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Особенности формирования востребованных soft skills в образовательном пространстве квест-комнаты

Проблема и цель. Включение игровых элементов и цифровых сервисов в познавательную деятельность обучающихся – актуальные направления развития дидактической системы. Проектирование интерактивной квест-комнаты, как организационной формы познания и учебной технологии, является одним из вариантов геймификации цифрового образовательного пространства. Авторами исследуются проблемы формирования игровыми интерактивными средствами квеста наиболее востребованных обществом компетенций, необходимых выпускникам для решения последующих профессиональных задач и успешной социализации.

Методы исследования. Для получения теоретических обобщений применялся анализ научных работ по проблеме геймификации обучения, применения цифровых ресурсов для формирования востребованных soft skills. Квест-комната реализована средствами современных интерактивных технологий. К проектированию игровых помещений образовательного назначения были привлечены 48 студентов (31% юношей и 69% девушек) Вятского государственного университета по специальности 44.03.01 Педагогическое образование, г. Киров. На контрольном этапе эксперимента при помощи критерия знаков G оценён характер изменений в формируемых надпрофессиональных компетенциях.

Результаты. Уточнена сущность понятия «квест-комнаты», как игрового пространства, полностью адаптированного под конкретный сюжет, каждый содержательный элемент которого призван отвечать одной общей истории, включая тематические задания. Описаны этапы проектирования и реализации квест-комнаты образовательного назначения: определение системы планируемых результатов, надпредметных компетенций; проработка игрового сценария; обоснованный выбор программно-технического сопровождения; соотнесение эмоционально-психологической составляющей с наполнением интерактивного образовательного пространства. Полученное в ходе эксперимента эмпирическое значение $G_{\text{emp}} = 3 < G_{\text{cr}} = 9$ (для $p = 0,01$) подтверждает, что сдвиг в сторону повышения качества обучения после применения предлагаемого подхода не является случайным.

В заключении обобщаются факторы, обеспечивающие эффективное применение интерактивных ресурсов квест-комнат для формирования наиболее востребованных обществом soft skills: учёт особенностей игровой механики; профессиональных стремлений и интересов, стиля познания обучающихся; соотнесение реально сформированных soft skills с запланированными и т.д.

Ключевые слова: геймификация, интерактивность, игровая среда, взаимодействие, надпрофессиональные компетенции, профессии будущего

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Peculiarities of forming high-demanded soft skills in the educational space of the escape room

The problem and the aim of the study. Including game elements and digital services into the students' cognitive activity are the current trends in the development of the didactic system. The designing of an interactive escape room as an organizational form of cognition and learning technology is one of the ways of gamification of the digital educational space. The authors investigate the problems of forming the high-demanded competencies through interactive quest games. These competencies are necessary for graduates to solve future professional tasks and for successful socialization.

Research methods. The analysis of fundamental scientific works on the problem of gamification in education and the usage of digital resources for forming high-demanded soft skills were used to obtain theoretical generalizations. The escape room was designed using modern interactive technologies. 48 students of specialty 44.03.01 Pedagogical education (31% of boys and 69% of girls) of Vyatka State University, Kirov, were involved in the designing of game areas for educational purposes. At the control stage of the experiment, the G-criterion was used to evaluate the changes in over-professional competencies being formed.

Results. The essence of the concept of an escape room has been clarified as a game space fully adapted to a specific story, and each single element of which is designed to respond to one common plot, including thematic tasks. The stages of designing and implementation of the escape room for educational purposes were described: determination of the system of planned results, over-subject competencies; development of the game scenario; reasonable choice of software and hardware support; correlation of the emotional and psychological component with the filling of the interactive educational space. The empirical value of $G_{emp} = 3 < G_{cr} = 9$ (for $p = 0.01$) obtained in the course of the experiment confirms that the shift towards improving the quality of learning after applying the proposed approach is not random.

In conclusion, the authors generalized the factors that provide the effective use of interactive resources of escape rooms to form the high-demanded soft skills: taking into account the peculiarities of game mechanics; professional aspirations and interests; students' cognition style; correlation of actually formed soft skills with planned ones, etc.

Keywords: gamification, interactivity, game space, interaction, over-professional competences, professions of the future

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Introduction

The formation of over-professional competencies (system thinking, project management skills, cross-industry communication, multilingual ability, etc.) is a priority direction for the development of the modern educational space. The "Digital School" project assumes to update the content of education, to introduce technical innovations as teaching tools, and to expand teachers' understanding of the possibilities of digital technologies, including mobile services and platforms [1]. New challenges of the state and society to the education system that are shown in the paper by E. V. Soboleva, N. L. Karavaev, make it necessary to develop students' skills in information interaction and project activities in the digital world, teaching data analysis, programming elements, and creating digital products [2]. The "quest" technology is one of the forms of organizing an environment that has necessary resources, both in educational and career guidance activities [3]. E. M. Bonsignore notes that WebQuest implemented by means of information technologies and presented online or via mobile application, activates students' interest, supports their educational and cognitive activity [4].

However, for many teachers the designing and implementation of WebQuest based on modern digital technologies has a number of objective methodological and software-technical difficulties: the lack of development experience, insufficient level of programming skills [5]; time limits; difficulties in correlating the course content with the capabilities of WebQuest game environment and planned learning outcomes. Despite the facts that P.-S. Seow, S.-P. Wong specified and described the conditions for training digital school teachers to use mobile applications for educational purposes, T. N. Suvorova, N. I. Isupova identified the conditions for effective organization of WebQuests in the e-learning environment [7], the organizer of game technology is faced with the significant problems:

- the correlation of planned educational results and formed soft skills with the functionality of digital technologies;
- the choice of software that best suits educational and cognitive goals and challenges of modern society and students' needs;
- the designing a game educational space, filling it with interactive game elements appropriate to the mechanics of the quests.

Hypothesis of the research: the design of a escape room for educational purposes based on modern digital technologies will contribute to the formation of students' high-demanded soft skills, if the peculiarities of implementation of the "quest" genre and stages of its game mechanics are taken into account.

The following main tasks have been identified:

- to clarify the essence of the concept of an "escape room" for the educational space of a digital school;
- to supplement the existing system of requirements for the designing and developing of educational quest rooms based on modern digital technologies, taking into account the necessity to form high-demanded soft skills;
- to describe the system for designing of an educational escape room using modern digital technologies;
- to verify the effectiveness of the proposed variant of gamification in education experimentally.

Thus, the aim of the work is to investigate the peculiarities of designing escape rooms on the basis of modern digital technologies to form high-demanded soft skills. Achieving this goal is possible due to the use of digital technologies and their interactive functionality, which support the developing and filling of quest environments for educational purposes. For example, innovative software can be used: Zunal, Power Point, MS Word, AXMA Story Maker, Tikatok, Quandary and others.

Materials and methods

To identify the substance of the quest technology as an organizational form of modern digital educational environment, the analysis of psychological, pedagogical and methodological literature was used. In order to study the potential of educational quest solutions, E. V. Soboleva's conclusions were studied [8]. Program variants of gamification in education and specific learning spaces in the "quest" genre, presented by A. Lagunov and N. Podorojnyak [9], were analyzed. When clarifying the essence of the term "escape room", the assumptions of V. Hill, K. B. Knutzen were taken into consideration. They consider a "quest" as a gaming technology that has significant potential for learning, cognition and personal development [10].

A system-activity approach was used as the main research method [11]. The system of activity is considered in the game environment of the educational escape room, supported by software: the using digital service tools by the master of the game to provide material; the applying technology's functionality by students in cognitive activities; the organization of interaction between students, with the characters of the quest and the game teacher.

The empirical methods (observation, expert evaluation, analysis of game applications and learner performance in relation to the system of soft skills generated) were used to experimentally assess the effectiveness of the proposed approach to the gamification of learning in the genre of escape room. The possibilities of interactive Power Point presentation development tools were used to design an educational space in the "quest" genre.

The senior students of Vyatka State University (Kirov) of specialty 44.03.05 Teacher education (bachelor degree level) were involved in the study. The designing and forming of educational escape rooms using modern digital technologies were organized during Academic Training and Productive Practice for obtaining professional primary. The average age of respondents was 23 years. A total of 48 students (31% of boys and 69% of girls) took part in the experiment. The use of Power Point, as a multimedia technology program, does not require any special software and hardware specifications and allows its combination with other digital services and traditional materials. In addition, the program provides tools for teamwork and individual work in various forms of e-learning, for solving research and application professional tasks. Criterion G was used as a statistical processing method.

Literature review

Currently, the researches to identify the possibilities of modern digital technologies for gamification in education [12]; to describe the essence of quest, its potential and features of inclusion in the learning process of modern school [8] are conducted. For example, D. A. Alexandrov, V. A. Ivanyushina, D. L. Simanovsky [13] point out the need to transform the content, organizational forms, methods and means of teaching in the context of

the formation of digital school. D. Petko, R. Schmid, L. Müller, M. Hielscher [14] identify functions and resources of applications for the formation of special set of knowledge, skills and abilities, which have received the conditional definition as "digital literacy" [11]. V. Hill investigates the acquisition of a special system of knowledge and acquisition of skills, the formation of digital literacy, through remote interaction in the virtual simulator of the medieval world "The Quest" (the project Camelot) [15]. M. H. Abu Warda proves that game platforms and services provide a wide range of educational incentives [16]. E. M. Bonsignore marks that possibilities of digital tools are not limited only to motivating students, but also provide a great number of resources: for working with multimedia content, for timely and "point" hints in cognitive activity, for interaction between participants in digital educational environment [4]. The theory and practice of including digital technologies in educational programs and courses is being actively developed [17]. J. M. Harley, E. G. Poitras, A. Jarrell, M. C. Duffy, S. P. Lajoie study the specifics of the usage of interactive resources in learning, the justification of their significance and didactic solutions are being studied [18]. E. Pechenkina, D. Laurence, G. Oates, D. Eldridge, D. Hunter describe and study the advantages and disadvantages of computer game platforms at school and the range of practical possibilities for personalizing learning are described and methodically studied [19]. The investigation of M. Chang, C. T. Chen, K. H. Wu, P. S. Yu are supplied with the analysis of existing program solutions, their interface and specifics of technological support [3]. The vast majority of the digital tools and applications currently in use are included in the cognitive process only at some specific phase of the activity to solve a certain system of tasks for educational and career guidance purposes, or to develop mental processes: thinking, memory, attention and imagination [20]. Undoubtedly these circumstances do not correspond to the specifics of implementing the quest technology in the learning process [21], the priority areas of variability, and the personality-oriented nature of education and professional training [2]. These reasons significantly reduce the didactic potential of digital applications supporting education quest technology in the context of the digital education environment. F. K. M. Arif, N. Z. Zubir, M. Mohamad, M. M. Yunus as a team of authors and developers of interactive applications with the ability to support the technology of the educational quest with the potential for the formation of high-demanded competencies in modern society, indicate in most cases, in practice there is no broad discussion of the form and content of resources with participants in the digital educational environment [22]. Analyzing the various functions of digital services that stimulate student personality development and support educational and cognitive goals, we conclude that most of these services correspond to the high-demanded competencies of professionals of the future [8]. However, there are practical difficulties in implementing the identified potential opportunities for game-based forms of education, including WebQuest, precisely because of the need for teachers to change the entire methodological system [23]. Indeed, thinking through the goal system must include a stage of reflection and selection of the soft skills that can and should be formed through a didactic process. It is also necessary to improve software tools and teaching methods (digital technologies, interactive resources, game platforms, cloud services). According to V. Hill, K. B. Knutzen [10], a complex of tasks is required to organize the game space of educational space and to orient its content towards both educational purposes and professional self-determination of the student. The designed educational game environment should not only meet the challenges of the priorities of the digital school, but also be personally oriented and responsive to the needs of the quest participants [18].

The analysis of labor market requirements to high-demanded specialists, government requests for the system of training graduates, performed in the paper of V. Grinshkun, E. Bidaybekova, S. Koneva, G. Baidrakhmanova [24], suggests that the activities to identify the level of formation of soft skills include: monitoring of behavior while solving a problem task; open dialogue in the form of direct online communication; psychological tests and cases; and business games. Based on this procedure, it is possible to make a conclusion that the materials and methods used at the stages of designing, developing and protecting of the realized game space of the quest correspond fully to the basic ideas of evaluating of this or that over-professional skill in the process of employment/self-realization of the graduate.

The detailed software tools for implementation of educational quests are analyzed in the work of N. I. Isupova, T. N. Suvorova [7]. These can be both local applications (e.g. Quandary) and online services that allow to create so-called WebQuests (Ribbon Hero, Zunal, Surprise Me, Quester, etc. [25]). A variant of organizing an educational quest is an escape room (or quests of the format "exit the room"). The game world is not only fully adapted to the specific plot, but also each of its content element corresponds to one common story, including thematic tasks.

Research program

The students' research activities on designing educational escape rooms using modern digital technologies (including Power Point tools) were organized during academic training and Productive Practice for obtaining professional primary skills. 48 students (44.03.05 Teacher education, bachelor degree level) were involved. All the participants are the fourth-year students with an average age of 23 years.

During the preparatory stage of the experiment, as part of the control activity, students were proposed to complete a quest presented in the form of a closed space of a unified structure of the data organization in the operating system. All the tasks were placed in the same directory. The first task, the file "Start", contained a description of the educational game, rules and a storyline. Each folder/file contained specific tasks involving the choice of one answer from several suggested ones. Each answer choice is supported by a hyperlink to the new document/resource. The quest consisted of four tasks of an information, law and economic management type. Upon successful completion of the quest, the student received "excellent". When solving three tasks, he was given a "good" mark. The completion of the two levels corresponded to the "satisfactory" mark.

Other teachers, employers' representatives and graduates were invited to carry out an objective analysis of the designed game space, its content, program implementation and correlation of the planned results with the actual ones. Each expert assessed on a scale from 1 to 5 for each competence. Thus, based on the results of project evaluation the participants could score from 0 to 30 points. As noted above, in order to determine the level of soft skills system formation, the criteria have been formulated which allow to correlate the actually obtained knowledge with the planned educational goals, requirements of modern society and the interests of students.

The high level (from 25 to 30 points) was demonstrated by the participants, who planned the system of educational and cognitive activities individually, considered the evaluation and application of the information received; justified the need to take into account the interrelationship between quest stages; made decisions based on the analysis and synthesis

of the software system data; actively, reasonably and rationally used the possibilities of the game environment for information interaction. When transmitting information, students also oriented on the possibilities and needs of other participants of communication; when designing the quest game environment, they used digital tools without errors; the projects were realized technically without mistakes and with the best possible functionality of digital technologies. In addition, the participants, who demonstrated a high level, understood the prospective directions of application of the received project solution, its development; adequately assessed the advantages and disadvantages of its implementation, its result of activity; formulated conclusions and recommendations competently.

The average level (from 13 to 24 points) was shown by students who did not always plan the sequence of educational and cognitive activities and could not objectively and critically evaluate the information obtained for its efficient usage; when justifying the need to take into account the interrelationships between the escape room stages only the most obvious facts; allowed one or two logical mistakes in the analysis and synthesis of the data; unreasonably applied the possibilities of the game environment for information interaction. When designing the quest game environment the participants also used algorithmic constructions/digital tools with one or two non-critical errors; the resulting projects were implemented on a good technical level, but with excessive time and labor resources; they did not always think about the possibilities of applying the resulting project solution, its development; when evaluating the results of their activities they were frequently not objective, but they accepted and corrected the comments of the mentor; they made the right conclusions about the work of the project in general, but they were difficult to understand.

The low level (0 to 12 points) was shown by the students, who could only perform tasks and solve problems under the constant guidance of a mentor; the information received from various sources was practically not criticized, understood, and its application was not justified and most often non-systemic. Also, the transition between the stages of the escape room was not technically realized or worked without taking into account the relationship between the previous and subsequent levels; only one or two requirements of other interaction participants were taken into account when communicating; the algorithm and the program were implemented, but with significant excess efforts; no thought was given to the possibilities of using the resulting project solution. Participants were most often unable to estimate the results of their activities; incorrect work conclusions were made, and corrections were made under the control of the teacher. Students made serious mistakes in formulating and presenting the conclusions.

Research results

In this research we consider the educational quest to be a solution of a learning problem that includes game elements. The system of game elements complements the process of searching information, taking a decisions and performing actions based on the data obtained, which are appropriate for the learning situation. The efficiency of the educational quest is increased by using interactive resources of the information educational environment: digital cards with tasks; tools for "drag-and-drop" objects; music background for correctly/incorrectly completed tasks; QR code scanning; use of a smartphone (or other gadget) etc.

These tools help to maintain motivation, cognitive activity and expand the communication and information interaction by ensuring that such interactive tools are in line with the

students' modern 'clip' way of thinking. The learning content obtained in such a quest is immediately applied in practice, increasing the playing and, consequently, social level of the participant. Today's young people for a greater percentage have the value scale necessarily includes a social hierarchy: the distribution of roles in the class, in everyday communication, in the virtual space and in the game world. The opportunity to improve their game and therefore social position is one of the advantages of the quest, as a technology for the gamification of learning.

We consider an escape room to be a game enclosed space fully adapted to a specific plot. And every single element of which is intended to correspond to one common story, including thematic tasks. The game mechanics of the escape room, which is implemented, for example, in a web resource, on presentation slides or separate files, includes: a cover, an introduction page, a task page, step-by-step instructions, a list of resources, a scores page and a conclusion. The escape room assumes the usage of many interactive automated elements, well-thought-out interiors and many hidden elements. Every next level is opened to players as they go through the quest. Each room is different from the previous one with its own decorations and characters. The most interesting thing happens during the game: the participants interact with each other, with the interiors, with the characters. Players find various artifacts and apply them in a special way, as a result of which secret doors are opened, mechanisms are launched and new theoretical material is acquired. The effect of surprise is an important component of the escape room. Players find various artifacts and apply them in a special way, as a result of which secret doors are opened, mechanisms are launched and new theoretical material is mastered. Educational tasks can be of two types: for searching (to find and attach; to pull, etc.) and logical riddles. The logical riddles provide a storyline component to preserve the quest's legend and meaningful unity.

For an escape room to be truly educational, it is necessary to design the content of the levels as a chain of solutions to non-standard tasks that contribute to the formation of fundamental theoretical knowledge and over-subject skills.

The effective inclusion of digital platforms in the organization of the educational escape room involves: software and hardware support; organizational support, methodological recommendations for teachers, rules for participants, evaluation principles and prizes; a plot; a game space with rules, characters, levels, etc.

The designing an educational escape room includes the following stages:

1. Matching planned educational results, soft skills with the functionality of digital technologies. Selection of a software tool that best suits the educational and cognitive goals, challenges of modern society and the needs of students.
2. Learning the software tool supporting the selected digital technology for the development of escape room: purpose, functionality, interface, features of implementation. Applying the content that has been studied for solving traditional learning tasks.
3. Formulation of a plot for an escape room, filling the game world, grading of tasks and transition to levels, distribution of roles, a system of points and rewards.
4. Development of an algorithm, a program for the implementation of escape room by means of the studied technology.
5. Correlation of the actual knowledge and soft skills with the planned educational goals, requirements of modern society and the interests of students. Assessment of the social significance and impact of the work on professional definition and development.

The aim of the research is the practical implementation of the features described above in the use of the escape room for the digital school education space. The peculiarity of the methodological solution is that the educational content of the escape room (the selection of the system of tasks, teaching materials, subject and personal results) can be selected by each teacher according to the specifics of class. It is possible because through the designing of the escape room every teacher can take into account the development of general subject skills and competencies. In other words, it can be seen as a game scheme or a world that can be filled with any characters. The levels of differentiation, recommendations and rules of quest remain the same.

In order to carry out the declared design of escape room, the first stage of the work included defining a system of soft skills, the development of which could be effectively implemented in the learning process. For this purpose, the requirements of potential employers for professions of the future both with the state requirements to the system of training graduates were analyzed. The following soft skills were selected in the course of relevant analytical activities: Communication and communication skills; Critical thinking; Customer focus; Project, people and self-management; Problem solving skills; Computer and technical literacy; Working in the uncertainty mode; Lean production and environmental thinking; Self-analysis and self-reflection. Subsequently they were grouped by the organizers of the web-quest into six competences: System Thinking, Algorithmization /Programming; Decision Making Ability in Uncertainty; Communication; Self-examination/Self Reflection; Project, people and self-management.

The proposed approach is described using the example of the application in the genre of escape room - "The Traveler's Terem". In Ancient Russia terem is a living accommodation in the upper part of the house or a tower-shaped house. The didactic component is presented in the form of a game educational space that supports interactivity and individual educational path. This capability is provided by a system of differential tasks. Each level has a particular content defined by the specifics of learning in a digital school. The choice of the software component is left to the teachers. In this study we used Power Point with its interactive features (triggers, animation) as the easiest for learning and practical application.

The idea of the quest: a group of 12 travelers (the number of participants is determined by the number of students) finds a half abandoned wooden terem. Methodical recommendation: the quest can be designed also on the basis of students' independent choice. In this case, the stylistic features of the presentation and perception of information (text, graphical, tabular forms) of students will be taken into account.

The Terem was very large, so travelers decided to split up and cast lots. To draw lots, they used the method "Guess the number". If the number is divided into three, then the participant joined the group, which goes through the downstairs door. If the number divided by three gives the remainder equal to two, the traveler will be in through the window. In the last variant - participant goes through the door in the second floor. Methodical recommendation: for splitting it is convenient to use a random number generator and the components for processing text messages. Depending on the number of participants and the number of groups, the algorithm can be easily corrected. Participants send the number with a message, or enter it into a text window for splitting.

Usually the Captain makes the decision, so each group should solve a mini-task to choose a leader: to count the average age, to determine the oldest one, etc. Methodical recommendation: for choosing a Captain, use a task for which all participants should know the initial data. Doing this task students activate the information interaction within the group.

When the Captain gets in, he meets the Ancient. He says that the treasure is hidden in the Terem, but he can't find it alone. The captain needs to decide whether the group will go to look for the treasure or not. Methodical recommendation: be sure to include into quest tasks, where participants make responsible decisions, make a choice. In this case, the over-professional competence - the ability to make decisions in conditions of uncertainty - is shown. If the Captain decides not to search, all the participants move in the virtual world of the quest in front of the house. If the group goes with the Ancient, the Terem offers them to pass the first test.

The task of the first level. The Terem was built in the year when Johann Gutenberg invented book printing. There are antique frescoes on the walls and participants should determine the fresco on which the inventor is depicted. The captain realizes the group's choice and clicks on the corresponding image. If the answer is right, an entrance is opened under the fresco. A Bird-talker sits in it and proposes the second level task. For example, a mystery: "A study of information processes is the second part of our performance. Here is the second task: storage, processing and...". The participants of the group have to finish the sentence (answer: data pass), thus guessing the riddle. If the answer is right, the group will receive the link to the second task. When they follow the link, a wooden figure of a Dog with a collar appears. Her task is an extension of the second level. "All your files are saved. And it does not bark or bite. Synchronizes, minimizes risk. It may be Google, or may be Yandex...". The group members have to complete the sentence (answer: disc), thus guessing the riddle. If the answer is right, the group opens the collar, and the Captain opens the new door. Methodological recommendation: At this level, the communication skills tasks should be used so that the group can communicate and interact to bring the team together, to prepare for more complex stages.

The next secret niche is closed with a code lock. The second level task is to calculate the information volume of the text in the first riddle. The result should be given in bytes and then should be decoded into a binary number system. Modification variant: For the first letters of each line of the second riddle, write out the values in the ASCII code table. The captain enters the resulting sequence as a code without spaces. Methodical recommendation: use system thinking tasks at this level, managing by the group as a team. This type of activity allows each participant to prove himself, while at the same time the result of each one determines the success for the whole group. In other words, the team works as a system.

Then the travelers meet the Tin Woodman which is managed by the program. The participants are required to perform the same operations of the algorithm by means and capabilities of digital technologies (programming language). Methodological advice: tasks for developing algorithmic skills, programming skills better to use at the last levels of the quest. The necessity to implement the algorithm technically causes difficulties and negative attitudes for most students. Such emotional experiences can have a negative impact on the group's interaction if such a task is placed in the content of the first level.

The path for the participants is then blocked by a wall depicting a large calendar of the current year and month, in which the ancient asks participants to indicate the current time, their time-presence in the Terem, the event held in the calendar. The difficulty is to specify the time in various international standards, in various watch formats (AM and PM). Methodological recommendation: one of the levels of the quest should include multi-language tasks so that learners develop this over-professional skill as well. Next, a joystick appears from the wall and when you click on it, you reach a large meadow. A table with food, friends of travelers may be presented on the glade (the main treasure is communication

with family and friends); there may be a portal at another time for a new journey (the main treasure is new horizons); there may be certificates in a cafe, bookstore, gym, etc. Methodological recommendation: the last level of the quest must take into account the needs and cognitive interests of the learners in order to consolidate the positive effect of the activity.

After leaving the escape room, the master of the game should organize the reflexing. For example, using the quest chat to write a letter to the Ancient, to the Bird-Talker, to the Dog, to the Tin Woodman or other travelers. In the chat, the participants should list their comments, wishes, emotions, impressions, etc. Be sure to indicate what caused the difficulties and to mention new getting knowledge. Methodological recommendation for the idea of the quest: an important condition for the effectiveness of the given series of educational and cognitive tasks is to correlate the content of each level in the game application with the professional preferences and needs of students. Without taking this factor into account, it is impossible to offer students really meaningful tasks (for socialization, for professional development). It can be realized through differentiation in project options for independent research activities. For example, in a project for a student who is fond of graphics, art illustration, modeling, each task can be designed as a "puzzle", "pixel" or a mechanical element. Doing the tasks of the escape room a participant collects the parts of an image, a model. As an option to complicate the level, the student can only be offered a part of the tasks, which will provide a graphic fragment. To identify and enter in the text field the name of the whole object (e.g. a robot vacuum cleaner, a globe, a picture's name) - this task is for the participant of the escape room.

At the fixing stage of the experiment, the repeated measurement was performed. An educational quest was required as a credit task. The essence of the test assignment: a player/team had to open a door with a code lock to get out of the room. Receiving a sequence of four digits for a code occurs during the execution of tasks. To test the effectiveness of the proposed approach, a G-sign criterion has been used to evaluate the random/non-random nature of the changes in the skills and abilities being formed. The measurement results before and after the experiment are presented in Table 1.

Table 1

Test results before and after the experiment

№	The mark before the experiment	The mark after the experiment	Shift	№	The mark before the experiment	The mark after the experiment	Shift
1	2	3	+1	25	4	5	+1
2	3	4	+1	26	4	5	+1
3	3	4	+1	27	4	5	+1
4	2	2	0	28	4	5	+1
5	4	5	+1	29	4	3	-1
6	5	4	-1	30	4	5	+1
7	2	3	+1	31	2	2	0
8	3	4	+1	32	4	5	+1
9	3	4	+1	33	4	5	+1
10	2	2	0	34	4	5	+1
11	3	4	+1	35	4	5	+1
12	3	4	+1	36	2	2	0
13	3	4	+1	37	4	5	+1

14	3	4	+1	38	4	5	+1
15	3	4	+1	39	5	4	-1
16	3	4	+1	40	3	4	+1
17	5	5	0	41	3	4	+1
18	2	2	0	42	2	2	0
19	5	5	0	43	3	4	+1
20	4	5	+1	44	3	4	+1
21	5	5	0	45	3	4	+1
22	4	5	+1	46	3	4	+1
23	4	5	+1	47	3	4	+1
24	2	2	0	48	2	2	0

According to the table, we have 11 "zero" (discarded shifts), 34 "positive" (typical shifts), 3 negative (atypical) shifts. The calculation was made using special tables. Let us formulate a hypothesis:

H_0 : the shift in improving the quality of learning outcomes after gamification in the escape room format is random.

H_1 : the shift in improving the quality of learning outcomes after gamification in the escape room format is not random.

Analyzing the values from the table of G signs, we find that for $n = 34$ (by the number of "typical" shifts) and the calculated $G_{emp} = 3$, the following is true: $G_{emp} = 3 < G_{cr} = 9$ (for $p = 0.01$) and $G_{emp} = 3 < G_{cr} = 11$ (for $p = 0.05$). Since $G_{emp} < G_{cr}$, the hypothesis tends to be alternative to the H_1 hypothesis, i.e. a shift towards improved learning outcomes after gamification in the escape room format, can be considered non-random.

Discussion

In order to analyze the data obtained in the expert evaluation, a summary of all points awarded for each competence has been determined. For visualization and interpretation, the results of the expert evaluation are presented graphically in Figure 1.

In the analysis of the presented results, we conclude that the greatest increase in the level of "high" and "average" occurred for "Decision-making skills under uncertainty" and "Self-reflection/self-analysis". This is due to the fact that, in the environment of the quest, cognitive activity requires participants to be able to work under conditions of a diverse future, assess the result of a decision and make adjustments to the track of the game world. The least qualitative changes are observed in the soft skills "Algorithmization / Programming" and "Systemic Thinking". Such results are also objective, as the development of these competencies requires more detailed work. This is due to the fact that, in the environment of the quest, cognitive activity requires participants to be able to work under conditions of a diverse future, assess the result of a decision and make adjustments to the track of the game world. The least qualitative changes are observed in the soft skills "Algorithmization / Programming" and "Systemic Thinking". Such results are also objective, because the development of relevant competencies requires longer and more focused training. In analyzing the development of communication skills, we note a significant increase at all levels, especially for "low". This confirms the fact that interaction in the virtual game environment corresponds to the psychological characteristics of digital schools' students.

Figure 1 Dynamics of levels for each of the selected soft skills

In summary, the use of digital resources with the ability to support the escape room provides an environment conducive to solving tasks important for a modern digital education system. However, there is a range of obstacles that teachers may face if they wish to use the escape room technology: the lack of technical training; the preferring the traditional way of organizing the quest; teacher's negative attitude towards digital applications as a "distraction"; the problem of devoting time to prepare and to realize quests, etc. To ensure the integrity of the educational and cognitive process, it is necessary both to apply the technology of the escape room based on software, and to combine it with traditional methods and forms of digital school education.

Conclusion

A significant result of this research is the description of the basic ideas of the approach that expands understanding of V. Hill, K. B. Knutzen [10] about the peculiarities of organizing an educational quest in the context of digital school priorities. The changes are presented on the example of the didactic, methodological components. The didactic component assumes that the designing of the escape room should be preceded by a system of planned educational and personal results and over-subject competencies. The development of a game story, reasonable choice of software and hardware support, and correlation of the emotional and psychological component with content of the game educational space are the important methodological stages in planning the escape room and corresponds to the conclusions of E. V. Soboleva [8]. The study justifies the possibility and effectiveness of using the escape room as a technology to stimulate students' cognitive interest, satisfying their

requirements and aspirations in choosing future professions and improving the quality of the didactic process as a whole. The authors describe the features of this method in the conditions of a digital school. The problems of including technology in the educational and cognitive process are pointed out separately: when choosing applications and technologies, a digital school mentor should know the definitions of the area and variety of games with teaching content. The teacher should be familiar with the methods of designing, developing and evaluating creative project forms of activity.

The significant result of this study is the completion of the system of principles by A. Lagunov, N. Podorojnyak [9] for designing the quest environment: to choose the format; to make the story entertaining and relevant to the students' needs; to prepare doubtful sources and sites with incorrect data; to prepare a list of reliable sources; to envisage tasks assuming a critical attitude to the selected information and group work; not to be limited to network resources only; to involve experts; the formulation of the task should assume the only one correct interpretation; the logical conclusion and the exit from the space of the escape room should be compulsory.

The effectiveness of the educational escape room has been tested as part of the pedagogical experiment, taking into account the characteristics for improving the quality of the learning process and creating a system of high-demanded soft skills. The results obtained in the course of the study can be used in gamification of the educational process in a digital school, but also to support cognitive research activities of students. The inclusion of the findings in the school's mentoring practice should be mentioned as a priority area for developing the conclusions formulated. In addition, game scenarios (task differentiation, content, relationship between levels) can be used to design a personalized educational environment with gamification elements.

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