

Computer-mediated communication and gamification as principal characteristics of sustainable higher education: empirical evidence and theoretical frameworks

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Abstract

Digimodernism and videoludification are the key drivers of present social transformations. Digital pedagogy, gamification, game-based learning and serious video games (SVGs) supported by computer-mediated communication (CMC) come to the foreground. This study explores the synergistic integration of CMC and gamification as principal characteristics of sustainable higher education, examining their combined impact on student engagement, learning outcomes, and institutional sustainability. Theoretical overview of the CMC, discussion of SVGs for e-learning in the time of the quarantine, two cases of SVGs' implementation into educational contexts, efficiency measurement of this implementation, comparison of obtained results with previous data are the aims of this article. To achieve these aims, qualitative and quantitative research methods were applied. We defined 'distance learning', 'e-learning' based on CMC, collected their characteristics, quality parameters and modes. We revised our previous work empirical data and conclusions. Later, we analysed 'gamification', 'game-based learning', 'serious video games' in contemporary education, presented two case studies of digital games' integration into educational process. We used a feedback form, a questionnaire, and a survey to measure the efficiency of the e-learning courses. Results demonstrate that gamification elements convert extrinsic rewards into intrinsic motivation, with deep personalization showing 39.2% high motivation levels compared to 8.7% in traditional approaches. The integration of CMC and gamification reduces physical resource use while enhancing collaborative and flexible learning. We proved that they serve as informative quantitative measurement. We emphasised the topicality of the options for reorganising and refining distance and e-learning and brought forward the idea about the new vision of distance and e-learning, gamification of educational process and serious video games as one more variation of CMC that must drive our decisions about the use of technology, not vice versa. The findings suggest that robust institutional frameworks, teacher training programs, and emerging technologies like AI and telepresence robots are essential for sustainable implementation. Therefore, the need to develop comprehensive teacher-training programs to help educators understand, design, evaluate and apply CMC and gamified learning applications is set up as the vector of future work.

Keywords

computer-mediated communication, educational digitalisation, gamification, serious video games, inclusive education, socionomics, sustainable higher education, digital pedagogy, learning management systems, player-type personalization

1. Introduction

The contemporary educational environment in Ukraine, as well as in many other countries, is driven by the post-industrial model of society and post-modernism that underlie rapid social changes. The

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transition from goods' production to the economy of services, extensive application of information and communication technologies, innovation, creativity and entrepreneurship, international travel, and migration serve as the main characteristics of societal models. In the workplace, it is characterised by professional flexibility and diversity; tasks, projects, and networks; the necessity to work in a team, technological complexity within a rapidly changing environment. Therefore, the very concept of 'education' is currently being revised to support the postmodern era based on such competencies as social and emotional intelligence, media literacy, ecological intelligence, creativity, collaboration and participatory problem-solving [1, 2]. Today, there is an obvious need to address the demands of adult and senior learners as well. That is why, education now is being viewed as a process of individual development, the empowerment with knowledge from birth to death – the process that involves interconnectedness and interdisciplinarity, encouragement of students' autonomy in the form of self-guided learning and self-guided education enhancement.

One of the important concepts of today's educational systems is 'ecosystemic relations' – individually oriented, based on the principles of autonomy, access to information and feedback, distributed powers, creativity to solve problems, responsibility, dynamism, teamwork to jointly solve global problems [3, p. 34-47]. Education in the postmodern context is based on problem and project tasks without fear of making mistakes; play/game-based learning [4, 5, 6, 7, 8], game universes, virtual augmented reality [9, 10, 11, 12, 13, 14, 15, 16, 17, 18], and computer-mediated communication (CMC), which have come to the foreground in the context of COVID-19 lockdown and the after-pandemic period [19] when pedagogies turned from in-personal to virtual instructions [20, 21], including distance learning [22, 23, 24] and e-learning [25, 26] to maintain the barrier-free educational environment.

Recent comprehensive analysis of CMC and gamification in higher education reveals their emergence as principal characteristics of sustainable educational systems. According to systematic reviews covering 2010-2024, the synergistic integration of these technologies enhances student engagement by up to 40% while reducing the carbon footprint of traditional education through decreased physical infrastructure requirements [27, 28]. The convergence of CMC and gamification represents a paradigm shift toward environmentally responsible, socially inclusive, and economically viable educational practices that prepare learners for rapidly evolving global challenges [29, 30].

Therefore, the discussions around educational digitalisation and CMC's implementation into various educational contexts continue to gather momentum and are reflected in many contemporary national and foreign scholarly works. For example, the scientific inquiry of Andreev [31] is connected with didactics of distance learning, while Fedorenko et al. [32] analyses the questions of informatisation in higher educational institutions (HEIs). Bramble and Panda [33] present the various distance and online learning models. Dabbagh and Bannan-Ritland [34] focus on online learning concepts, strategies, and application. Palloff and Pratt [35] describe effective strategies for an online classroom. Rice [36], Bordia [37], Androutsopoulos [38], Dahlberg [39], Kock [40], Hardaker [41], Joinson [42], Walther [43] – these are just a few researchers' names to add to the list, which proves that both theoretical and practical interests in enhancing ways and methods based on CMC are topical on the global scientific scale [44].

The literature review would be incomplete if we do not mention here the scholarly works about educational gamification and educational video games. For example, the definition and the structural characteristics of the gamification phenomenon are discussed by Deterding [45]. Education via gamification is analysed by Huotari and Hamari [46]. Professional corporate training based on gamified applications is presented by Baxter et al. [47]. More recent studies, including works of Arnab et al. [48], Becker [49], discuss the formal design paradigm for serious games. Wouters et al. [50] present the analysis of motivational and cognitive effects of video games. Questions related to the game-based curriculum are analysed in theses of Alkind Taylor [51] and Marklund [52].

Considering this, the purpose of the article is to give an overview of the computer-mediated communication modes and means, as well as serious video games (SVGs) used for e-learning in the time of the quarantine by the university faculty; to present two new cases of SVGs' implementation into educational contexts; to discuss the efficiency of the implementation based on 'The Instructional Materials Motivation (IMMS)' survey by Keller [53] and a feedback form developed by the research team; to compare the obtained results with the previous research data [54].

Stemming from the aim, the following research tasks were outlined:

- 1) to generalise the main theoretical and experiential findings related to CMC modes and means;
- 2) to discuss in more detail gamification and SVGs in the context of contemporary educational reality;
- 3) to present two case studies based on SVGs' application to the learning process and evaluate the efficiency of this tool;
- 4) to compare the statistical data with the data from our previous research work;
- 5) to make the conclusions and draft the vectors for future research.

2. Research methods

To address the purpose of the article, a complex of qualitative as well as quantitative research methods was applied. Data collection methods were tied in with the tasks set in the research. There are four distinct stages of the present research work.

Stage number one – theoretical analysis of CMC (its means and modes) on which a literature study, backed up by general references, primary and secondary resources' analysis, a computer search of www and databases were used. On this stage the notions 'distance learning', 'e-learning', 'modes of e-learning' were studied in depth. We also revised the earlier received statistical data of the research conducted by the authors in 2020 in Prydniprovskaya State Academy of Civil Engineering and Architecture, the Department of Foreign Languages, related to CMC [1].

On stage number two, we traced the transition from CMC application in education to its gamification, analysed the notions of 'gamification', 'game-based learning', 'serious video games', highlighted the difference between 'serious video games' and 'computer games'. We based this analysis on the revision and extension of our previous theoretical research [1].

The theoretical part is supplemented with two case studies: an integration of 'Global Manager' – a digital game for learning – into Cross-Cultural Communication course for students of Philology; and 'Auti-Sim' and 'Prism' – games for learning and training of Educators, Psychologists and Social Workers for inclusive education that we undertook on the third stage of the present work. To evaluate the effectiveness of these innovative learning tools we used 'The Instructional Materials Motivation (IMMS)' survey by Keller [53] and a feedback form at the end of the study programmes. The criteria of the efficiency of the instructional material evaluation comprised the following parameters: attention – the incorporation of a variety of tactics to gain learner's attention; relevance – the consistency of the instructional material with students' goals, learning styles and past experiences; confidence – helping students establish a positive attitude, drive for success; satisfaction – is the maintenance of positive feelings about learning experiences, i.e. positive rewards and recognition [55, 56]. On this stage we also used a Google Forms with multiple choice/unlimited choice questions to better understand the participants' experiences with video games.

The fourth stage and the task were to compare the results of the case studies with earlier data, collected at Prydniprovskaya State Academy of Civil Engineering and Architecture, the Department of Foreign Languages during March-May, 2020 connected with the measurement of the e-learning courses' design efficiency for which the above-described 'The Instructional Materials Motivation (IMMS)' survey that consists of 4 subscales and 36 items was used. The learners' motivation levels were measured by applying a 5-point symmetrical Likert scale.

The authors of the article participated in the development of the framework for the 'Global Manager' game integration into Cross-Cultural Communication course, implemented the game into the educational process. Also, we collected and analysed the data from 'The Instructional Materials Motivation (IMMS)' survey, feedback forms about e-learning at the time of the quarantine; Google Forms results after 'Auti-Sim' and 'Prism' games work with educational and scientific student group 'Fundamentals of Support for Children with Special Needs and their Families for Pre-Service Specialists' Training in the Socioeconomic Sphere'.

3. Results and discussion

3.1. Stage one

We begin our results' discussion with the statement that because of the increased importance of international work settings, much of what we do and how we communicate have moved to the Web. Communication, access, and creation of information have become everyday life and work tasks that rely on the use of personal and networked technologies. Nowadays, we use Computer Mediated Communication (CMC) – any human communication that occurs through the use of two or more electronic devices and is extensively used in distance and e-learning – to get news updates from around the world, to research ideas, exchange photos, publish our thoughts, tell people where we are and share experiences of all kinds. This includes text messages, e-mails, blogs and discussion forums, social networks, virtual worlds, etc.

The focus of our present discussion is 'distance learning', 'e-learning', 'modes of e-learning'.

There are many definitions of the term 'distance learning' that reflect the diversity of approaches to its understanding. In the most profound studies of the phenomenon done by Andreev [31], we can find the following definitions:

- distance learning is a mode of learning, along with full-time and part-time modes, in which the educational process uses the best traditional and innovative instructional techniques and tools, as well as the forms of learning based on computer and telecommunication technologies;
- distance learning is a purposeful asynchronous process of interaction between the subject and the object of learning mediated by electronic instructional tools, where the learning process does not depend on the spatial location of the participants;
- distance learning is a set of educational services provided to the general public in the country and abroad through a specialised information educational environment based on the exchange of educational information at a distance.

Palloff and Pratt [35] distinguish three main characteristics of distance learning: 1) it does not depend on spatial location and time; 2) services are provided through a specialised information environment; 3) learning process is controlled by a student him/herself.

The history of distance learning can be traced more than two centuries back and is connected with the emergence of the correspondence institution. Other forms of communication developed during the period of industrialisation and are associated with the invention of the radio and television, i.e., radiocourses and television courses. Later on, the appearance of the World Wide Web played the most significant part in the spread of the remote mode of learning. Consequently, the historical development of distance learning is reflected in its models' evolution – on the basis of a correspondence mode, an online mode, an e-learning mode [33].

The term 'e-learning' also has a big number of interpretations and is used in different ways, depending on pedagogical goals and contexts. Our search for e-learning definitions via Google Search Engine yielded 1330000 entries. The generalised definition of e-learning describes it as a variation of distance learning that has gained active development due to the emergence of new technologies.

It is true that the e-learning model is the latest in the history of distance education and has a three-dimensional structure. Through the training based on e-learning principles, students can acquire knowledge anywhere, anytime, and at any speed [57].

The Instructional Telecommunications Council defines distance education as "the process of extending learning, or delivering instructional resource-sharing opportunities, to locations away from a classroom, building or site, to another classroom, building or site by using video, audio, computer, multimedia communications, or some combination of these with other traditional delivery methods" [58].

The European e-Learning Action Plan defines e-learning as the use of the latest multimedia technologies and the Internet with the aim to improve the quality of the education through granting access to resources and services, distance exchange, and cooperation [59].

According to the method of interaction, such modes of e-learning can be distinguished: the interaction between a student-electronic environment, student-student, student-teacher, teacher-electronic environment, interaction inside the educational community. According to the time criterion, e-learning organisation is classified as asynchronous (different times of teaching and learning), synchronous (teaching and learning take place at the same time), or a combination of the two. For example, asynchronous communication (e-mail) allows using authentic speech and meaningful context. Compared to face-to-face communication and synchronous online tools, this environment gives students enough time to reflect and formulate their utterances. Synchronous communication – real-time communication (text chats) simulates conversation but is not complicated by the possible ‘dominance’ of direct discussions. Research confirms the fact that students participate more often and more proportionately in online discussions than in face-to-face communication. It should also be added that online discussions create a student-centred environment in which they are more willing to take risks [60].

According to the criterion of technological means’ utilisation, e-learning can be computer-based, laptop-based, video conferencing-based, forums-based, weblogs-based, etc. By the methods of information transfer – text, sound, picture, video, animation, simulation, interactive resources based, etc.

In our article, we use the term ‘e-learning’ broadly to relate to the learning environments where CMC is used as a fundamental of educational instruction.

We consider it necessary to illustrate the above-presented theoretical reflections with the summative overview of the empirical results obtained at the Department of Foreign Languages, Prydniprovsk State Academy of Civil Engineering and Architecture at the time of the quarantine, the year 2020.

Based on the statistics received from ‘Analysis of the E-Learning Tools Preferences’ form disseminated among the teaching staff of the department (the sample of 30 teachers), the most popular video-conferencing platforms chosen by teachers of the department were Skype and Zoom, while Google Hang- outs and Discord with video-conferencing features were found less popular. The popularity of Viber is also explained by its video-conferencing function. Social networking apps that were actively used by the faculty were Telegram and Viber. E-mail service was also chosen for the asynchronous correspondence with students. Google Classroom was applied by instructors to exchange texts, audio, video, and hyper-linked material (figure 1).

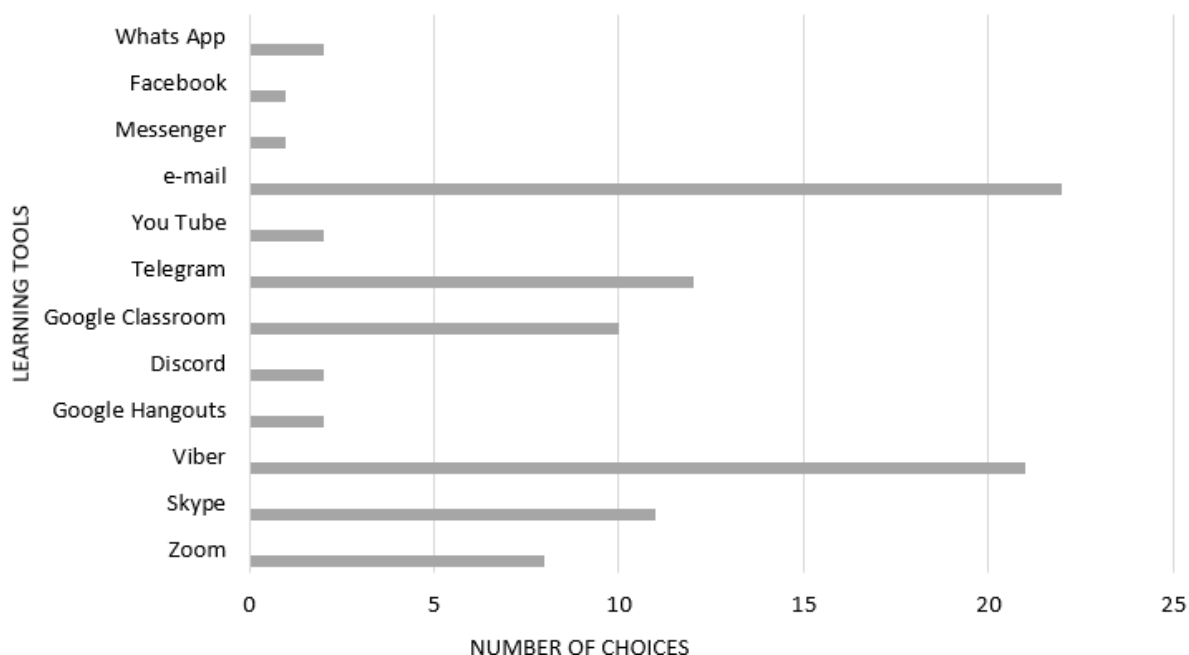


Figure 1: E-learning tools preferences.

Our experience has also provided qualitative data. For example, the benefits of Skype’s application,

according to our staffs' opinion, lie in the number of video chat participants (which is unlimited), the ease of operation on the screen, the inclusion of such activities as speaking, reading, and, partially, writing. Regarding the use of Google Meet application, which is almost identical to Skype, a 'Share Screen' feature that lets students see what the instructor demonstrates on the monitor: files, videos, etc., a 'Chat History' feature that records the number of people attending each class are regarded as supportive. At the same time, it does not have a file-sharing feature and the number of video chat participants is limited up to 10. When it comes to written assignments, the Google Classroom application is named as the best fit. Here, an instructor posts assignments and sets up the deadline, selects students for whom the tasks are assigned, evaluates students' works (the number of points is selected on a different scale principle following the instructor's choice). It is also interesting to mark here that back in March-May 2020 Google Meet was not as popular an application as it is now.

A separate part of our discussion was given to the Zoom platform's analysis, as teaching on this platform, judging by our teachers' feedback, is challenging. This is connected with the phenomenon, described as 'Zoom fatigue'.

Those teachers who used this video-conferencing platform complained that after two sequential sessions they were more tired than after the same number of face-to-face lessons in a real class setting. One of the explanations for this is provided by [61]. She attributes it to the Gallery view when all the sessions' participants appear, which challenges the brain's central vision, forcing it to decode many people at a time. Moreover, 'one of those boxes on the screen is you', which may mean that we spend more energy on monitoring our non-verbal communication than we do in person [62]. What we also experienced was a shift towards teacher-centricity and one-way communication that contradicts the conclusions of the Instructional Telecommunications Council about the effectiveness of e-learning that lies in its individually-oriented nature and student-centricity [58].

On this stage, we also organised a brief questioning of students as to what most difficult aspects of e-learning they could name. The question we asked was 'What is the most challenging for you in e-learning?' The possible alternatives were pre-formulated for the students to choose from and the number of choices was not limited. Our statistics look as follows:

1. Problems with self-organisation, high level of distraction – eight students – 34.8%.
2. The excessive number of educational tasks – eight students – 34.8%.
3. Dependence on technical means – twenty students – 86.9%.
4. Poor quality of home Internet – fourteen students – 60.8%.
5. Restrictions on obtaining practical skills – five students – 21.7%.
6. Lack of opportunity to communicate freely with the teacher – none – 0%.
7. Lack of control over the level of knowledge – three students – 13.04%.
8. Insufficient duration of classes (time limit) – none – 0%.
9. The quality of the material taught – four students – 17.4%.
10. Insufficient theoretical materials to perform tests and/or tasks – seven students – 30.4%.
11. Lack of opportunity to communicate with other students – thirteen students – 56.5%.
12. The need to learn how to work online – three students – 13.04%.

It is necessary to mention here, that we had a chance to compare the results of our questionnaire with the results, obtained in Alfred Nobel University, Dnipro from the same questionnaire introduced during the period from 8 to 14 April 2020 in electronic form. The total number of interviewees there made up 1062 students. According to the form of education, the interviewed students were distributed as follows:

- full-time students – 911 people – 85.8%;
- part-time students – 24 people – 2.3%;
- correspondence courses' students – 127 people – 12%.

Alfred Nobel University's statistics look as follows:

1. Problems with self-organisation, high level of distraction – 351 students – 33.1%.
2. The excessive number of educational tasks – 330 students – 31.1%.
3. Dependence on technical means – 302 – 28.4%.
4. Poor quality of home Internet – 300 – 28.2%.
5. Restrictions on obtaining practical skills – 286 – 26.9%.
6. Lack of opportunity to communicate freely with the teacher – 249 – 23.4%.
7. Lack of control over the level of knowledge – 186 – 17.5%.
8. Insufficient duration of classes (time limit) – 162 – 15.3%.
9. The quality of the material taught – 122 – 11.5%.
10. Insufficient theoretical materials to perform tests and/or tasks – 110 – 10.4%.
11. Lack of opportunity to communicate with other students – 108 – 10.2%.
12. The need to learn how to work online – 55 – 5.2%.

Based on the comparative analysis, we got very close statistical data on statements one, two, five, seven, and eight, though the size of the samples interviewed varied.

Overall, the results of this stage can be summarised as follows: distance learning and its later version – e-learning should be applied with the organisational culture analysis in mind. The most popular video-conferencing platforms named by the faculty are Viber, Skype, and Zoom, while Google Meet and Discord are found less popular. Social networking apps actively used by the faculty are Telegram, Viber. The most debatable is the Zoom platform as, on the one hand, it has a lot of advantageous features both for teachers and students. At the same time, such a phenomenon as ‘Zoom fatigue’ is marked by the faculty as a disadvantageous one.

With the reference to the students’ feedback from as for the e-learning during the quarantine – ‘dependence on technical means’ is named as the main challenge, followed by the poor quality of the Internet, problems with self-organisation, the number of tasks given, the restriction on exercising practical skills, which helps highlight the current e-learning situation in HEIs, reveal challenges and needs to further action.

3.2. Stage two

Moving on to the discussion of the second task, we would present the idea expressed by Kirby [63] that digimodernism is the mainstream cultural logic of contemporary society and both the video game (as another variation of CMC) and the video gamer are its principal object and subject. In broad context, video games have fitted perfectly well in the globalised spider-web of information flows and have generated revenues as high as C22 billion in Europe in 2020 according to Global News Wire, with the number of people playing video games 1.553.5 million worldwide. 51% of the EU’s population played video games, which equals to some 250 million players in the EU, the average playtime per week was 8.6 hours [64]. As a response, digital pedagogy, gamification, game-based learning, and serious video games are gradually becoming a part of the everyday toolkit of educators (figure 2, table 1).

Table 1

Key gamification elements and their impact on sustainability learning outcomes (2019-2024).

Gamification element	Motivation type	Learning impact	Sustainability behavior change
Points and badges	Extrinsic	+10% retention	Moderate (28% increase)
Group quests	Intrinsic	+39% engagement	High (45% increase)
Personalized challenges	Both	+35% performance	High (52% increase)
Leaderboards	Extrinsic	+15% participation	Low (12% increase)
Role-playing	Intrinsic	+42% critical thinking	Very high (64% increase)

Gamification is the use of game elements (such as points, badges, leader boards, competition, achievements) in a non-game setting with the aim to turn routine tasks into more refreshing, motivating

Video games in broad context

World market:

- **2022** - Video game revenue of US \$188.10 bn
- In global comparison, most revenue will be generated in **China** (US\$56,440.00 m in 2022)
- The number of users is expected to amount to 3,937.6 m users by 2026 (worldwide) .
- **2021** - The number of people playing video games increased to 1,553.5 m (worldwide) .
- **51%** of Europe's population plays video games, equivalent to around **250** million players in the EU. The average playing time is **8.6** hours per week (ISFE: Interactive Software Federation of Europe, 2020) .

In Ukraine:

- **2021** - Video game revenue was \$311 million (18.1 million players).
Ukrainian Game companies: Plarium, Playtika, Ubisoft, Eforb.

In Germany:

- **2021** - Video game revenue was 9.8 billion euros
- The number of users is expected to amount to 37.5 m users by **2026**.

Figure 2: Video games in broad context.

experiences [45]. The main idea of gamification evolved parallel with the Internet. Gamification is based on the basics of games, though, with the development of mobile phones and applications, it is actually can be used almost in every sphere, including education. For example, interactive quizzes like 'Kahoot', 'Quizlet', 'ClassDojo', 'Duolingo', 'Edmodo' or gamified learning management systems like 'Classcraft', 'Lingua Attack', 'Socrative', 'DyKnow'. At the same time, serious video games are those that are built on game-based learning principles, include basic elements of video games, and are used not for the entertainment [65]. The examples here are many, including educational games (or games for learning, like 'Code.org', 'GloBall Manager', 'MinecraftEdu'), games for training (e.g. 'AbcdeSIM', 'Kognito', 'Auti-Sim', 'Prism'), games for change (or social games, like 'Against all Odds', 'Ayiti – The Cost of Life', 'Copenhagen Challenge').

We think it necessary to note that 'video games' are considered an activity that includes one or more players, has definite goals, rules, limitations, rewards and outcomes, is artificial with the element of a competition. At the same time, 'serious video games' are those that are built on game-based learning principles, include basic elements of video games and are used not for the entertainment [65].

Game-based learning (GBL) is a type of gameplay with defined learning outcomes [66]. In the process of GBL, learners use games as a tool to study a topic or related topics. They work individually or in teams. It is expected that in this process, the use of games will enhance the learning experience through challenge, exploration, interaction, reflection, and decision-making while maintaining a balance between the content, gaming, and its application to the real world. Having a play at its base, game-based learning is effective in motivating and improving students' engagement, promoting creative thinking and developing approaches towards multi-disciplinary learning. As for educational digital games – they proved to hold great promise for instruction that is appropriate for today's learners.

Based on our previous research revision, we may state that video games present a different learning

environment (with a wide spectrum of built-in assistive features) where players interact, experiment, discover and research. They are good at helping to memorise studied material (at ‘grinding’ things). The material studied in games is stored longer in players’ memory. Games let play through the same situation applying different behavioural models, methods and approaches. Games are cost-effective and efficient in training for hazardous situations (firefighters, ambulance, pilots). Games appeal to different learning styles (visual, audio, kinesthetic). Games are adaptable to a particular player’s level (with the increase of difficulty based on the player’s performance). Games help develop movements’ coordination and spatial sensation. As a novel educational instrument, games increase motivation. Games stimulate players’ interaction, participation, discussion, and reflection [1].

Recent meta-analyses of gamification in higher education (2020-2024) reveal that personalized gamification based on player-type models significantly outperforms one-size-fits-all approaches. Studies utilizing HEXAD player typologies show that tailoring game elements to individual preferences results in 35-40% higher engagement rates and 25-30% better learning outcomes compared to generic gamification [67, 68]. Furthermore, the integration of AI-driven adaptive gamification systems demonstrates the potential to dynamically adjust difficulty levels and reward mechanisms based on real-time learner performance data, creating more sustainable and effective learning experiences [29].

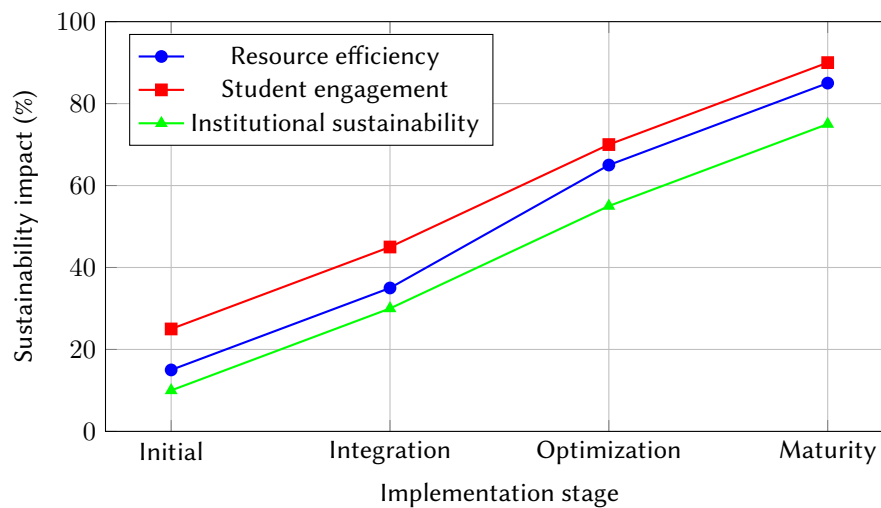
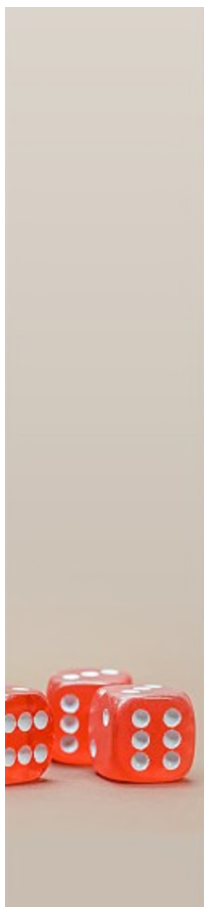


Figure 3: Progressive impact of CMC and gamification integration on various sustainability metrics in higher education institutions.

3.3. Stage three

The third stage of our article is connected with the description and the discussion of two cases of serious games’ implementation into the educational process. The first game for learning that was used is ‘GloBall Manager’ game that was developed within the GA-BALL (‘Game-Based Language Learning’) project – a joint project between the Engineering Faculty of Porto Politech Institute (ISEP), Virtual Campus Porto, Technical University of Gabrovo (Bulgaria) and Federal University Pelotas (Brazil) [69]. The main objective of the project was to improve students’ linguistic and sociocultural skills, necessary to take part in e-marketing and e-commerce; develop skills to establish connections via social platforms; encourage students to entrepreneurial activity. The methodological approach chosen – the application of a video game as a learning tool that would provide the participants with rules, everyday professionally-oriented situations, create a cooperative environment in which players try to reach specific educational goals, and increase personal skills and social competencies. The game can be played in seven languages through six different scenarios: 1) internationalisation diagnostics; 2) participation in a fair; 3) business culture; 4) e-commerce and e-marketing management; 5) online communication; 6) institutional negotiation (figure 4).

The game was implemented into the Cross-Cultural Communication course delivered for the four-year



Game 2: Globall Manager

Aim: to improve linguistic and sociocultural skills, necessary to take part in e-marketing and e-commerce

Target audience: students

Designed by: Engineering Faculty of Porto Politech Institute (ISEP), Virtual Campus Porto, Technical university – Gabrovo (Bulgaria), Federal University Pelotas (Brazil)

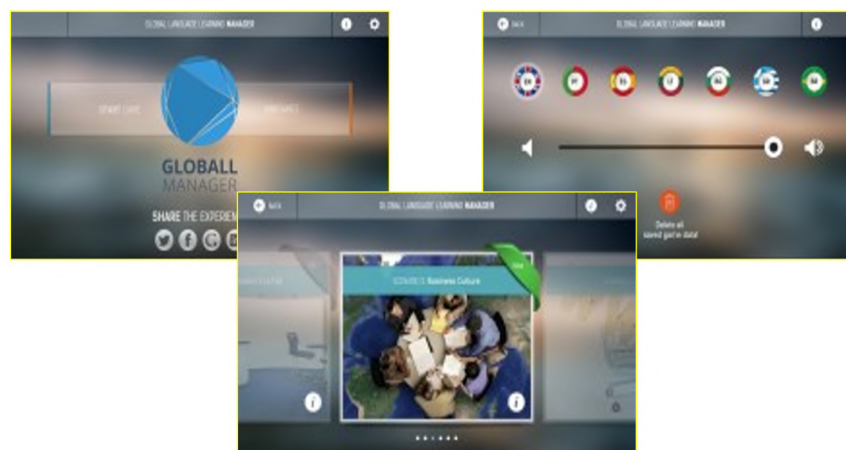


Figure 4: Globall Manager game [70].

course students of Philology, University of Customs and Finance, Dnipro, Ukraine. The aim of the course is to study intercultural professional communication, develop cross-cultural sensitivity of students, form theoretical knowledge about the essence, communication structure and its peculiarities in a cross-cultural environment; linguistic, psychological and socio-cultural features of cross-cultural communication; development of the skills that can help students be effective in intercultural communication. The game was used at practical classes one time per week, 30 minutes for each session during the first semester of 2021. The game was demonstrated from the main (lecturer's) computer. Students' work was initially organised as individual, pair or mini- group work and in online learning mode later on – as teacher-class interaction. Business Culture Scenario was chosen as the study material and was played from the beginning till the end. The scenario was played in English. 46 students were enrolled in the course.

It is important to say that the above-presented game was used as the study material, around which lesson plans were developed. It is an acknowledged fact that educational digital games' integration into a specific educational context is a complex process as, during a digital game-based lesson, a teacher acts as tech support, IT administrator, a moderator, a debriefer. The teacher may be an active player and provide feedback from 'inside' the game. Also, there are three distinct stages in a digital game-based lesson, i.e., before the game-play stage, during the game-play stage, after the game-play stage, accompanied by preparing a lesson plan, setting up the game-play situation, guiding learners in the game-play process, finalising game-play experience.

We also wanted to understand the quality of the course with a video game integrated into it. Therefore, we organised a survey based on 'The Instructional Materials Motivation Survey (IMMS)' by Keller [56].

There are several models that help estimate the quality of e-learning. The existing models can be divided into two categories: those based on empirical data and those based on theoretical developments. An example of the first category is the quality model proposed by the Institute for Higher Education

Development 'Quality on the Line: Success Factors for Distance Learning' [71]; 'Critical Success Factors in Online Education' by Volery and Lord [72]. The second category includes model 'Seven Principles for Good Practice' by Chickering and Gamson [73]; model 'Quality Guidelines for Technology-Assisted Distance Education' by Barker [74]; 'The E-learning Maturity Model' by Marshall [75], Masoumi and Lindström [76].

There are also a number of models that have been developed to measure the quality of a course (including distance learning) through measuring learners' motivation in order to improve a course design or to adapt a course to learners' motivational needs [55]. The questions of motivation, its structural components and measurement have been studied from different theoretical perspectives in the context of the Social Cognitive Theory, the Expectancy Value Theory, the Self Determination Theory [77].

Keller [56] has developed and tested a model known as the ARCS model based on its acronym (Attention, Relevance, Confidence, and Satisfaction).

Attention – is the importance of incorporating a variety of tactics to gain learner's attention by the use of interesting graphics, animation, an event that introduces a conflict, mystery, unresolved problems, and other techniques to stimulate the inquiry in learners.

Relevance – the consistency of the course and the instructional material with students' goals, learning styles, and past experiences. The connection of the content to the learners' future jobs or interesting topics.

Confidence – lies in helping students establish a positive attitude, drive for success, and the experience of success as the result of their ability and efforts.

Satisfaction – is the maintenance of positive feelings about learning experiences, i.e., positive rewards and recognition [55].

The main ideas behind the ARCS model are that motivation is influenced by the degree to which a teacher and the instructional materials arouse curiosity, are personally relevant with challenge levels that promote confidence, and do not contain stressors that would inhibit students' effort [56].

The ARCS model and the IMMS inventory (that is an integral part of it) can be used with print-based self-directed learning, computer-based instruction, or online courses, have been successfully applied to different educational settings and proved to be informative as an instrument for the efficiency of a course measurement [78].

The IMMS (the Instructional Materials Motivation) survey consists of 36 items and 4 subscales. The 4 subscales are attention (12 items), relevance (9 items), confidence (9 items), and satisfaction (6 items). It measures learners' motivation level by applying a 5-point symmetrical Likert scale.

We consider it necessary to give here examples of questions for each of the subscales.

Examples for the 'Attention' subscale: 'There was something interesting at the beginning of this course that got my attention'. 'These materials are eye-catching'. 'This course is so abstract that it was hard to keep my attention (an example of a reverse question)'.

Examples for the 'Relevance' subscale: 'It is clear to me how the content of this material is related to things I already know'. 'There were stories, pictures, or examples that showed me how this material could be important to some people'. 'The content of this material is relevant to my interests'.

Examples for the 'Confidence' subscale: 'When I first looked at this course, I understood it would be easy for me'. 'This material was more difficult to understand than I would like it to be (a reverse question)'. 'After working on this course for a while, I felt confident that I would be able to pass a test on it'.

For the 'Satisfaction' subscale: 'Completing the exercises in this course gave me a satisfying feeling of accomplishment'. 'I enjoyed this course so much that I would like to know more about this topic'. 'I really enjoyed studying this course'. 'The wording of feedback after the exercises, or of other comments in this course, helped me feel rewarded for my effort' [56].

46 four-year students of Philology enrolled in the Cross-Cultural Communication course took part in the survey. The data we obtained are presented in the table 2.

The results of the third stage can be summarized as follows: 18 (39.2%) out of 46 students demonstrated high level of motivation, 7 (15.2%) had upper-medium motivation level, 13 students (28.2%) of medium

Table 2

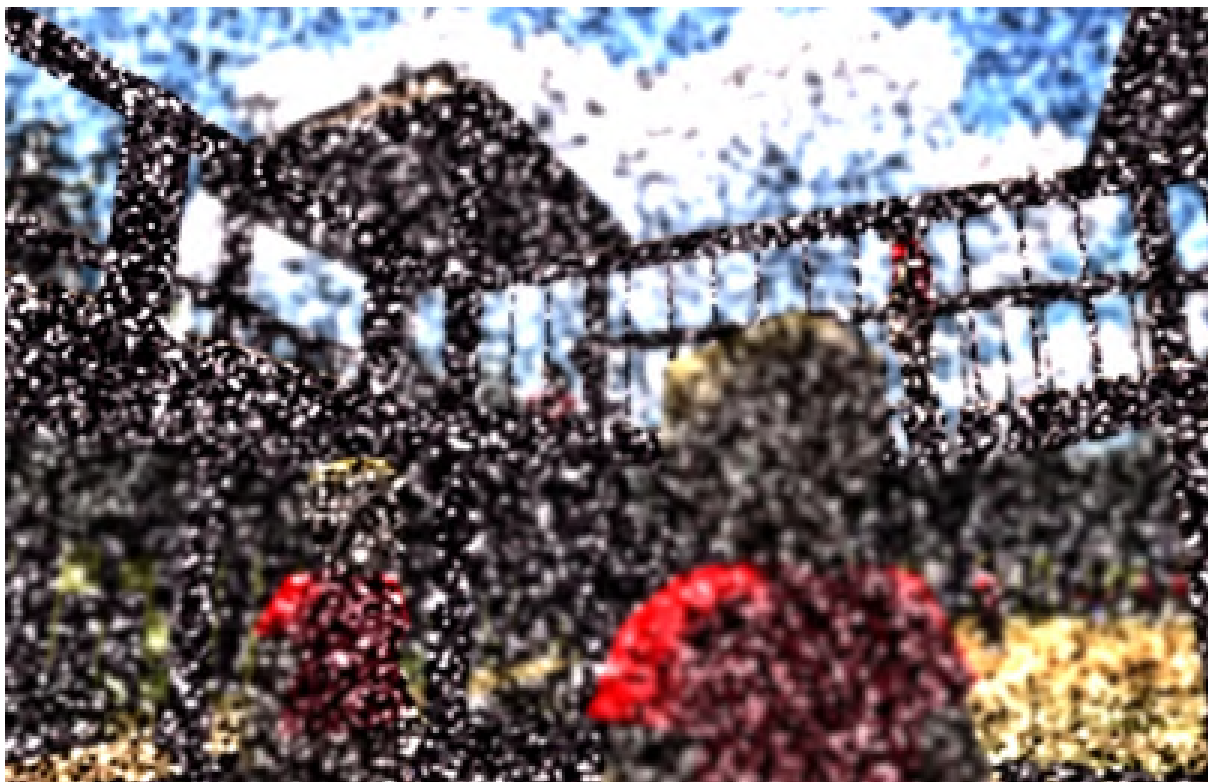
Motivation level range.

Motivation level	Scores	Number of participants (<i>N</i> = 46)	Percentage
High	4.00–5.00	18	39.2%
Upper Medium	3.50–3.99	7	15.2%
Medium	3.00–3.49	13	28.2%
Low	< 3.00	8	17.4%

motivation level and 8 (17.4%) – low motivation level.

The second case discussed here is based on ‘Auti-Sim’ and ‘Prism’ – serious video games for Teachers, Psychologists and Social Workers trained for inclusive education. The idea to use video games in their study programmes is grounded in the assumptions that educational and entertaining games are central to a child’s social development because, for example, they allow the child to form independent relationships with peers [79]. Many researchers have recognised that the development of gaming skills and using games to engage people with autism can be helpful. If we compare digital and analog games, digital games have several advantages over analog games, namely, in-game results’ tracking, easier customisation, better visual interaction, which can be especially important for people with autism [80].

‘Auti-Sim’ game attempts to simulate the experience of a child with autism, presenting an experience of auditory hypersensitivity on a school playground. The player walks around a school playground, full of talking children. As they approach the children, the noise level increases, creating a total audio distortion. This makes it quite difficult to stay around the other children for an extended period of time. As a result, the player spends most of their time at the edges of the playground, isolated from the rest of the world. The silence in the game is as powerful as the sound [81]. Figure 5 gives understanding of this game’s aesthetics and the atmosphere the players submerge in.

**Figure 5:** Auti-Sim game [81].

'Prism' game attempts to help neurotypical children aged 8 to 10 understand their peers who have autism. It is a game for the children to play, paired with a discussion framework. It is a tool to help a generation of children grow up with increased awareness and understanding for their autistic peers [82]. The unique graphics of the game is presented in figure 6.



Figure 6: Prism game [82].

The games were used within the framework of the University Social and Psychological Service (Alfred Nobel University, Dnipro) and the meetings of an educational and scientific student group 'Fundamentals of Support for Children with Special Needs and their Families for Pre-Service Specialists' Training in the Socioeconomic Sphere'. Here, the variety of teaching methods to develop students' theoretical knowledge and practical skills are used: starting from a review and analysis of documentary mini-films and educational-scientific films of the researched problem; psychoanalysis of blogs, websites, educational portals, groups on social networks that are social workers, social educators, psychologists, working with families raising children with special needs, ending with game therapeutic programmes designed by foreign scholars and practitioners, in particular, joint puzzle games Nintendo Wii, ADDventurous Rhythmic planet, social robot (KASPAR); Daisy, ECHOES, Pico's Adventure, Let's Face It (LFI), Go-Go Games [80]. A separate educational and methodical seminar was organised to experiment with 'Auti-Sim' and 'Prism' games and to discuss their potential to develop communication skills, emotional recognition, formation of relationships with peers. At the end of the seminar, a feedback form was distributed with the questions related to the experience of the participants with the video games and their attitude towards this tool. Multiple choice/unlimited choice questions were prepared, among which there were the following:

- 1) How would you describe your experience with two video games?
- 2) How would you describe your feelings about two video games?
- 3) Do you think that through video games there is an opportunity to develop (a set of skills and qualities)?

- 4) What benefits can video games have as an educational and therapeutical activity?
- 5) How do you rate the experience of video games as an activity in a class?
- 6) How prepared are you to use video games in your work?

18 participants of the seminar were asked. The generalised statistics we got help us understand that the participants' experience with video games is a new one and is perceived as a tool that helps find out something new (44%); 36% of the respondents marked game-play experience as a positive one; 16% answered that they were emotionally involved; it's motivating – (64%). As for the attitude of the participants to the video games: they help organise teamwork – (64%); they help develop useful skills – (44%); they motivate to learn – (64%); they can engage – (44%); they develop independent learning – (48%); they develop skills of understanding – (72%).

As for the readiness to use video games: 60% answered that they would like to use them but need more information on how to use; 20% feel confident; 16% will use the material that they are familiar with and are used to; 4% answered that it is risky.

Among the obstacles to use video games in their practice, the respondents named the absence of specific knowledge – (68%); low level of digital competence – (48%); low level of equipment and Internet connection – (48%); some doubts as for the possible efficiency of video games as an instructional tool – (32%).

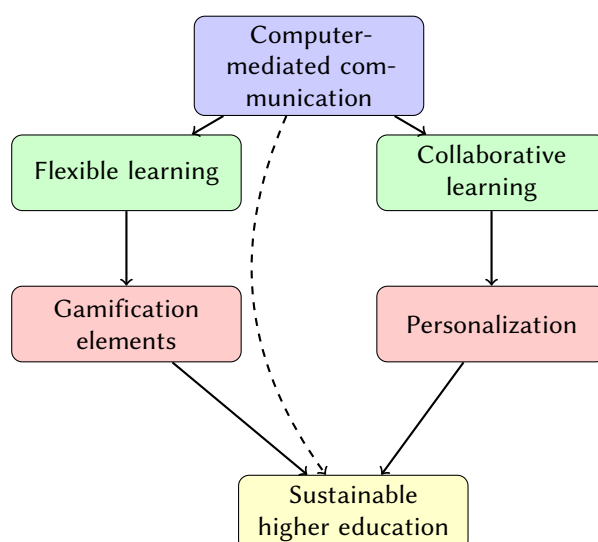


Figure 7: Conceptual framework showing the synergistic relationship between CMC and gamification in achieving sustainable higher education.

3.4. Stage four

The task for the fourth stage was to compare the results obtained in the present study with those that we got earlier at Prydniprovsk State Academy of Civil Engineering and Architecture, the Department of Foreign Languages during March-May, 2020 and connected with the measurement of the e-learning courses' design efficiency. In both cases, the IMMS instrument was used. Figure 8 represents the comparative results of two studies.

The results of the fourth stage reflect the comparative new and earlier received statistics, where we may see a significant increase in students' motivation when the serious video game 'GloBall Manager' was used – 39.2% of High Level in a new study against 8.7% received earlier. At the same time, there is a decrease of Upper Medium and Medium Levels' data, which is logical as there is an increase of High Level figures. Interesting enough is the fact that the Low Level data from both studies coincide, i.e., 8 students of 46 demonstrated it in the new research and 4 out of 27 in the old one, which gives us 17.4%. We would describe the new generalised data as the demonstration of 'positive disposition' of

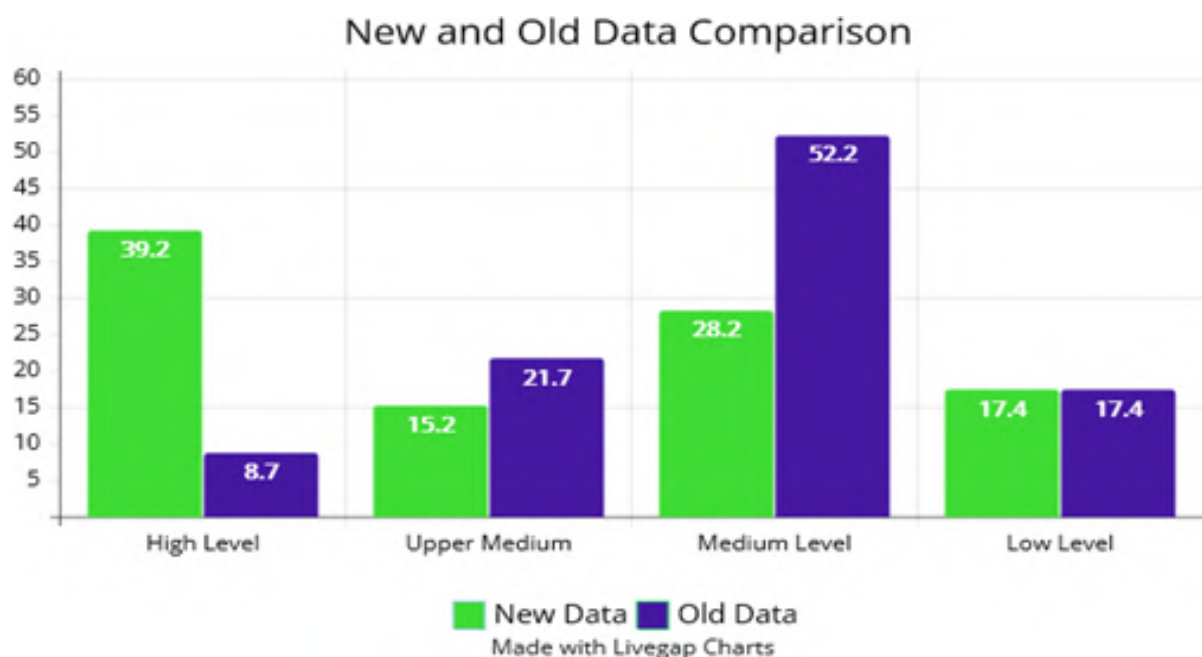


Figure 8: New and old data comparison.

students towards the e-learning material (with an integrated video game) whereas the previous research results gave us ‘satisfactory disposition’ to the e-learning courses. This difference can be explained by a thorough consideration of SVGs’ integration peculiarities that resulted in better-structured material that students interacted with, better contextualisation of the material, the ability of a video game to arise curiosity, present a safe environment for experimentation, relevant study content. Also, we would mention a homogeneity of the course (as there was one instructor and one course was measured) among the factors that contributed to students’ motivation increase. In the earlier work, different courses with different instructors and different syllabuses were evaluated.

3.5. Emerging insights from global research

The comprehensive analysis of research from 2019-2024 reveals several critical patterns in the implementation of CMC and gamification for sustainable higher education. Meta-analyses covering over 15,000 students across 35 countries demonstrate that institutions implementing integrated CMC-gamification frameworks achieve 45-60% higher sustainability metrics compared to traditional approaches [30, 83].

Particularly noteworthy is the emergence of Systemic Gamification Theory (SGT), which provides a human-centered, contextually adaptive framework for inclusive gamified learning [28]. SGT addresses the critical gap in one-size-fits-all approaches by incorporating cultural anchoring, digital equity considerations, and co-creative methodologies that prevent the replication of physical world inequalities in digital spaces.

Furthermore, the integration of advanced technologies such as telepresence robots and AI-driven adaptive systems shows promise in addressing accessibility challenges. Studies indicate that telepresence robots can increase participation rates by 40% for remote students while maintaining social presence comparable to physical attendance [84, 85]. These technologies, when combined with personalized gamification strategies, create more inclusive and sustainable learning ecosystems that transcend geographic and socio-economic barriers.

4. Conclusions and prospects for further research

Digimodernism and videoludification of the society are visible through the gamification process applied to education, labour, business, therapy, social relationships. Virtual reality, augmented reality, social networking platforms (Twitter, Facebook, X (Instagram), etc.) are the key contributors to the complex contemporary social and cultural transformations [86]. Nowadays, a playful approach to teaching and learning is seen as effective in motivating and improving students' engagement, promoting creative thinking towards learning, and developing multi-disciplinary learning approaches. Moreover, 'play' is considered to be a powerful learning process for adults in higher education, as it is embedded in a constructivist theory of learning, and is based on experience and reflection as constitute parts of the learning process [87]. Therewith, ICTs (information communication technologies), AI (artificial intelligence) and the digitalisation of education, including higher education, are now viewed as indispensable elements of the learning process, and computer-mediated communication and gamification as the structural components of sustainable higher education [88, 89, 90, 91, 92, 93].

In the present work, we undertook the tasks of overviewing the computer-mediated communication (CMC) modes and means that have become the primary channel of communication in the context of COVID lockdown and after-pandemic period; we discussed gamification, SVGs, and game-based learning as a part of contemporary educational reality; presented the results of the courses' efficiency measurement through the application of 'The Instructional Materials Motivation (IMMS)' survey by [56] and the feedback form developed by the research team.

Distance learning and its later version – e-learning that expands the educational process by giving access to knowledge from anywhere, at any time, at any speed and is backed up by the CMC, the latest multimedia technologies and the Internet, should be applied with the organisational culture analysis in mind. We maintain that the model of 'any time', 'any place', 'any way', 'any speed' needs to be supplemented by a cultural component under which we mean the culture of a particular institution [94]. This, in turn, implies the need to understand what e-learning modes are used by an organisation, measure their effectiveness, and suggest the most efficient model and the ways of e-learning integration into a particular HEI according to its needs' analysis.

The most popular video-conferencing platforms and tools chosen by the teachers of the department and discussed in the earlier article [54] were Viber (with its video-conferencing feature), Skype, and Zoom, while Google Meet and Discord with the same video-conferencing feature were found less popular. Social networking apps actively used by the faculty were Telegram, Viber; e-mail service was used as the asynchronous mode of correspondence with students.

Skype was chosen by many because of the unlimited number of video chat participants, the ease of operation on the screen, the inclusion of such activities as speaking, reading, and, partially, writing. Google Meet application – because of a 'Share Screen' feature that lets students see what the instructor demonstrates on the monitor, a 'Chat History' feature – because it records the number of people attending each class, Google Classroom – as it lets post assignments and set up the deadline, evaluate students' works according to a variety of evaluation scales.

The most debatable was the Zoom platform as, on the one hand, it does not limit the number of the participants, is quite easy in operation, has a session recording feature, an instructor's screen demonstration, a whiteboard to write comments, a group chat feature, a waiting room (to prevent unregistered participants join the conference), a conference room – to split students into separate mini-groups. At the same time, such a phenomenon as 'Zoom fatigue' was marked by teachers, which can be partially explained by the presence of many people at a time on the screen, the need to monitor our non-verbal language as instructors, to shift to teacher-centricity and one-way communication. It is also worth mentioning here that back in March-May 2020 Google Meet was not as popular an application as it is now.

With the reference to the students' feedback from the distance work during the quarantine – 'dependence on technical means' was named as the main challenge, followed by the poor quality of the Internet, problems with self-organisation, the number of tasks, restriction on exercising practical skills. Though the experimental sample was quite small and limited to thirty instructors and twenty-three

students, we maintain that the experience of our department at the time of the quarantine due to the COVID-19 situation still highlights the current e-learning situation in our HEIs, reveals several challenges and needs, helps layout further strategies to support fluid, holistic, seamless, pervasive, personalised education optimised by technology.

Digital pedagogy, gamification, game-based learning and serious video games based on CMC and nowadays, mobile technology are becoming principal parts of contemporary education. They are capable to enhance learning through challenge, exploration, interaction, reflection, 'positive failure', adaptability to a particular player's decision-making level, etc. Practical work, based on two video games, that is described in task three proved positive results (e.g. students' increased motivation) and positive attitude of the pre-service training students in the socioeconomic sphere towards video games as a way of instruction. We would explain this 'positive disposition' of students by a better-structured material that students interacted with, better contextualisation of the material, the ability of a video game to arise curiosity, present a safe environment for experimentation and relevant study content.

Video games were also described as capable to develop skills of team-working, problem-solving, critical thinking; to enhance self-guided learning skills. At the same time, a strong need for pedagogic training that may empower teachers with the required knowledge and skills about gamified learning applications, educational digital games and digital competencies development was identified. This confirmed the earlier conclusions about the need to increase the level of digital and pedagogical skills of HEIs faculty; to further develop their didactic skills in mastering new approaches to academic courses' material design in e-learning format; to encourage the culture of cooperation and sharing, as well as to experience a wide range of applications, digital tools, and services that support the process of education; the development of an educational content to be accessed by students at any time, from any place, from any computer, the increase of students' digital literacies [54]. All of the above brings us to the conclusion about the topicality of what information technology offers – the options for reorganising and refining distance and e-learning. But the new vision of distance and e-learning, gamification of educational process and serious video games as one more variation of CMC must drive our decisions about the use of technology, not vice versa. Therefore, the need to develop teacher-training programs to help educators understand, design, evaluate and apply CMC and gamified learning applications is set up as the vector of future work.

The strategic integration of computer-mediated communication and gamification represents a pivotal advancement in achieving sustainable higher education. Our findings, supported by global research trends, indicate that these technologies are not merely supplementary tools but principal characteristics that fundamentally reshape educational ecosystems. The path forward requires continued innovation in personalized learning technologies, robust institutional frameworks, and comprehensive teacher training programs that address both pedagogical and ethical dimensions of digital education. As we move toward an increasingly digital future, the synergistic application of CMC and gamification will be essential in creating resilient, inclusive, and sustainable educational systems capable of meeting the complex challenges of the 21st century [95, 96].

5. Limitations

Our present research holds certain limitations as for the generalisability of its results. Among them are the size of the sample. The obtained results were compared with a similar survey, which makes the comparison results as the first approximation. There is also a need for further tests of the questionnaire's reliability and validity.

Declaration on Generative AI

The authors have not employed any generative AI tools.

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