The use of digital escape room in educational electronic environment of maritime higher education institutions

Serhii A. Voloshynov[1\[0000-0001-7436-514X\]], Halyna V. Popova[1\[0000-0002-6402-6475\]],
Alona Y. Yurzhenko[1\[0000-0002-6560-4601\]] and Ekaterina O. Shmeltser[2]

[1] Kherson State Maritime Academy, 20 Ushakova Ave., Kherson, 73009, Ukraine
helen18@online.ua
[2] State University of Economics and Technology,
5 Stepana Tilhy Str., Kryvyi Rih, 50006, Ukraine
shmelka0402@gmail.com

Abstract. The paper is tended to investigate the gamification activities use in educational electronic environment of maritime higher education institutions. Gamification methods with examples are described (gamification testing, QR Code quest, storytelling and escape room). Comparative characteristic of traditional learning and learning using gamification in educational electronic environment is given in the article according to different criteria: the place and role of teacher or students in the learning process; type of information communication; methods of training; equipment; level of freedom of the actions; presence of the problems in educational process; level of its control and learning outcomes. The paper also presents examples of gamification activities based on escape room quest to form communicative competency of future maritime professionals. Escape room activity presented in the article contains storytelling element, crossword and electronic testing questions of different types. Question types listed in the paper are Drag and drop to the text, Short answer and Multiple choice. Escape room activity was done by second year cadets of Kherson State Maritime Academy. According to the received results, knowledge quality increased by 10% and success by 20%. Further investigation of gamification activities can also be done for learning system of maritime higher education institutions using simulation technologies of virtual, augmented and mixed realities.

Keywords: Blended Learning, Educational Electronic Environment, Maritime Higher Education, Gamification, LMS Moodle, English For Specific Purposes.

1   Introduction

The constant and rapid development of professional information, the emergence of new technology, digital technology and navigation informatics require professional education to accelerate the updating of content, search, development and testing of new pedagogical technologies that guarantee the training of a specialist who has practical

competences at the time of training completion.

Today it is impossible to separate professional competence from the knowledge of modern computer facilities, which are constantly updated and upgraded in shipping industry with the sole priority – to ensure the preservation of human life. It is precisely this emphasis on the importance of improving ship equipment to the IMO (International Maritime Organization) and put forward certain requirements for the professional competence of future marine professionals. A new problem arose before the maritime institutions of higher education – the search for new effective methods and technologies for training to build the professional competence of future marine professionals. For the placement of teaching materials and interactive content, modern educational establishments create and use an electronic information environment.

The scientists who studied the use of the electronic information environment in education are: Olga V. Bondarenko [4], Olena G. Glazunova [9], Oleksandr H. Kolgatin [13], Olha V. Korotun [14], Vitalii V. Lapinskyi [10], Svitlana H. Lytvynova [15], Maiia V. Marienko [16], Pavlo V. Merzlykin [18], Olena V. Pakhomova [25], Larysa M. Petrenko [21], Olga P. Pinchuk [22], Volodymyr V. Proshkin [26], Viktor B. Shapovalov [27], Mariya P. Shyshkina [29], Aleksandr V. Spivakovsky [31], Vladimir I. Zaselskiy [30], Snizhana O. Zelinska [35] and others. Researchers who considered the electronic information environment in the higher educational establishment are Gilly Salmon (E-Moderating) [24], Robert J. McClelland, Nick Hawkins (use and development of a broad range of e-books in higher education and their use in supporting virtual learning environments) [17], Hepu Deng (usage of Electronic Information Resources for academic research) [7], and others. The latest trend in learning, the Escape room (quest room), the number of tasks you need to do to get out of the room or get to a certain place, was explored by Olha V. Shykina (the development of quest-attractions) [28], Maximilian Pohle, Veit Haensch (chemistry escape room for students) [23], Ifan Jenkin, Natalie Fairhurst (escape rooms in medical teaching) [11], and others. However, the use of the proposed technology in the electronic information environment for the formation of professional communicative competence by future marine professionals remains unresolved.

The purpose of our study is to analyze the potential of using gamification as a pedagogical technology for forming a communicative competence of future marine professionals, for example, by organizing "escape room" game on Learning Management System (LMS) Moodle in the Kherson State Maritime Academy (KSMA) [32].

2   Methods

The participants of this research are a total of 120 cadets (male) aged 17–19 from Ukrainian maritime higher education establishment (KSMA). They are cadets of three departments: navigation, ship engineering and electrical engineering one.

The participants of the research were asked to study in an educational electronic environment including study on LMS Moodle and its activities (Quiz, Page, SCORM package). The materials to be used on LMS Moodle e-course are from "Seven Seas Ahead: coursebook" [3].

Stage one. The e-course "Maritime English" escape room activity was created in order to form communicative competency of future maritime professionals.

Stage two. This stage involved the collection and analysis of the results.

Stage three. The questionnaires were created in order to get feedback from the cadets who have done escape room activity.

Stage four. There was the circulation and collection of the survey questionnaires.

Stage five. Calculation and analysis of the received data took place.

3   Results

The main IMO regulatory documents that clearly regulate the standards of training of future marine professionals they include the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW-78/95) with Manila Amendments, which define the minimum requirements for the content, criteria and evaluation of professional competencies. According to the STCW, sufficient knowledge of English is a compulsory professional competence that allows the ship navigator to use maps and other navigational aids, to understand meteorological information, communications regarding safety and operation. As for a ship engineer this competence allows him to maintain the ship, use technical manuals and perform all the duties. According to the standard of higher education of Ukraine in specialty 271 "Marine and inland water transport" for the first (Bachelor) level of higher education, which was approved in 2018, communicative competence is defined by one of the general competences of a marine professional (see Fig. 1) [5].
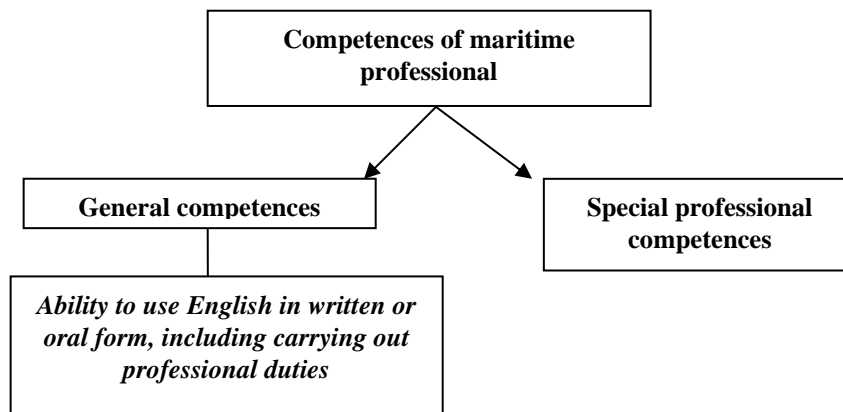

Fig. 1. Competences of maritime professional.

The knowledge quality of marine specialists depends on the extent to which the educational process is focused on future professional activities that are associated with solving various tasks of processing, transmission, transformation of information flows and processes, and involves solving various tasks of modern information production through the development of complex algorithms for modeling information processes.

The processes of digitalization and globalization have pushed for the search for the latest effective techniques, forms and technologies for training professional disciplines in higher education institutions. The system of education is in a state of irreversible changes under the influence of external (socio-economic, informational, cultural) and internal (professional) factors. A significant increase in competition in the maritime labor market requires an immediate increase in the level of training in higher education institutions, which will meet modern trends and time requirements.

One of the perspective areas of the educational process is the use of e-learning [2], which is based on the use of virtual environments [20] in the educational process, complemented by the reality of computer simulations [12], virtual 3D worlds with the effect of immersion [36; 19]. The need to attract students to virtual forms of interaction is a consequence of the redevelopment of educational space, which has been proclaimed as a modern educational trend in the Horizon reports [1].

In connection with this, there are new pedagogical technologies that are becoming widespread and implemented in the educational process. One such technology is gamification, which is a tool for using game thinking and game dynamics to engage the audience in solving professional problems [33; 34].

The use of a game without a professional context can not promote the development of professional competencies, and the setting of a certain goal is one of the most important conditions for the use of gamification in the educational process.

Since the fact that gamification has been used in educational processes of higher education not so long ago and is not a very common technology, it is indisputable that the scientific understanding and wide discussion among the representatives of the educational community about the involvement in the practice of teaching modern technology of gaming technology takes place.

Patrick Buckley and Elaine Doyle [6] theoretically and practically consider the possibilities to individualize gamification for the formation of students' interest. The use of the Escape room game was studied by Olha V. Shykina [28], Maximilian Pohle, Veit Haensch [23] and others. The analysis of scientific literature and personal pedagogical experience of authors in higher educational establishment allows us to highlight the peculiarities of the use of various types of gamification exercises in the electronic courses of LMS Moodle. While designing gamification content the first and most important is to distinct competencies that can be generated using this method (see Table 1).

There is no doubt that the skillful use of all gamification elements which we've described above can in many cases increase the efficiency of learning the material and develop the necessary competencies. Using the LMS Moodle mobile application allows you to implement virtual learning by accessing content from anywhere, at any time. The modern information materials representing the educational material produce qualitatively new properties of the content of education, which was not in the traditional methods. Virtual reality environments are the development of virtual simulators, workshops, games that are actively used in the educational process, and are tools that allow you to simulate real-world situations of professional activity for the more effective formation of professional competencies. Given the relevance of the implementation of the gamification approach, consider the characteristics of learning

using gamification technologies.

Table 1. Gamification elements, their description and examples of use.

Name	Description	Examples of competencies, which can be formed using this method
Gamified testing	Online task system based on the game technique, the results of which can be judged on the level of knowledge and skills of the student.	to describe symptoms and recommend first aid for a specific disease/injury;
QR Code quest	The chain of tasks to do which you need to scan QR codes.	to list shipboard emergencies in terms of their causes, ways of preventing them and actions to be taken if emergency actually occurs;
Storytelling	The use of a plot line in the tasks.	to name Life Saving Appliances in terms of their stowage, construction and launching procedure;
Escape room tasks	The chain of activities you need to perform to win.	to list marine environment in terms of causes and consequences of marine pollution, MARPOL, sea garbage disposal regulations and actions in case of an oil spill [3];
Badges	Visual tokens of achievement sharable across the web.	to compare properties of conductors, semiconductors and insulators

Escape Room is a life-based game where the player finds hints, performs a chain of tasks for them at a certain time. This kind of educational games was based on the genre of computer games. The term "escape room" was first used in 2006 when creating the video game "Origin". The chain of tasks and clues to them was taken from the works of Agatha Christie.

For the application of this technology in the educational process, we used the "Testing" activity of LMS Moodle. Being part of the "Maritime Security" module, the escape helps to form the key competence of the module – talk about maritime security in terms of the main guidelines of the International Ship and Port Facility Security (ISPS) Code [1]. The competence of this module, as well as other modules, is contained in the course competency framework and a separate file like the "Page" at the beginning of the module, which can be seen in Fig. 2.

When setting up a test, the required element is storytelling or adding a plot element to the task. An example is the escape room for the module "Maritime security" – Your ship was attacked by the pirates. You have 15 minutes to get to the panic room!

Exactly "Testing" activity allows adding one of the key elements of the escape room – the time when tasks are interrelated. When creating an escape room, it is mandatory to link it with the competence of the course, using the competency framework. The escape room tasks (different places on a ship) goes consecutively – each one is located on a separate page. In the escape room of the topic "Maritime security" the first task is to perform an author's crossword, which was designed and located on learningapps.org

website, the transition of it to LMS Moodle is possible by the link (see Fig. 3). After solving the crossword, the cadets must find the keyword. This keyword must be written under the picture of Engine room, next to the word "Answer". Questions of this type are called Short answers and allow you to create tasks with a controlled response [8].

Fig. 2. List of competencies of "Maritime security" module from e-course «Maritime English» on LMS Moodle.
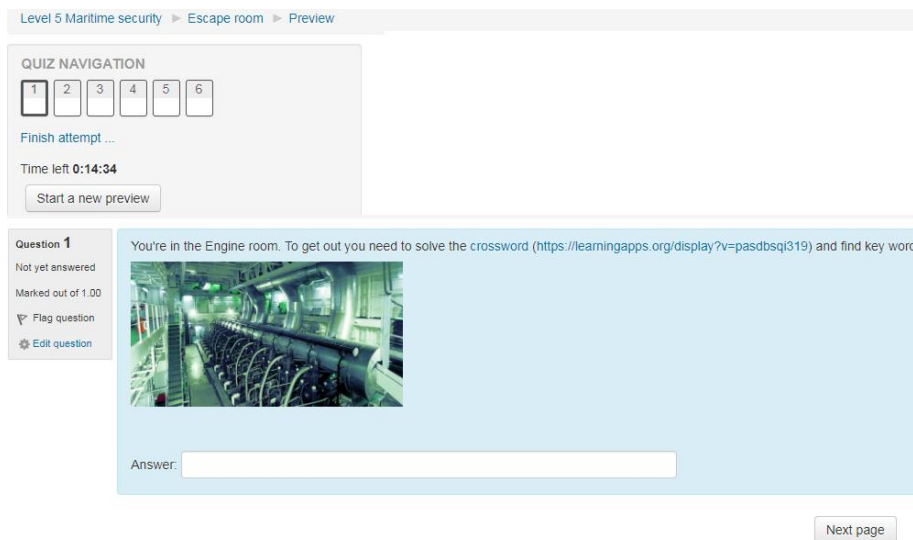
Fig. 3. The first task of the escape room of the topic "Maritime security" with a link to the crossword.

Each issue of the escape room contains images from the real ship, which allow you to create an effect of presence and reflect the places through which the player virtually moves to achieve the main goal of the quest room – reach the citadel to save himself from the pirates.

The next task of the escape room is "Drag and Drop to Text". This type of question allows you to fill in gaps in the text (the names of the pirates' tactics when attacking the ship) using the phrases provided after the image of the part of the ship (main deck) where the player is virtually in during this task.

Fig. 4. "Drag and Drop to Text" task of gamified testing.

After completing tasks about naming parts of a superstructure – the names of individual spaces with the help of the question type "Multiple choice" – the course users virtually reach the citadel, where they can escape from the pirates. Questions of the type "Multiple choice" allow to use an image (with the possibility of using gif), create a list of its possible names (see Fig. 5).

The next type of question is "Drag and Drop onto Image" (Fig. 6). This type of question allows you to drag images or text labels and drop them into defined drop zones on a background image.

Current category   Module 5 Maritime security (8) ☑ Use this category

Save in category   Module 5 Maritime security (8)   ▼

Question name *   04

Question text *

You're passing the space of superstructure. Name it.

Default mark *   1

Fig. 5. Setting up a Multi-choice option.

You're running to the superstructure along weather deck. Name anti-piracy methods to enter the superstructure.
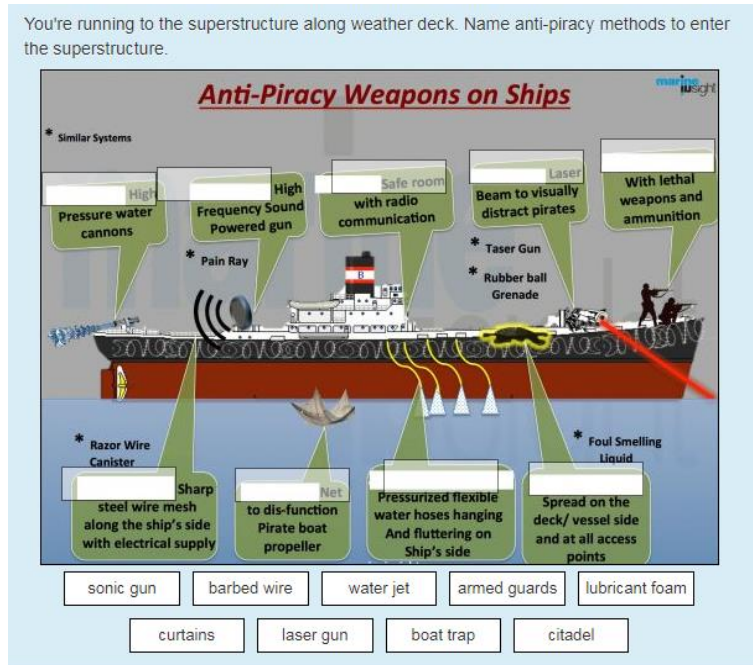

Fig. 6. Drag and Drop onto Image task of gamified testing.

4   Discussion

Thus, after completing all the tasks, the users of the course will achieve a single result (achievement of the goal – the citadel), this result depends on the level of preparedness of the player on a specific topic.

By analyzing the data of success after using the gamification exercises in the electronic course, one can observe that the current state of formation of the communicative competence of future ship engineers of the 2nd year 2018-2019 Maritime College of KSMA is better compared with 2015 year (Fig. 7). According to the results, we see an increase in the success, the marks 3-5/5 (by 20%) and knowledge quality, 4-5/5 (by 10%).
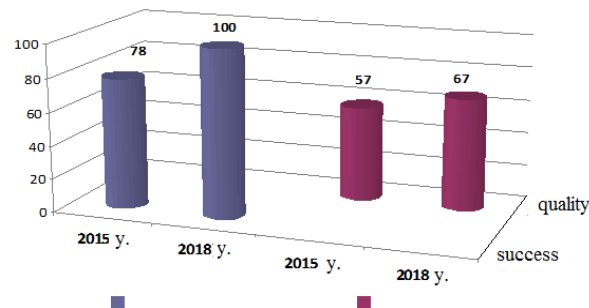
Fig. 7. Comparison of statistics for 2015 and 2018 years.

Informative is the survey of the cadets of KSMA in choosing the desired form for studying the topic or answering questions (Fig. 8). So, with the help of Google Forms, cadets noted that only 26.6% would like to do this traditionally in a notebook. 45.6% of cadets said that their testing tasks on LMS Moodle were desirable, and 13.9% of the cadets indicated that they would like to perform gamification exercises/questions on Moodle.

If you need to study the topic and answer the question, what form would you choose?

79 answers

Fig. 8. Comparison of statistics for 2015 and 2018 years.

5 Conclusions

Gamification activities like the digital escape room increase interest in learning, motivate, implement learning through independent tasks, provide self-development of users of the electronic course.

We believe that the use of gamification exercises can not only form general and professional competencies, but also acquire practical experience of teamwork skills, responsibility and awareness of your belonging to one profession.

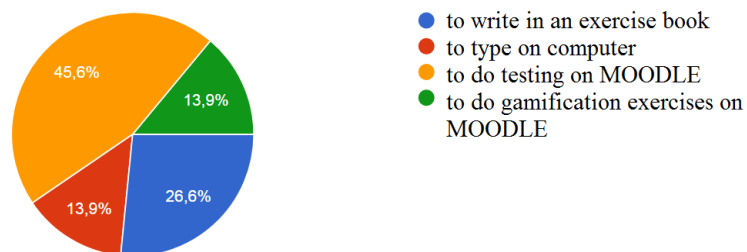The prospects for further research, we see in the inclusion in the educational process of gamification scenarios using simulation technologies of virtual, augmented and mixed realities.

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