enrolled in the class. Of the total students, 29,5% were female and 70,5% were male. In this class, 12,5% were working students. From the total of students, 23,5% are from different countries, more specifically 3 % were from Brazil and 20,5% were from Portuguese-speaking African countries. Their ages range between 19 and 26 years old. This cultural diversity among students promotes an inclusive and differentiated teaching-learning process.

Considering the present teaching-learning process context:

a) Bearing in mind that the students generally have particular characteristics that make the teaching-learning process very hard, such as being very dependent on technology, lacking motivation for expositive teaching, and lacking attention for different reasons and in certain periods;

b) Additionally, the students normally use different tools within the classroom, such as cellular, computer, and iPods, using constantly internet and more recently ChatGPT, the students get distracted and out of class very easily;

c) Teachers need to adapt the course content to professional practice for two important reasons. The first is to get the students' attention and motivation. If they feel that what the content that they learn they will apply in future work, they will be motivated to learn and to participate in different activities. The second reason is because the job market demands that students know how to do things on the job.

In this context, the following question arises: How can teachers engage and attract students' interest and motivation for learning in the classroom in higher education, while at the same time that articulating both content and skills to the profession?

The main aim was to engage and motivate the students' participation in the teaching-learning process through several active learning strategies using digital technology, such as Mentimeter, Jamboard and Google Slides. Several specific goals

The active learning activities were rigorously planned and presented using PowerPoint with active slides. The active learning activities were presented in two different moments:

In the first moment learning the principal theoretical concepts:

1 See a movie about Internal Communication;
2 Answer an open question through Mentimeter using their own cellular;
3 Form a group of three students;
4 Using QrCode, or Jamboard link, within collaborative work, research different Internal Communication questions

In the second moment, apply the knowledge acquired and apply in a practical situation through workgroup project:

1 Form a group of three students;
2 Using QrCode, or Jamboard link, within collaborative work, select and produce Internal Communication tools;
3 Presented through Google Slides in two minutes the group work to all classes;
4 Group discussion.

A supporting categorization was created to assess the transversal skills developed by the students, such as communication, problem-solving skills, time management, creativity, collaboration, leadership, responsibility, etc. Critical thinking was assessed using a frequency scale (never (N); rarely (R); sometimes (A); often (F) and always (S). Table 1 below sets out the analysis of the information.

Table 1. Categorising information

Observation Grid		
Participation in the work group	Task	1.1 Understanding of the tasks performed
	Focus	1.2 Concentrating on the work done
	Listening	1.3 Listens and tries to understand the ideas and opinions of different colleagues
	Speaking	1.4 Presenting ideas and opinions to colleagues
	Giving support	1.5 Encourages colleagues to participate in work
		1.6 Helps colleagues whenever necessary
	Get supporting	1.7 Accepts help from colleagues
	Creativity and autonomy	1.8 Carries out assigned tasks with creativity and autonomy
	Time management	1.9 Completes assigned tasks on time
	Self-motivation	1.10 Motivation to do the job
Carrying out group work	Organisation	2.1 Planning and organisating the work
	Research	2.2 Collecting data
	Structuring the work	2.3 Reading, organising information and writing the final report
	Formatting	2.4 Formatting and referencing the text of the final report
	Communication	2.5 Public presentation of the work
	Leadership	3.1 The group had a leader which divided up the tasks and put all together

Participation of all group members in the development of work	Team work	3.2 The members of the groups divided up the tasks and put the pieces together
	Collaboration	3.3 Everyone in the group collaborated and helped each other out
	Motivation	3.4 Everyone in the group tried to get the job done
	Responsibility	3.5 Everyone in the group feels responsible for the success of the work
	Democracy	3.6 Everyone in the group shares opinions and respects to each other
	Problem-solving	3.7 The group tries to solve problems that arise during the work
Other observations		

Source: own elaboration

At the end of the class, students auto-reflected and auto-evaluated their work and their competencies acquired through the activities proposed, they also evaluated their peers. The teacher completes the information through observation and following Table 1.

3 RESULTS

3.1 Description and results achieved for each digital tools used through active learning activity

There were two different moments of teaching-learning process: The first moment teacher pretends that students comprehend complex and important concepts. The second moment the teacher pretends to apply in a real context the theoretical content understood during the moment before.

3.1.1 Mentimeter digital tool

In order to engage students and gather real-time feedback from all students, a digital tool was used during an activity learning activity, it is called the Mentimeter.

After the teacher presented a specific episode from a reality show called “A Thanksgiving Miracle-SNL.” This is a humorous sketch movie, from a reality show. It is pretended that students are involved in a relaxed, fun and humorous moment so that everyone wants to participate.

An open-ended was asked: “What kind of communication is present? Write a short sentence about the video you saw”. Through the Fig 1, you can see the students ‘answers.

Figure 2. Mentimer results

Not all the students were able to identify the type of communication correctly, but through their answers, the teacher was able to understand the difficulties encountered and clarify some of the doubts that arose. It was a moment of discussion, involving all the students, as they tried to justify their answers and help their classmates figure out the correct answer.

3.1.2 Jamboard digital tool

Jamboard is a collaboration tool that allows students to work collaboratively with their peers and develop their work creatively. Students can write text, add images, and change the color and design of the background. In addition, this tool allows the teacher to give feedback in real time. This digital tool also allows students can see everyone's work. See Fig. 2 which presents the results from the research of students and Fig. 3. shows the practical application of the theoretical concepts learned at the previous stages.

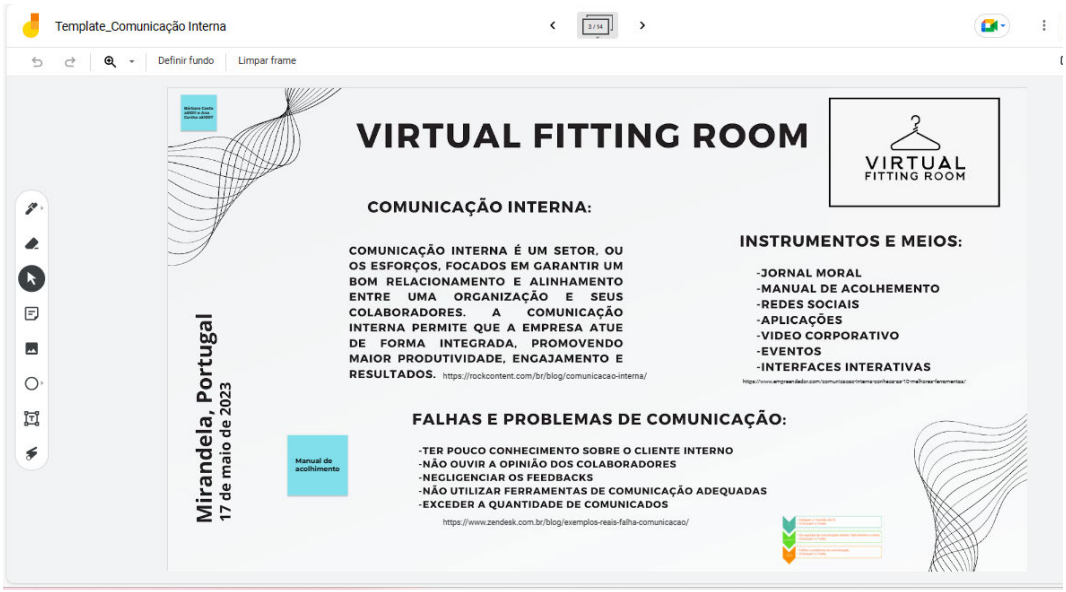

Figure 3. Jamboard activity in the first moment

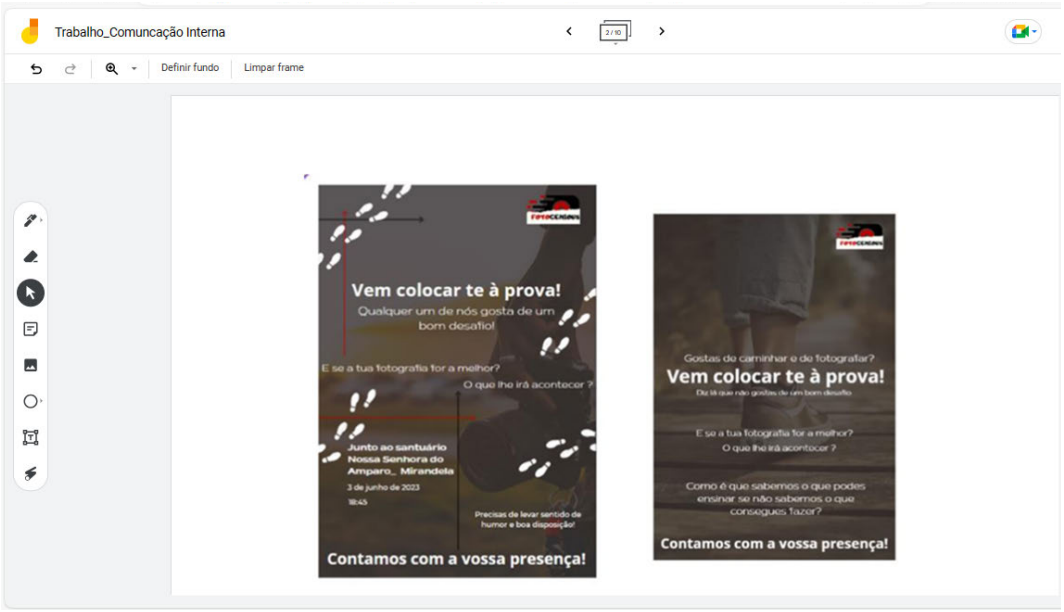

Figure 4. Jamboard activity in the second moment

During their work on the Jamboard, the students were very active and worked autonomously. They divided up the initial research work and made different strategic decisions to acquire information about

the concepts. Because these students are Multimedia Bachelor, they can easily work with images, and they can work with other digital tools. The students sometimes used other digital tools to complement the Jamboard work, such as Canvas. But all students work in the Jamboard, in order to have some teacher feedback and at the same time the work can be storage for the final evaluation.

3.1.3 Google Slides Digital Tool

Google Slides was used in order for students can present one slide within two minutes per group their final work to all classes. Google Slide is a sharing presentation, that allows students and teacher to better manage their presentation time. Several students can work on different presentations at the same time. In this moment, the students need to use the best of their time in order to use the most objective verbal communication and for all the students to be able to participate in this final moment final work presentation. This kind of tool allows the presentation can be more accessible, but also more inclusive.

Figure 5. Google Slides Results

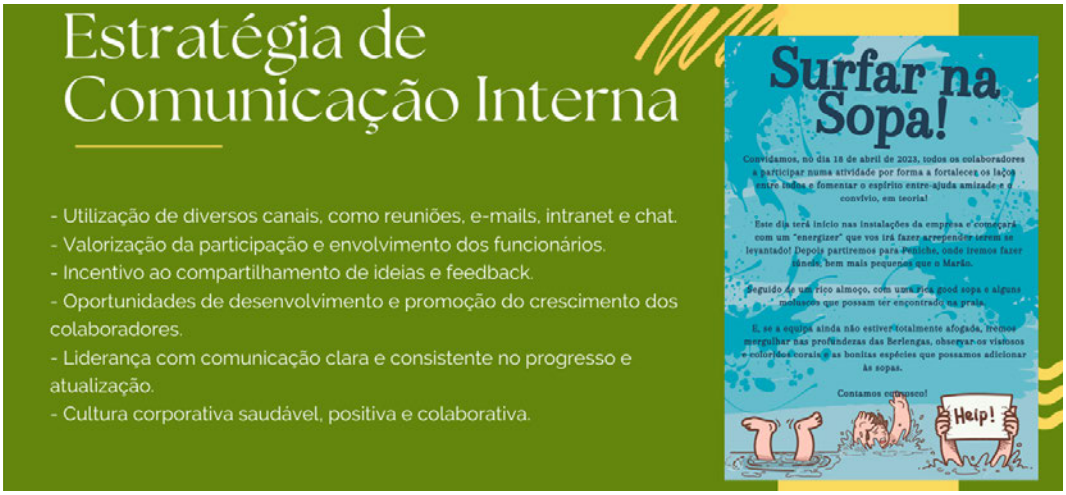

Figure 6. Google Slides Results

All students felt motivated to develop this kind of activity. There is no doubt that it was very important for the students' commitment to bringing their computers so that each element of the group could work autonomously and responsibly.

The results of these pedagogical activities were interesting. Students were very motivated and committed to the learning process in the different moments of the class. All students participated individually and collaboratively in groups of three or four students. The time for activities were controlled by a timer. At first, the students didn't feel very comfortable with the time required to complete the activity, but at the end of the activity, they realized that this way they were able to complete the activity within the classroom period and that it reflects learning in a professional environment. Some important workplace skills were developed, such as critical thinking and problem-solving, teamwork, oral and written communication, listening, and observing. Surprisingly, one group asked if they could implement the Mentimeter tool in all classes to get their opinion on choosing the best logotype of their business idea.

4 CONCLUSIONS

It is important to emphasise that there is a paradigm change in the teaching-learning process, which converged from a more conventional/traditional system to a more digital one [1, 3, 4]. The use of digital tools for problem-solving, as a creative process, that is concerned with adapting classroom learning to the needs of the job market [5, 7, 8]. In Higher Education, students are characterized as a more digital group. But, in this field, is equally required that they develop specific verbal communication skills and teamwork, essential to prepare students for future internships or jobs.

CCR highlights the model of 4D - Knowledge, Skills, Character, and Meta-Learning [9]. That is in line with the cognitive skills, changes in cultural practices and social values, and expectations in the teaching-learning systems [10, 11]. Therefore, learning and innovation skills curricula must enhance students' knowledge, creating a symbiosis with digital technologies, as well as responding to the challenges of using artificial intelligence [2, 16, 17]. In this sense, it is suitable to use digital tools and active learning moments so that teaching is more student-centered and not teacher-centered [13, 14, 15].

The findings of this study answer the question that arises: how can teachers engage and attract students' interest and motivation for learning in the classroom in higher education at the same time that articulates both content and skills to the profession?

Teachers engage and attract students' interest and motivation through active learning activities that are student-centered. Furthermore, they learn classroom content by doing and participating in different activities. These activities need to be related to the future activities they will be able to carry out in the business environment. It is essential to use digital tools for different reasons. Firstly, because these students are very tech-savvy and can't concentrate without using technology. Second, these digital tools are very easy to use and promote learning in different ways. Adding digital tools to the active learning activities promotes the teaching-learning process in a different, memorable, and fun way [13, 14, 15].

Innovative and active learning tools were useful to develop competencies such as critical thinking and problem-solving, teamwork, oral and written communication, listening, and observing.

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REFERENCES

[1] C. Hursen, D. Pas ̧a, and H. Keser, “High School Students’ Use of Information, Media, and Technology Skills and Multidimensional 21st-Century Skills: An Investigation within the Context of Students, Teachers, and Curricula,” *Sustainability*, vol. 15, nº. 16: 12214, pp. 1- 21, 2023. https://doi.org/10.3390/ su151612214

[2] M. Halaweh, “ChatGPT in education: Strategies for responsible implementation,” *Contemporary Educational Technology,* vol. 15, nº. 2, pp. 1-11, 2023. https://doi.org/10.30935/cedtech/13036

[3] N. P. McKee, *Measuring disruption in higher education using the metaphor of ecology: A case study of changes to postsecondary education during the COVID-19 pandemic*. Doctor Dissertation. Urbana, Illinois: University of Illinois at Urbana-Champaign. 2022. 10.13140/RG.2.2.15908.08320.

[4] A. Haleem, M. Javaid, M. A. Qadri, and R. Suman, “Understanding the role of digital technologies in education: A review”, *Sustainable Operations and Computers*, vol. 3, pp. 275-285, 2022. https://doi.org/10.1016/j.susoc.2022.05.004.

[5] M. Bialik, and C. Fadel, *Knowledge for the Age of Artificial Intelligence: What Should Students Learn?* Boston, MA: Center for Curriculum Redesign, 2018.

[6] S. Marginson, “World higher education under conditions of national/global disequilibria”, *Centre for Global Higher Education,* Working Paper nº. 42, pp. 1-28, 2018. Retrieved from https://www.researchcghe.org/wp-content/uploads/migrate/publications/wp422.pdf

[7] A. Dilekçi, and H. Karatay, “The effects of the 21st century skills curriculum on the development of students’ creative thinking skills,” *Thinking Skills and Creativity*, vol. 47, 101229, pp. 1- 11, 2023. https://doi.org/10.1016/j.tsc.2022.101229

[8] J. Koffi, *Fostering advanced digital skills. In-depth look at the opportunities and challenges for skills in the EU’s Digital Europe Programme*. Brussels: SwissCore, Contact Office for European Research, Innovation and Education, 2019. Retrieved from https://www.swisscore.org/wp-content/uploads/Fostering_advanced_digital_skills.1.0.pdf

[9] C. Fadel, A. Black, R. Taylor, J. Slesinski, and K. Dunn. *Education for the Age of AI: Why, What and How should students learn for the age of Artificial Intelligence?* Boston, MA: Center for Curriculum Redesign, 2024.

[10] B. Jongbloed, J. Enders, and C. Salerno, “Higher education and its communities: Interconnections, interdependencies and a research agenda” *High Educ*. 56, pp. 303–324, 2008. https://doi.org/10.1007/s10734-008-9128-2

[11] S. Bergan, and R. Damian, *Higher education for modern societies – Competences and values.* Strasbourg: Council of Europe Publishing, 2010.

[12] H. Yao, W. Liu, and S. Chen, “Teachers sustainable teaching innovation and graduate students creative thinking: The chain mediating role of playfulness climate and academic self-efficacy,” *The International Journal of Management Education,* vol. 22, nº. 1, pp. 1-14, 2024. https://doi.org/10.1016/j.ijme.2023.100900

[13] M. Baricˇevic´, and L. Luic´, “From Active Learning to Innovative Thinking: The Influence of Learning the Design Thinking Process among Students,” *Educ. Sci.*, vol. 13, nº. 5, pp. 1-19, 2023. https://doi.org/10.3390/educsci13050455

[14] L. Silva, A. C. Loureiro, F. Magoni, and V. Gonçalves, “Active methodologies and digital technologies in learning: a systematic literature review”, In *17th Iberian Conference on Information Systems and Technologies*, CISTI 2022. p. 1-5. Retrieved from https://bibliotecadigital.ipb.pt/bitstream/10198/25829/1/Active%20review.pdf

[15] B. F. Gonçalves, and V. Gonçalves, “Active learning methodologies in online teaching,” In *Management, Tourism and Smart Technologies. ICMTT 2023*. (Montenegro, C., Rocha, Á., Cueva Lovelle, J.M. eds) Lecture Notes in Networks and Systems, vol .773. Springer Nature, p. 155-163. https://doi.org/10.1007/978-3-031-44131-8_16

[16] European Union, *Council Resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030),* (2021/C 66/01), 2021. Retrieved from http://publications.europa.eu/resource/cellar/b004d247-77d4-11eb-9ac9-01aa75ed71a1.0006.03/DOC_1

[17] J. Holford, and M. Milana, “The European Union and Lifelong Learning Policy,” In: *Third International Handbook of Lifelong Learning*. (Evans, K., Lee, W.O., Markowitsch, J., Zukas, M. eds) Springer International Handbooks of Education. Springer. 2022. https://doi.org/10.1007/978-3-030-67930-9_27-1

[18] K. Vallely, and G. Poppy, "Engaging students on their devices with Mentimeter," *Compass: Journal of Learning and Teaching,* vol. 11, nº. 2, pp. 1-6, 2018. https://doi.org/10.21100/compass.v11i2.843

[19] V. Stafford, “Using Google Jamboard in teacher training and student learning contexts,” Journal of Applied Learning & Teaching, vol. 5, nº. 2, pp. 181-185, 2022. https://doi.org/10.37074/jalt.2022.5.2.3

[20] Google Jamboard, Jamboard whiteboard Accessed 7 May 2024. Retrieved from https://workspace.google.com/products/jamboard/