Gamification in Education and Demand for Acquired Skills: A Systematic Review

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Abstract

The main focus of the paper is to present a systematic review of research by analyzing the state of gamification in higher education and its connection to labor demand. 80 papers published in high-impact academic journals over the last decade are reviewed. This study contributes to the research by attributing embedded gamification to skills acquired for recruitment purposes. In terms of managerial implications, research findings in the area have encouraged educators to embed gaming elements in their teaching routines to not only increase students' levels of motivation, engagement, and knowledge retention, but also to release into the labor market a sought-after workforce with all the necessary skills. Therefore, this paper demonstrates the effectiveness of the universal learning model, which ensures improvement of learning tasks with a view to training competitive specialists. The results suggest that the skills acquired by students in an educational process with integrated game-based elements tend to be in high demand on the labor market. The novelty of the work lies in the taxonomy of theories and methods in the field related to the acquisition of essential skills.

Keywords

embedded gamification, in-demand skills, job postings, higher education

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Gamification in learning is becoming an increasingly popular research direction in the international scientific community [Manzano-Leon et al., 2021]. Gamification itself was first documented only in 2008 but received worthy attention in the second half of 2010. Despite the recent development of the newfangled pattern in various contexts, some authors are convinced that the concept it-

self is not completely new [Dicheva et al., 2015]. For example, such game design elements as badges and ranks were used in army, Soviet factories and American Boy Scout organisations as a motivation booster and reward. Nowadays, the integration of gamification is being studied in many areas, such as business, marketing, healthcare, sports management, and education. It is believed that the introduction of gamified scenarios is aimed at increasing productivity and efficiency among employees and students, and research is done on the role of this phenomenon in the learning environment.

Gamification in education is defined as the introduction of gaming components into the non-gaming context of the learning process. Thomas and Baral [2023] argued that the success of gamification is due to its ability to create unique gaming experience, during which students have an opportunity to immerse themselves in artificially created circumstances and attempt to try on any game role under competitive conditions. In practice, they can interact with gamification in different learning formats due to the variety of game elements and scenarios, which helps to find an effective approach for each learner [Schobel et al., 2020]. Thus, embedded gamification can be realized through rating and bonus systems during academic lessons, additional points framework for students' activity, competition-based challenging group tasks, storytelling techniques and feedback systems, multilevel complexity ladders in mastering the material, as well as digital interactive platforms with virtual badges and visualization of educational processes. All of this suggests that the gamification of learning is a complex and extensive topic to be studied.

After analyzing previous studies on gamification in education, it could be concluded that the authors only focused on short-term incentives for student development. Accordingly, researchers have revealed a positive correlation between game-based learning and efficient development of knowledge, skills, and abilities (KSAs), i.e., the level of theoretical understanding of subjects, the performance of certain activities, and the quality of being able to perform certain tasks efficiently [Cetin et al., 2016; Obaid et al., 2020; Poonsawad et al., 2022; Schobel et al., 2023]. They have empirically demonstrated that gamification has a significant impact on students' motivation, engagement, knowledge retention, and performance, as well as on the acquisition of a range of skills, such as problem solving, critical thinking, communication, teamwork, creativity, and leadership. However, all studies focused on the assessment of the use of these acquired skills in the educational process, although the most important task is the development of skills suitable for future employment [Tholen et al., 2016]. In fact, for the most part, the authors did not provide a real assessment of the labor market by linking the set of skills acquired to the demand for labor among employers, who

actually manage the current situation in the labor market [Grijalvo et al., 2022; Marell-Olsson, 2021; Murillo-Zamorano et al., 2021; Poonsawad et al., 2022].

The problem lies in the fact that there is a lack of deep understanding of how effectively the introduction of gamification assists the development of highly demanded skills, which increases students' chances of finding employment. The student needs to gain a deep knowledge of how these skills are applied in practice. While the authors have already managed to prove that gamification contributes to ensuring adequate levels of certain skills, the demand for them among employers is still an open question. In addition, education practitioners lack an understanding of universal teaching methods with proven effectiveness that aim to release an effective workforce with in-demand skills into the current labor market [Kivunja, 2014]. This problem is relevant, as the goal of any educational institution is to provide graduates with the necessary knowledge that a skilled workforce should have. Skilled workforce could make a significant contribution to the economy by reducing companies' spending on internships, induction and additional training.

The main focus of the paper is to present a systematic review of research by analyzing the state of gamification in higher education. This study contributes to the research by analyzing embedded gamification as a tool to develop skills that are essential for recruitment. The novelty of the work lies in the taxonomy of theories and methods in the field of skills acquisition.

1. Research design

The systematic review methodology is used in the paper. The time period of the analyzed literature covered 10 years from 2013 to 2023, with the greatest advantage in the last four years, as gamification in learning has recently become a popular research trend [Rahman et al., 2018]. The search terms used to analyze relevant literature were "education" and "gamification". Google Scholar platform was used as a baseline scholarly search engine. Publication date was limited to the range from 2013 to 2023. The search queries were phrases such as "gamification in higher education", "gamified learning mechanisms", "embedded gamification", and "acquired skills and gamification in higher education". Then, the articles were filtered within highly rated journals (the first quartile journals were used) using SCImago Journal Rank. Since all the articles used for this literature review were published in the first quartile of journals according to SCImago Journal Rank, the analysis performed can be considered highly relevant. According to Swacha [2021], studies based on the bibliometric approach have been proven effective in various research areas, including business studies, medicine, tou-

rism research, and education sciences. The search query was also limited by the language of writing — English.

This research aims to identify the background of this study, combining both theoretical and practical knowledge presented in previous research papers. First, it was necessary to identify the general description of gamification, considering the characteristics that can be essential in the context of this paper. Gamification is a continuous type of innovation that is mainly applied to influence the behavioral characteristics of users [Patricio et al., 2018]. This means that through rapid incorporation of this method, it is possible to add more motivational elements and engage people [Jen-Wei and Hung-Yu, 2016; Rodrigues et al., 2022]. Second, the structure and several subtopics were identified to thoroughly analyze the main ideas related to the selected topic. Finally, the systematized ideas were verified by conducting a survey among both students and professors at the Higher School of Economics and analyzing the data collected. Based on the literature analysis, we divided the research directions into four main parts, which are analyzed in detail in the following section:

1. Gamification: general information and insights.
2. Gamification in education: peculiarities of the field.
3. Skills developed by the gamified mechanisms' integration.
4. In-demand skills on labor market: current trends.

2. Literature review

The information reviewed from the related papers with a summary of the main findings, supported theories and applied methods is presented in Table 1. Each group of papers is then discussed in detail in the following subsections.

Table 1. **Research taxonomy for gamification in education**

Group of papers	Main results	Main theories	Methods
Gamification: general information and insights	Gamification is aimed at increasing the level of motivation and engagement [Jen-Wei, Hung-Yu, 2016; Muller-Stewens et al., 2017; Pamuru et al., 2021; Patricio et al., 2020; Schobel et al., 2023] Main gamification components: game design elements, context, and application features [Jayalath, Esichaikul, 2022; Liu et al., 2017; Rodrigues et al., 2022]	Social cognitive theory: psychological perspective on human functioning that emphasizes the critical role played by the social environment on motivation, learning, and self-regulation [Schunk, DiBenedetto, 2020] Flow theory: theory that was developed with the aim of understanding how people feel when they most enjoyed themselves, and why [Biasutti, 2017]	Experiment [Pamuru et al., 2021; Rodrigues et al., 2022; Santhanam et al., 2016] Systematic literature review [Gimenez et al., 2021; Patricio et al., 2018; Schobel et al., 2023; Spanellis et al., 2022] Semantic analysis [Gimenez et al., 2021; Villegas et al., 2021]

Group of papers	Main results	Main theories	Methods
Gamification in education: specifics of the field	Gamification has a positive effect on and steady increase in students' knowledge retention, learning performance, engagement, intrinsic and extrinsic motivation, social relatedness, academic performance, and achievement [Cerra et al., 2022; Manzano-Leon et al., 2021; Murillo-Zamorano et al., 2023; Putz et al., 2020; Sailer, Sailer, 2021; Thomas, Baral, 2023] The most effective and widespread combination of game elements is PBL triad — points, badges, and leaderboard [Dichev, Dicheva, 2017; Murillo-Zamorano et al., 2021; Wannapiroon, Pimdee, 2022]	Social interdependence theory: interdependent relationships between individuals in a group setting are influenced by goal structures [Dindar et al., 2021]	Experiment [Cerra et al., 2022; Legaki et al., 2020; Putz et al., 2020; Smiderle et al., 2020] Regression analysis and ANOVA [Donnermann et al., 2021; Thomas, Baral, 2023] Survey-based methods [Bovermann, Bastiaens, 2020; Murillo-Zamorano et al., 2023; Rahman et al., 2018]
		Theory of gamified learning: effective instructional content directly influences learners' behaviors, attitudes, learning outcomes and learning process performance [Sailer, Sailer, 2021)]	
		Goal setting theory: individuals are goal-directed in their behavior, and setting of difficult goals can influence human behavior, motivation, and performance [Thomas, Baral, 2023]	
		Self-determination theory: social contexts which support the fulfillment of competence, autonomy, and relatedness, might maintain intrinsic motivation, and integration of extrinsic motivation [Donnermann et al., 2021]	
		Equity Theory: people in social exchange relationships seek a balance between the ratio of their inputs to exchanges and outcomes from those exchanges [Leclercq et al., 2018]	
		Stimulus organism theory: gamification — stimulus — creates engagement — response — through flow experience — organism [Thomas, Baral, 2023]	
Skills developed by the gamified mechanisms' integration	The gamified learning environment stimulates students to acquire the wide range of 21st century skills, specifically soft ones [Grijalvo et al., 2022; McNaughton et al., 2018; Marell-Olsson, 2021; Ratnawati et al., 2020; Sutil-Martin, Otamendi, 2021] Specifically, they develop problem-solving, critical thinking, teamwork, creativity, leadership, communication, and innovation skills [Gatti et al., 2019; Kruskopf et al., 2021; Murillo-Zamorano et al., 2021; Parody et al., 2022; Poonsawad et al., 2022; Taguas et al., 2022]	We-intention theory: individuals who are subject to we-intentions regard themselves as members of a group who perform actions collectively rather than individually [Morschheuser et al., 2017; Riar et al., 2022]	Experiment [Marell-Olsson, 2021; Schobel et al., 2023; Sutil-Martin, Otamendi, 2021; Taguas et al., 2022] Survey-based methods [Gatti et al., 2019; Grijalvo et al., 2022; Wannapiroon, Pimdee, 2022] Regression analysis and statistical tests [De Santo et al., 2022; Kruskopf et al., 2021; Yusof et al., 2021]
		Flow theory: flow which is a state of mind characterized by focused concentration and elevated enjoyment is enhanced when an individual uses matched skills during intrinsically interesting and challenging activities [Jagust et al., 2018]	
		Experiential learning theory: individual goes through different stages in a learning process to obtain environmental or personal experiential value [Kolpondinos, Glinz, 2020; Riar et al., 2022]	

Group of papers	Main results	Main theories	Methods
In-demand skills on labor market: current trends	Employers demand soft skills mostly when searching for employees to fill the position [Blokker et al., 2019; Gregorio et al., 2019; Tholen et al., 2016; Vogler et al., 2018] There is a mismatch between the demanded skill sets on the labor market and acquired skills by graduates [Borner et al., 2018; Durazzi, 2019; Foster-McGregor et al., 2013; Suleman, 2018] The demand for artificial intelligence skills is growing rapidly [Alekseeva et al., 2021; Leigh et al., 2020; Staboulis, Lazaridou, 2020]	Skill-formation theory: individuals achieve and develop innate or acquired skills to cope with everyday life challenges [Knox, Warhurst, 2018] Human capital theory: productivity increase through a greater focus on education and training [Suleman, 2018] Career construction theory: way of thinking about how individuals choose and use work [Blokker et al., 2019]	Regression analysis [Alekseeva et al., 2021; Foster-McGregor et al., 2013; Leigh et al., 2020] Validity tests [Staboulis, Lazaridou, 2020; Tavakoli et al., 2022; Tholen et al., 2016; Vogler et al., 2018] Machine learning techniques [Borner et al., 2018; Kwarteng, Mensah, 2022]

2.1. Gamification: General information and insights

An analysis of gamification should start with a rough study of different approaches to understanding this phenomenon, taking into account different points of view and ideas. As already mentioned, the concept of gamification does not have a unified description with clear characteristics [Liu et al., 2017]. Nevertheless, there are different explanations that, on the one hand, are very similar to each other and, on the other hand, have each their own specific characteristics. Based on the information from scientific journals, it was decided to identify four major concepts and conduct a comparative analysis, which are presented in Table 2.

Table 2. **Comparative analysis of gamification concept**

The basis of comparison	Concepts and authors			
	Liu et al. [2017]	Fitz-Walter et al. [2011]	Borges et al. [2014]	Huotari, Hamari [2012]
Analytic questions (preconditions)	"Gamification is the use of game design elements in non-game contexts"	"Gamification refers to adding game elements to an application to motivate use and enhance the user experience"	"Gamification is the use of game-based elements such as mechanics, aesthetics, and game thinking in non-game contexts aimed at engaging people, motivating action, enhancing learning, solving problems"	"Gamification is a process of enhancing a service with affordances for gameful experiences to support user's overall value creation"
Which problem gamification is aiming to solve?	Motivate and increase user activity and retention	Create more engaging user experiences with a wide range of applications	4 goals: behavioral change; learning improvements; socialization; engagement	Increase user motivation, level of engagement, give rise to experiences rather than methods

The basis of comparison	Concepts and authors			
	Liu et al. [2017]	Fitz-Walter et al. [2011]	Borges et al. [2014]	Huotari, Hamari [2012]
What are the main elements of gamification?	Game design elements, application context, and gameful interactions	Three main layers: game (game components such as achievements, levels), context (user actions), and utility (application events)	Playful design, serious games, video games or digital games	Game components and application features
Where gamification can be applied?	Any situation which refers to non-game environment, including business and education	Mainly university-orientated	Non-game environment: education focus	Service marketing; business
What are the challenges of gamification?	Variety of gamification elements, no unified understanding of the concept	Too many gamification elements can cause distraction from the study process	No defined principles of successful gamification use; this makes it a risky task	A lot of research & development work is needed to successfully apply gamification in business

From Table 2, it is clear that in all definitions, the authors mentioned increasing engagement and motivation as the main goals of gamification. Borges [2014] also referred to socialization and academic improvement. However, these points can be treated as functions that directly depend on motivation and engagement, which also makes them the main characteristics [Schobel et al., 2023]. The next point to be clarified the components of gamification. It is important to highlight three main groups: game design elements, external features, and context.

Game design elements refer to the mechanics that underpin the design of gamification innovations applied to the ongoing operations of the enterprise and in education [Villegas et al., 2021]. They include various goals, rules, problem-solving techniques, rewards, and motivational patterns that the gamification mechanism presents to users [Patricio et al., 2020]. The most successful game design elements identified in contexts other than learning are virtual goods, redeemable points, team leaderboards, and trophies [Jen-Wei, Hung-Yu, 2016]. The next component of gamification is the set of external features, which mainly refers to any external features that could directly influence processes related to the adaptation of game design elements [Spanellis et al., 2022]. The last component is the context, which plays a significant role in identifying the ways in which the core game design elements are incorporated. It considers the peculiarities of the target audience and predicts their actions [Santhanam et al., 2016].

In all the research papers analyzed, the authors emphasize that gamification is applied in a non-gaming environment [Jayalath, Esi-

chaikul, 2022; Pamuru et al., 2021]. However, it is mainly integrated in the university context with the aim of increasing the overall performance of students [Muller-Stewens et al., 2017]. Furthermore, gamification is often described in the context of digitalization and video-games as one of the most frequently used mechanics for gamified activities integration [Cooper, 2014]. This phenomenon influences the way in which gamification mechanisms are designed and applied. For this reason, gamification is often associated with the application of gamified digital technologies in education, using video gaming services as a base for further transformation [Gee, 2014; Prensky, 2007].

Five main theories have been used in studies investigating gamified relationships. The first one is self-determination theory; it helps to examine the motivational aspects that are essential for building gamification mechanisms for specific purposes from an internal perspective [Jayalath, Esichaikul, 2022; Liu et al., 2017; Schobel et al., 2023; Villegas et al., 2021]. The next pair of theories that have been mainly used in combination are social capital and social cognitive theories, aiming to analyze human capital from both psychological and social perspectives [Jen-Wei, Hung-Yu, 2016; Santhanam et al., 2016]. Another theory is the flow theory because it examines a certain state of mind when people enjoy themselves and the activities they do at a certain point in time, which can be treated as an essential part of any game design element [Pamuru et al., 2021; Santhanam et al., 2016]. The last theory to be mentioned here is the inductive learning theory. It describes the approach that best fits the evaluation of gamification, focusing on the particularities that have been identified [Patricio et al., 2018].

2.2. Gamification in education: Peculiarities of the field

In the related literature, gamification with regard to education is referred to as the fifth theory of learning, being compared with behavioral, cognitivist, constructivist, and connectivist approaches to educational personnel [Grijalvo et al., 2022]. Its unique feature is learning expedition, or the so-called flipped class technique, a way to digitalize education [Marell-Olsson, 2021]. It means that in practice gamification is closely related to online learning, which introduces a variety of interactive platforms that help students to learn the material effectively [Bovermann, Bastiaens, 2020; Dichev, Dicheva, 2017; Parody et al., 2022; Toda et al., 2019]. Such technology-enhanced education is making great strides towards the development of artificial intelligence within the framework of training courses [Donnermann et al., 2021].

The scientific community agreed that by combining gamification tools with competent knowledge of human psychology by educators, students will be able to enhance their lifelong learning process

by improving their mental state [Almeida et al., 2023; Dicheva et al., 2015; Donnermann et al., 2021; Sailer, Sailer, 2021]. In this way, motivation and engagement under the direct significant influence of gamification have been demonstrated by analyzing both qualitative and quantitative studies through quasi-experimental and experimental constructs, regression analysis, statistical tests, meta-analysis, in-depth interviews with students, and systematic literature reviews [Almeida et al., 2023; Cerra et al., 2022; De Santo et al., 2022; Dicheva et al., 2015; Dichev, Dicheva, 2017; Legaki et al., 2020; Manzano-Leon et al., 2021; Murillo-Zamorano et al., 2023; Parody et al., 2022; Putz et al., 2020; Sailer, Sailer, 2021; Schobel et al., 2023; Smiderle et al., 2020; Taguas et al., 2022; Wannapiroon, Pimdee, 2022; Yusof et al., 2021].

Despite the fact that Manzano-Leon et al. [2021], after an in-depth analysis of approximately 750 papers dedicated to gamification in education, found a positive influence of game-based learning on the aforementioned aspects in more than 93% of studies, some negative trends were also observed. Almeida et al. [2023] revealed the risks of gamification, which consist in possible inaccurate performance assessments, a decrease in self-esteem, and a lack of group consistency. Finally, Donnermann et al. [2021] and Sailer and Sailer [2021] were concerned about the destructive forces of the competition component associated with negative emotions due to the unfair distribution of benefits among students. The authors draw on equity theory, which studies how exactly mechanisms that create a win or lose situation could affect learners' experience in competitive gamified setups [Leclercq et al., 2018].

2.3. Skills developed by the gamified mechanisms' integration

Skills in demand in the 21st century are universally known, and much attention is paid to their development in educational institutions [McNaughton et al., 2018]. Researchers community agree that the gamified learning setup aims to improve the experience of active learning in higher education institutions, which allows to achieve higher levels of these broad skills and maintain the knowledge of how to apply and adapt them practically [Kruskopf et al., 2021; Murillo-Zamorano et al., 2021]. Yusof et al. [2021] note that the reason for integrating gamification techniques into the learning process is far from replacing the traditional postulates of education and, for example, the cardinal replacement of face-to-face interaction between a student and a teacher, but in strengthening the development of higher-quality generic skills.

In contrast to hard skills, which are aimed at understanding and knowing "how to do" specific tasks, soft skills teach "how to be" and are an essential complement to the technical component in any field. In practice, a person with soft or so-called social skills is able

to communicate competently with colleagues, work effectively in group projects, resolve work conflicts and misunderstandings, and find balanced, rational solutions to complex problem situations [Murillo-Zamorano et al., 2021]. Sutil-Martin and Otamendi (2021) qualified soft skills into the categories of intrapersonal (self-awareness and self-management), interpersonal (empathy and influence), personal social responsibility (strategic thinking and conscientiousness), and organizational sustainability (compassion and morality) macro skills, each of which is subdivided into separate micro soft skills.

Problem-solving skills can be defined as one of the most complex and important soft skills among modern learning skills, which are closely related to decision-making, analytical, and troubleshooting skills [Dicheva et al., 2015; Manzano-Leon et al., 2021; Poonsawad et al., 2022; Putz et al., 2020]. This skill has been identified in the literature as situated, deliberate, learner-directed, activity-oriented effort to seek divergent solutions to authentic problems through multiple interactions and resources [Schobel et al., 2023]. Despite the fact that Schobel et al. [2023] did not find a significant effect of gamification on problem-solving skills in their analysis of the experimental online training program, they demonstrated that the effect is confirmed by the emotional engagement that is directly regulated by gamified approaches. The rest of the researchers who used regression tests and experimental settings were unanimous in their results, validating the direct influence of gamification on problem-solving abilities [Grijalvo et al., 2022; Kruskopf et al., 2021; Marell-Olsson, 2021; Ratnawati et al., 2020; Taguas et al., 2022; Yusof et al., 2021].

Gamification promotes the development of teamwork, communication, ability to cooperate, and effective collaboration due to the ability of the framework itself to establish cooperation settings in group learning [Riar et al., 2022]. According to the we-intention theory proposed by Morschheuser et al. [2017], within the framework of the gamified experience, individuals recognize themselves as part of a team and strive for self-actualization as a whole group, which contributes to the growth of teamwork and cooperation skills. It means that the competent integration of such gamification formats as business simulators or iterations inspired by video-games strategies have a satisfying effect on the individual's awareness of being a part of a team [Gee, 2014].

Considering the acquisition of hard skills, Cerra et al. [2022] found that gamification helps engineering students to develop graphical representation skills by conducting an experiment, while Manzano-Leon et al. [2021] evidenced through a systematic literature review that gamification integration aids students in improving Science, Technology, Engineering, and Mathematics (STEM) skills.

Nevertheless, digital and computer hard skills were found the main category to be heavily influenced by gamification, and those should be developed up to advanced level in order to learn how to use digital tools freely regardless of any context [Marell-Olsson, 2021]. Thus, Saad et al. [2022], and Alt and Raichel [2020] experimentally observed the positive effect gamification has on improving students' computer, programming, and digital literacy skills, which are necessary for personal and professional development in modern realities.

2.4. In-demand skills on labor market: Current trends

The last topic to be covered in the analysis is the skill sets that are most demanded in today's labor market. Many employers declare a shortage of potential employees with the skills and knowledge needed to apply for a particular position [Cappelli, 2015]. This fact makes the problem of occupational skills mismatch extremely urgent and creates a demand for further examination of skills in the context of real labor market demands. They can be an important indicator for employers when making a decision during the hiring process [Bills et al., 2017; Gregorio et al., 2019; Smaldone et al., 2022]. These soft skills include competencies such as teamwork, communication skills, leadership, decision-making skills, problem-solving techniques, and empathy [Borner et al., 2018; Suleman, 2018; Vogler et al., 2018]. The main reason for this situation is that soft skills aim to increase the overall efficiency of hard skills performance [Knox, Warhurst, 2018]. For example, Hampf et al. [2017], Knox and Warhurst [2018], as well as Kolling [2022] were convinced that the presence of required competencies is a direct consequence for increasing employee wages, while Gregory and Zierahn [2022], on the contrary, argued that high wages are not associated with highly skilled employees. In the context of this work, it can be concluded that some basic skills are perceived by employers as mandatory skills that a potential employee should have by default. This means that business leaders expect an employee to have at least some basic skills, such as creativity, teamwork, and digital literacy, that were acquired in an educational institution and should not be learned from scratch after being hired.

Regarding the main theories used in the selected research papers, five of them can be highlighted. The first one was skill formation, which was useful in analyzing how people choose and acquire skills that they need for both everyday life and work [Durazzi, 2019; Knox, Warhurst, 2018]. The second theory to be mentioned here is the human capital theory; it describes how to foster efficiency by paying greater attention to education process [Smaldone et al., 2022; Suleman, 2018; Tholen et al., 2016]. The third theory that was used in order to identify which skills are essential to acquire through the education process in order to fill slots in the occupational hier-

archy is the credentialist theory [Bills et al., 2017]. One more useful theory is the signaling theory, which helps to compare the hiring behavior of the employers and job searching behavior of potential employees [Kwarteng, Mensah, 2022]. Finally, among the research papers analyzed, some authors used the career construction theory because it clearly shows the behavioral characteristics in the job search process and helps to understand what oskills candidates need to be competitive in the labor market [Blokker et al., 2019].

The last point to be covered is the methods that were mainly used in this particular block of papers. The authors mainly employed quantitative techniques, such as regression analysis, including simple linear regression models, and more complicated ones [Alekseeva et al., 2021; Foster-McGregor et al., 2013; Leigh et al., 2020]. Also, tools such as validity tests, which work well with regression analysis, have often been used to help understand whether the authors can trust the results obtained [Staboulis, Lazaridou, 2020; Tavakoli et al., 2022; Tholen et al., 2016; Vogler et al., 2018]. Another useful method is machine learning techniques as it helps to work with large data streams and identify behavioral patterns to the observed topic [Borner et al., 2018; Kwarteng, Mensah, 2022].

3. Gamification in higher education: An empirical illustration

To provide an empirical illustration into the fact that connection between gamified learning mechanisms embedded in higher education can foster the acquisition of in-demand soft skills, we employed the following steps of data collection and analysis.

The data were collected in two stages. In the first one, we employed a number of survey data collection techniques, including a pilot study to test whether the received data was reliable and sufficient for further analysis. In the second stage, we created a validated version of survey data. The population surveyed were students from three educational programs of the Higher School of Economics: “International business and management”, “Sociology and social informatics”, and “Political science and world politics”. These educational programs were chosen because students study in both Russian and English, which implies a good knowledge of the English language, and this skill is essential to complete the survey, which was created to collect primary data for this study. Notably, only third- and fourth-year bachelor students were chosen in order to pass this survey as they can be treated as more competent and qualified. Moreover, there were several reasons why this survey focused on students at the Higher School of Economics. First of all, gamification mechanisms are implemented at the charter level, for example, the rating system which is publicly available for everyone on the official website. Secondly, mandatory point elements at seminars and lectures are enshrined in the syllabus and expected

to be included in the majority of evaluation formulas of academic performance. These are the main reasons why the Higher School of Economics can be treated as the best possible option among other Russian universities. All in all, there were 683 students, this number unevenly distributed among the selected educational programs, since the number of students who study there differs. There were 398 students from the educational program "International Business and Management", 134 students from the program "Sociology and Social Informatics", and 152 students from the program "Political Science and World Politics". In other words, more than 50% of all students in the population were from the international business and management department, while students from political and social departments were distributed approximately equally and were estimated at 22% and 19%, respectively (see Table 3).

Table 3. **Population distribution of students**

Population	Unique number of students from 3 educational programs		
	3 course	4 course	Total
International Business and Management	164	234	398 (58.27%)
Sociology and Social Informatics	68	66	134 (19.62%)
Political Science and World Politics	54	97	151 (22.11%)
Total	286 (41.87%)	397 (58.13%)	683

However, if only the opinion of bachelor students had been considered, the responses would have been biased and unreliable as a basis for research. This is the reason why this survey was also sent to professors who teach at selected educational programs. The overall population of professors consisted of 204 people. Such a strategy gave an opportunity to normalize and validate the survey results for them to be used in further analysis.

The survey design was rather simple as it had to be understandable for an unprepared respondent and consisted of four main blocks. The first one addressed the influence of gamification on motivation of students. In this section, the students were expected to answer general questions on how gamification can increase or decrease motivational aspects, such as better performance, ambition, and striving to overcome one's weaknesses. The next block of questions was aimed at exploring the influence of gamified mechanics integrated into the educational process on the engagement of students. This part examined how and to what extent gamification affects students' involvement in seminars and lectures. One more block looked into the skills that gamification can help students to acquire. In this part, the respondents were asked to choose whether

gamified mechanics influence the development of certain skill sets. The skill sets were identified through the literature review and included problem-solving, critical thinking, teamwork, communication skills, creativity, innovation, leadership, and digital literacy. Finally, the survey offered the respondents to answer several demographic questions about their status, age, gender, and similar characteristics. All in all, the strengths of the presented questionnaire are simplicity and logical structure because respondents can easily navigate through the survey and find additional theoretical information on gamification and practical examples if they are not familiar with this topic. The full version of the questionnaire can be found in the appendix (Appendix 1).

In order to gather respondents from the population that was mentioned earlier, purposive sampling was chosen. This is a non-random sampling strategy, which focuses on those units that the researchers are particularly interested in [Palys, 2008]. It perfectly fit the survey designed for this study. For example, such a sampling strategy can help to focus only on those educational programs that are appropriate for this research or mediate the number of respondents of each course of study by using a personal mailing list. However, this is not the only sampling strategy that fits the survey design of this study. Snowball sampling, defined as the sampling strategy in which the participants are asked to assist researches in distributing the survey, was also used by asking the respondents via email to send an invitation to answer the survey questions to their group chats in social media as well as tell their friends from the same educational program about the survey and offer them to participate.

When the design of the survey was set up, a pilot study was conducted in order to verify the validity and reliability of the study. It consisted of the first 50 respondents whose distribution turned out to be unequal among students and professors who took part in the survey. There were 14 professors and 36 students in total.

All in all, the majority of students were from the international business department, and the distribution was estimated at 63%. Comparing the distribution of third- and fourth-year students, the sample distribution tends to be approximately the same in all categories. However, simple descriptive statistics was not enough to understand whether the data received through this particular survey was sufficiently reliable, so additional tests and validity techniques were applied to verify the data. To make computations easier and more structured, each question in the first two blocks was encoded in the following form: number of the question/number of the section. In the third block, each question was named according to the skill described in it.

Then, we validated the survey using the following set of formal techniques. The first one is the Cronbach's alpha measure, which

can be defined as the coefficient aimed at measuring the internal consistency of the items in a survey. If the Cronbach's alpha values are high enough, response values can be treated as consistent across a group of questions [Bonett, Wright, 2014]. Researchers usually take 0.7 as a benchmark when defining which items can be treated as consistent in order to show that the chosen measure is reliable enough [Ibid.]. In this study, the Cronbach's alpha is 0.88, which is a rather good result. This means that the responses obtained in the pilot study can be treated as internally consistent. Since the maximum value for this estimator is one, it can be said that the responses are reliable enough to be considered strongly correlated with each other.

The next tool used for the survey validation was exploratory factor analysis (EFA), which is generally applied to recognize the structure of the factors and to examine its internal reliability [Howard, 2015]. In factor analysis, several assumptions were to be held. First of all, variables had to be correlated between each other. The second assumption was aimed at proving the sampling adequacy, so Kaiser-Meyer-Olkin (KMO) measure was used, with its cutoff point for determining the factorability of the sample data being 0.6 [Costales et al., 2022]. The total KMO of the sample data was 0.71, indicating that, based on this test, factor analysis can be conducted as the second assumption was held. The last assumption had to check the usefulness of factor analysis for this particular data. For this purpose, the Bartlett's test of sphericity small *p*-value was used because it is aimed at comparing the observed correlation matrix with the identity matrix [Noor et al., 2016]. The *p*-value of the survey data was below the significance level, which indicated that factor analysis may be extremely useful. When all the assumptions were held, it was necessary to understand how many unobserved factors were influencing the results of the survey. Based on the results of the previous survey diagnostics, it was decided that the suggested number of factors was two. Considering the results were achieved during the validation of the data received through the survey conducted among the students and professors at the Higher School of Economics enabled us to claim the data to be reliable enough to be used for analysis in the empirical part of this study.

After the data collection stage, quantitative analysis was used. The analysis is based on the data collected through the survey. The preliminary data analysis phase consisted mainly of the advanced filtering techniques to extract useful information from the big amount of data, descriptive statistics to quickly gain significant insights into the survey data, and clustering procedures. The initial dataset included 30 different variables covering personal information of the respondents, motivation points, engagement issues, and skills that can be acquired with the help of gamification mecha-

nisms by both students and professors. By the status of the respondents, the data was divided into two main datasets, which turned out to be composed of 272 students' and 141 professors' observations. The first step of analysis was frequency distribution of gamification techniques integrated into the education process. Most students and professors claimed that in the Higher School of Economics they face with gamification applied at each academic lesson (see Table 4). It may be concluded that the data collected perfectly represents the analyzed topic because the respondents are very familiar with gamification mechanisms and processes.

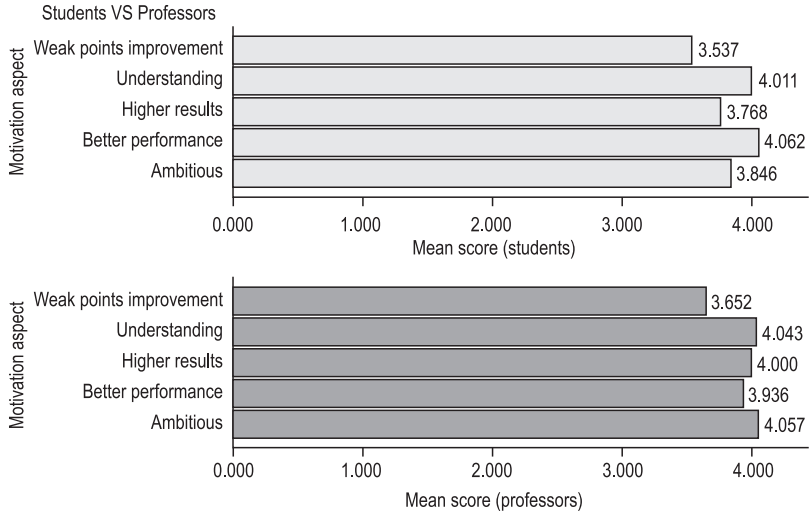
Table 4. **Frequency distribution of gamification experience**

Category	Students	Professors
At each academic lesson	101 (36%)	44 (31%)
At least one time a week	86 (32%)	41 (29%)
Several times a month	51 (19%)	25 (18%)
Several times per module	34 (13%)	31 (22%)

Subsequently, it was decided to analyze the data related to the gamification issues in three major categories depending on the internal sections of the survey. Starting with the first part, the results of the gamification influence on the students' motivation were considered. For each of the questions, the mean value was calculated in order to understand how the respondents assessed the level of motivation in various gamification-modeled situations. As illustrated by the distribution chart in Figure 1, for all five questions in this category the mean value was higher than 3.5 and the superior result was obtained for a better understanding of the presented material and for the better motivation for higher performance among students. On the other hand, professors more often referred to ambition and problems with understanding.

After preliminary mean values for each question in the first section of the survey were defined, we decided to run several confidence intervals for the mean in order to verify the obtained results. The analysis showed that with 95% certainty it might be said that the average score by which the students assessed the impact of gamification on weak points improvement lies in the range from 3.403 to 3.671 points, while for the professors' responses it lies in the range from 3.482 to 3.822. The average score of gamification impact on better understanding lies in the range from 3.899 to 4.123 points according to the students' responses and between 3.925 and 4.16 points from the professors' point of view. In terms of influence of gamified mechanisms on higher results, the mean value of the students' answers lies in the range between 3.641 and

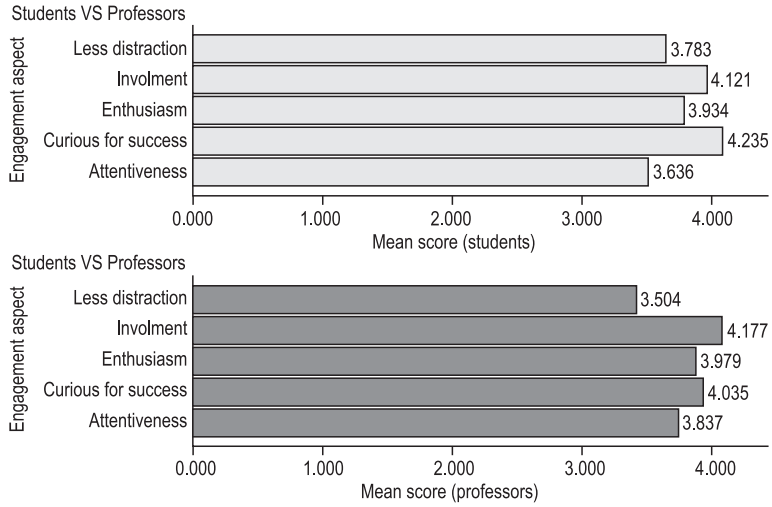
Figure 1. **Distribution of survey responses within first group of questions attributed to motivation aspects (upper chart — students' responses, lower chart — professors' responses)**



3.896 and that of the professors' answers — between 3.383 and 4.157 points. With 95% certainty, it can be claimed that the average score by which the students assessed the impact of gamification on better performance lies in the range from 3.957 to 4.168 points and from the professors' point of view it does in the range from 3.798 to 4.074 points. Finally, the average score of the students' responses concerning the role of gamification in increased ambition lies between 3.722 and 3.969, while the professors' score does between 3.904 and 4.209. The mean scores stated previously can be treated as reliable because they fit the ranges identified during the confidence interval analysis using the 95% confidence level. All in all, it can be argued that both learners and teachers are convinced that gamification integrated in the education process positively influences the motivation of students covering different scenarios of personal development features including improvement of weak points, better understanding of the material, increased motivation for higher results and better performance, and ambition during academic seminars.

The second group of questions looked at how gamification influenced student engagement. The design of the questions was similar to that in the first section, so the same procedure was chosen. As a result, the mean values were calculated and after that compared in groups depending on the status of the respondent. As can be seen in Figure 2, the highest result was obtained in the questions related to involvement and curiosity among the students' responses. The opinion of professors concerning the students' engagement was

Figure 2. **Distribution of survey responses within second group of questions attributed to engagement aspects (upper chart — students' responses, lower chart — professors' responses)**



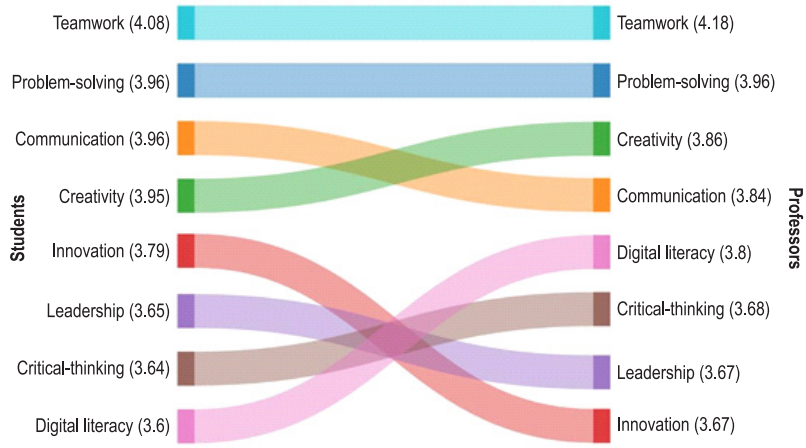
quite similar because the biggest mean value was obtained by the variables that represent the same questions in the survey.

Similarly to the procedures chosen for verifying the results of the first survey section, the confidence interval analysis for the mean was applied to the ideas derived from the second section. As revealed by calculations, it can be claimed with 95% certainty that the average score by which the students assessed the influence of gamification on decreasing distraction lies in the range from 3.643 to 3.923 points, while for the professors', the mean score is between 3.314 and 3.693. What is more, the mean value of gamification impact on better involvement lies between 4.003 and 4.239 for the students' answers and between 4.049 and 4.305 for the professors' responses. In terms of the impact of gamification on student enthusiasm, the mean values of the students' and professors' answers are in the ranges from 3.813 to 4.054 and from 3.843 to 4.114, respectively. With 95% certainty, it can be said that the average score by which the students assessed the impact of gamification on curiosity lies in the range from 4.126 to 4.345 points, while for the professors' answers it does between 3.896 to 4.175 points. Besides, the mean value of ranking the impact of gamification on attentiveness is between 3.509 and 3.763 points for the students' answers and between 3.694 and 3.98 points for those of the professors. The confidence interval analysis showed that the mean values identified previously are reliable enough to derive further conclusions because they fit the defined ranges for each question. To sum up, it can be argued that gamification applied at seminars and lec-

tures helps to increase the overall level of student engagement and can be used to make them more active in the course of study.

The last section of the survey analyzed skills that students can acquire with the help of gamification mechanisms integrated in the educational processes. Each question was related to one specific skill out of eight which were defined through literature review, and we asked the respondents to assess how gamification helps to develop these certain skills on a five-point scale. The aim was to calculate the mean value for each of the skills separately in two datasets and then match the results obtained from the students' and professors'. At this stage, the professors' answers helped to support those by the students' so that the results turned out to be reliable and valid enough. As shown in Figure 3, the first two skills which represent teamwork and problem-solving were treated by both professors and students as those that gamification helps to acquire the most. In terms of the third and fourth positions in this rating, the two datasets are slightly different. The set of skills is the same since both students and professors attributed such skills as communication and creativity on the third and fourth place, respectively, but the order of skills is different, as the students pointed out that gamification better develops communication skills than creativity skills.

Figure 3. **Rankings of students' and professors' responses about skill sets acquisition through gamification**



To summarize, using the primary data collected for this particular study, we successfully verified all skill sets, which previous authors defined as the abilities that gamification helps to develop the most. Therefore, it can be concluded that gamification indeed helps to obtain both soft and hard skills and directly contributes to the success of skills' acquisition process.

4. Conclusion

In conclusion, our research has proven that gamification in education offers excellent opportunities for students to develop skills that are in demand on the job market in order to create competitive workforce. Undoubtedly, such basic soft skills as communication, teamwork, problem solving, critical thinking, creativity, leadership, and innovation have become prime requirements of employers in recent years. At the same time, businesses prioritize a high level of digital literacy in their employees as an essential component of technical optimization. This means that these skills are a decisive factor in assessing the potential effectiveness of an employee and possessing them leads to successful employment. Moreover, the analysis showed that the skills that students acquire through the educational process with integrated game-based elements tend to be highly demanded in the labor market. However, this set of skills needs to be validated to understand whether this information matches modern business realia.

Appendix

Appendix 1. Survey

Dear participants, we invite you to participate in the research on gamification by completing the following survey. The aim of this research is to reveal your attitude to gamification as part of the educational process. This questionnaire will require approximately 6 minutes to complete. Thank you for taking your time in assisting us with this research. The data collected will be used solely for academic purposes.

Optionally: we kindly ask you to leave your corporate e-mail at the end of the survey if you want to get the results of the study.

**For this survey, we define gamification as applying game mechanics in a non-game context.*

Gamification experience

Theoretical background[1]:

*What does the gamification in education mean practically?

Gamification in education refers to the integration of:

- rating and bonus systems;
- seminar points for activity;
- competition-based challenging group tasks;
- storytelling techniques;
- digital interactive platforms with visualization of learning processes;

[1] Incremented in each subsection.

- multilevel complexity system;
- quizzes;
- effective feedback, etc.

1. How do you assess the gamification experience inside the university?

Gamification techniques are applied and met:

- At each academic lesson
- At least 1 time a week
- Several times a month
- Several times per module

Motivation

2. Express your opinion about the effect of gamification on the overall motivation among students during academic seminars where 1 — strongly disagree and 5 — strongly agree.

Gamified learning activities help students to successfully understand and learn difficult topics.
Classroom competition created by gamification motivates students to do their best in order to achieve high results.
Gamification introduced into class activities increases the overall performance of students.
Gamification techniques allow students to see their weak points and improve these areas.
Gamification helps students to become more ambitious for success.

Engagement

3. Express your opinion about the effect of gamification on the level of involvement among students during academic seminars where 1 — strongly disagree and 5 — strongly agree.

When students work on activities which involve gamified mechanics, they feel interested and focused.
When students answer questions on gamified exercises, they feel curious about the correct answers and progress scores.
Students feel enthusiastic to participate in gamified learning activities.
Students are less likely to be distracted by gadgets on lessons with integrated gamification mechanisms.
During sessions with applied gamification design, students are attentive to feedback, group members' comments, and discussions.

Skills acquisition

4. Note which skills and to what extent gamification helps to improve from your point of view where 1 — no improvement at all and 5 — advanced level of improvement.

Problem-solving (brainstorm and implement best solution)
Critical thinking (analyze facts and form judgements)
Teamwork (work on groups' activities effectively)
Communication (learn to be a great speaker)
Creativity (integrate creative approaches)
Innovation (discover original ideas)
Leadership (try on to be a leader)
Digital literacy (apply computer-based techniques)

Demographic issues

5. Gender:

- Male
- Female

6. Age:

- 18–25
- 26–30
- 31–40
- 41–50
- 51+

7. Current status:

- Student
- Professor

For students

8. Course of study:

- 3
- 4
- Graduate student

9. Educational program:

- International Business and Management
- Sociology and Social Informatics
- Political Science and World Politics

10. Average grade:

- Above 9
- 8–9
- 7–8
- 6–7
- 5–6
- 4–5
- Below 4

11. Work experience:

- Full-time job
- Part-time job
- Do not work

12. Corporate e-mail (optional)

For professors

13. Work experience at HSE University:

- Less than a year
- 1–2 years
- 3–4 years
- 5+ years

14. Corporate e-mail (optional)

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