

The Application of Quest Technologies in Teaching Students of IT Specialties

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Abstract: The quest is analyzed as an innovative learning method that provides the development of creativity, cognitive flexibility, emotional intelligence of a person and meets teamwork that is especially important for IT professionals. The components and stages of quest-technology application are described. It is noted that the quest, in addition to the knowledge gained, gives students an understanding of the processes of group dynamics, behavioral patterns in the system of interpersonal relations. A quest-plan that has been developed can be used as a template for building quests. The example of components of the developed quest for students of the specialty Software Engineering with the specified features of each component is given. The proposed example can be used as a recommendation for constructing quests.

Keywords: quest; teamwork; group dynamic, software engineering; quest plan; information technologies

I. INTRODUCTION

Requirements for the provision of educational services by higher education institutions should be based on the needs of the economy and society. Education is a rather conservative industry, and the impact of new trends, technologies is not fast and productive. One of the priorities of the modern education system is the search for new types and forms of organization of educational activities. The use of innovative teaching methods allows us to correct the situation of inconsistency of the learning outcomes with the expected requirements, and make the necessary changes flexibly to provide the necessary competencies for students.

The general trend in modern production is the automation of clearly defined works, which can be formalized for the performance of machines, however creativity is not yet present in artificial intelligence. Making decisions and responding to a quick change of conditions remain for the person, and creative approach can help to choose the best option for the case.

In 2016, the World Economic Forum in Davos has identified criteria that will be important for a successful specialist in 2020: complex problem solving, critical thinking, creativity, people management, coordination with others, emotional intelligence, judgment and decision-making, service orientation, negotiation, cognitive flexibility, active listening, quality control

cognitive flexibility [1, 2]. Compared to 2015, new criteria – emotional intelligence and cognitive flexibility – appear for 2020, and the highest importance of creativity was identified in 2015 and 2020 (Fig.1).

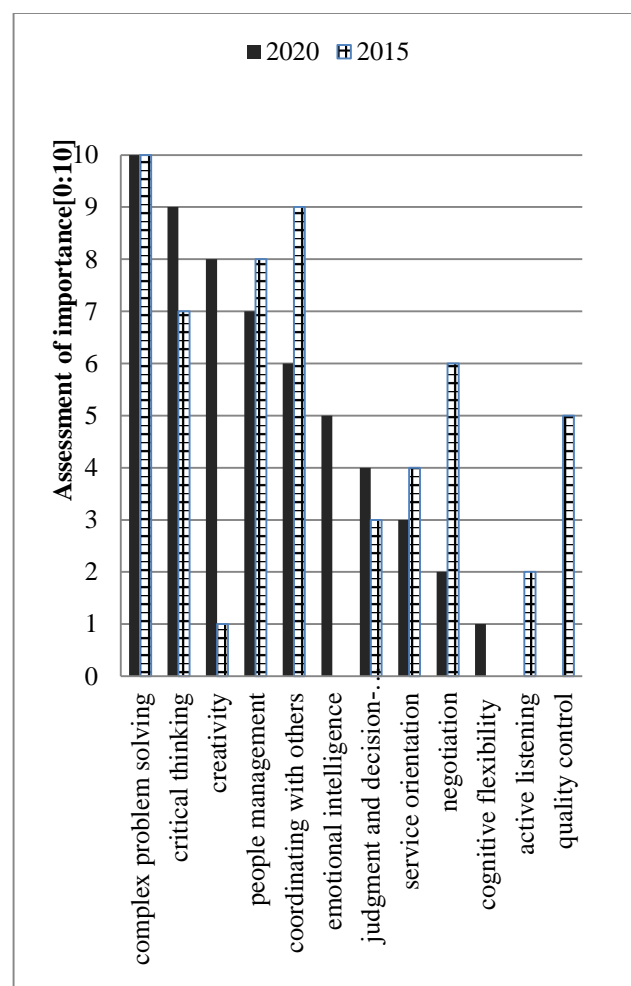


Fig.1. Modern skills of a successful specialist

Emotional intelligence – a group of mental abilities that are involved in recognizing and understanding own emotions and the emotions of others. Persons, who tend to have a high emotional intelligence level are well aware of their emotions and emotions of others, can effectively manage their emotional sphere. Therefore, in society, their behavior is more adaptive and it is easier for them to achieve their goals in interaction with others. Emotional intelligence refers to soft skills, which are defined as a complex of non-specialized, super-professional skills

important for a career, responsible for successful participation in the work process, high performance and not related to a specific subject area [3,4].

Cognitive flexibility – mental ability to switch from one thought to another, and process several things at once. Related terms are cognitive flexibility, mental flexibility, changing attitudes, cognitive switching, attention switching. Cognitive flexibility describes the ability to adapt thinking or attention in response to changing goals and / or external incentives.

The driving force behind the creation of innovative services and products is well-trained creative staff.

Most of the studies, conducted in the field of studying the creative possibilities of a person, are focused on studying the influence of the external environment on the formation of creativity. The results of the research carried out by Torean E. regarding the formation of creativity indicate that the development of creativity is not determined genetically, but depends on the influence of the environment; the decline in creativity can be overcome at any age by different learning methods [5,6].

The necessity of forming creative abilities, creativity of the personnel becomes especially important for the innovative development of the enterprise, its competitiveness. Enterprises will be able to compete with each other only when the creative potential of employees is rather high and then will be able to manage it to regularly offer the innovative product to market with the highest demand for it.

II. ANALYSIS AND PROBLEM STATEMENT

The question arises whether education can provide future specialists with acquisition and development of skills of emotional intelligence, cognitive flexibility and creativity.

In IT, in the background of high-tech knowledge, the need for commutative and creative abilities of specialists is particularly acute. The opinion of leading experts in the field of Software Engineering is that the key task of Software Engineering is not only the use of technology, but the combination of technological knowledge, people and processes to achieve the business goals of the organization. There are qualities that are not taught by any artificial intelligence. Leadership is formed only in the process of interaction in the team, as well as the skills of effective communication, emotional intelligence.

Since the mid-90s of the last century, there has been a change of the direction in the educational process – the transition to a personally oriented learning that determined the changes in the nature of the object and the learning process, as well as the features of the interaction between the teacher and the student. In place of the subject-object interaction between the teacher and the student comes the subject-subject, characterized by partner cooperation in solving educational tasks.

This change in orientation corresponds to the words of Confucius (Confuzius): - Tell me and I forget! Show me and I'll understand! Make me do something and I'll learn!

The use of quest technologies in teaching IT students is offered to solve specified problems. Quest is an amateur sports and intellectual competition, based on the consistent execution of predefined tasks by teams or individual players. Quest is a term that has gained popularity as a fun new entertainment for adults and children. In the simplest case, the quest will be considered a set of interesting tasks, the completion of which ends in a significant result in the form of a reward (key from the room, prize, etc.). For the first time, web quest technology was developed at the University of San Diego (USA) in 1995 by research professors Bernie Dodge and Tom March to effectively organize the use of student time and focus its efforts on working with information rather than on its search [7-9].

Quest technology helps the student to find the necessary information, analyze, organize and structure it, develop cognitive activity and form the key competency of the student. Quest is a form of person-oriented learning. Person-oriented learning is characterized by student activity, especially their interest in new information, interactivity with the teacher. Teacher is viewed not only as source of knowledge, but also as an organizer of the process of learning. Internet resources are a large data warehouse, but it is necessary to learn, select and organize this information and use it on practice [8- 12].

The group quest format corresponds to team work and requires consolidation, combining of all possible and necessary resources, then merging into one knowledge, skills, emotions, actions. Employers in the field of IT indicate a low level of commutative skills of specialists, which is an aftermath of not paying attention to their development in the learning process.

It is known that the purpose of using the quest in the learning process is:

- diversification of the educational process,
- increasing activity of cognitive activity,
- systematization and generalization of the received knowledge.

Quest as a teaching method has been described since the late 90s of the last century by many experts [7-14]. However, it is mostly depicted as a helping educational tool in the schools. The adaptation of the quest is not considered particularly for certain student specialty and there is no emphasis on the teamwork. These are exactly the problems which are discussed in this work.

It is important to note that one of the disadvantage of quests is the need for IT knowledge for their participants. In the case of IT students, such a disadvantage is irrelevant. Another major disadvantage of using quests in the learning process is the cost of preparing quests. The

solution proposed by the authors in the form of a quest-plan can reduce the complexity of the quest organization processes and save time on its preparation.

III. PROPOSED SOLUTION

It is proposed to define quest technology for the needs of IT education as a form of learning that allows for teamwork and group dynamics processes to be taken into account, focusing students on the development of creativity, cognitive flexibility and emotional intelligence.

Team work and group dynamics. The essence of the balanced team is that each member plays a unique role. If the teamwork is properly constructed, team members can achieve better results than the sum of their individual achievements. Target roles are distributed in a way that enables selection and performance of the group tasks. The target roles are such as "head", "generator of ideas", "communicator-extractor of information", "skeptic-analyst", "controller-finisher" [15,16]. The group form of the quest provides the acquisition of elementary teamwork skills – planning, distribution of functions between team members, mutual assistance, mutual control. Also, there is the development of interpersonal relationships of participants in quests within the team. All this relates to a team-wide task solution that is necessary when passing quests.

Creativity. As a rule, the traditional performance of individual work during training reduces the reproduction of the information received in standard form. In this case, little attention is paid to the research activity. Same scenarios for implementing the quest as a result of the participants' freedom of action and the spontaneity of the plot's development make the quest a unique and creative activity. Quest in game form develops a creative approach. Experimentation and self-knowledge that occur during the quest, promote creativity. Research, analysis, synthesis – a triad that is necessary for solving problems in quests. The ability to analyze and synthesize, rather than just search for information, is essential for quest participants.

Cognitive Flexibility. It is the ability to rely on the imagination as well as logic, to generate and combine different ideas, willingness to experiment, tolerance for loss. The need for flexible thinking arises when circumstances are not typical and prone to changes. The quest allows to train the flexibility of thinking, get rid of stereotyped patterns of finding answers, focus on the consideration of tasks from different points of view.

Emotional intelligence. During the application of quest-technologies, students undergo a complete cycle of motivation from attention to pleasure. Quest combines methods of brainstorming, discussion, games. In this case, the necessary conditions for the application of these methods are tolerance, the ability to defend own views, the mobilization of personal resources. The quest allows to motivate the student's emotional activity.

Consequently, the quest meets the above requirements. It is suggested using IT (webquest) in combination with live communication in team work. The structure of the quest technology is determined by the components (Fig. 2).

It is worthwhile to distinguish the following stages of quest technology application:

Planning a quest. It is supposed to determine the solutions for the components of the quest-technology by the template (Table I). Quest plan is a document that describes the entire scope of work, ranging from the topic, the necessary equipment, special knowledge of participants to the criteria of evaluation.

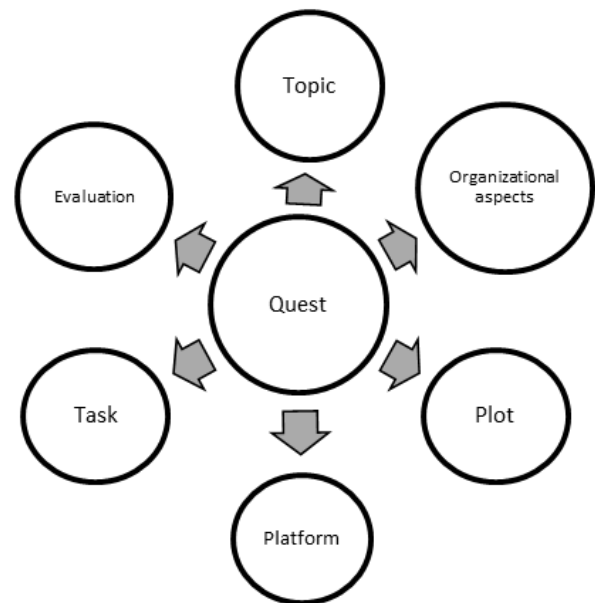


Fig. 2. The components of quest technology in learning

Development of tasks. It is aimed at checking already acquired knowledge and gaining new knowledge. Objectives are formed unambiguously, focused not only on the search for information, but also on its analysis and generation responses, based on these. For formation of tasks use QR-codes, clouds of words, specialized services.

Conducting a quest. Practical implementation according to the quest plan.

Evaluation. It concerns the summing up, the evaluation of both the quest participants and the quest itself. The evaluation of the participants takes place according to the criteria previously defined. Assessment of the quest provides feedback, which makes it possible to improve the quest.

Quest plan that has been developed allows formalization of the quest preparation. As a result, this leads to a reduction in the time required for the implementation of the preparatory phase in the application of quest technologies.

IV. EXAMPLE OF COMPONENTS OF DEVELOPED QUEST

A quest for students of the Software Engineering specialty for studying the topic "Elements of the UML Language" has been developed. The purpose of the first lessons is to study the symbols and terms of the graphic language, through which create different models of software for displaying architectural views [17, 18]. The primary task of the quest is to activate the cognitive activity of the students due to the interest that arises

during the passing of the game plots. In addition, students acquire the simplest commanding skills.

The short storyline design is the journey of adventure seekers to an unknown UML country, where chimeras create obstacles. Each chimera symbolizes a typical student error when learning UML. To get to the country you need to get a visa once the first problem was solved. Then adventurers should learn about the history, architecture, culture UML through performing the following tasks. The result of the journey is knowledge and souvenirs.

TABLE I. QUEST PLAN

Component of quest technology	Content
Topic	The subject of a discipline that is technical, strictly formalized, without the elements of creativity, in studying which is difficult. Students do not show interest, focusing mostly on memorizing.
Organizational aspects	Audience with the necessary equipment. The team is the number of people. Necessary knowledge and ability to perform tasks. Duration. Number of tasks. Auxiliary materials – files on a computer, books, drawings. How to get a work. The method of answer.
Plot	Game character. Advantage is given to universal subjects – the search for treasures, the exit from the labyrinths, adventure travel and obstacles.
Platform	A combination of classroom and web technology. Mini-projects for finding information using Internet and acquired knowledge. Not just the use of a computer, but also obligatory live communication, the development of joint decisions, the development of oral communication.
Task	Task sequence – successful script: task analysis, role distribution, information search, analysis of the received information, development of a single solution; alternative scenario - in case of unsuccessful performance of the task for a certain period of time receiving the cards taking into account penalty points.
Criteria for evaluation	External and internal (evaluation of each participant to other participants and themselves as well).

An example of one of the tasks is a task that is formed based on a cloud of words. From this cloud, you need to select synonyms for the UML name. There are many available services for constructing a cloud of words that the teacher can use [19, 20]. Moreover, the task of this type can have many options that will not prevent pursue the quest for multiple teams at the same time. The cloud is placed on a computer in a folder whose name needs to be recognized by completing an additional task. For example, the latest version of the UML language, the first year of the binary code, etc. The answer method is to send a phrasing to the electronic mailbox that is the answer to the job.

The teacher and the participants of the quest carry out the assessment both by themselves and by other members of the team (TABLE II). To do this, we suggest using Google forms.

Score: 0 - very bad, 1 - many mistakes, 2 - good, but there are remarks, 3 - very good.

To prepare and conduct a quest, it is suggested that the following available IT tools should be used:

1. Service for constructing a cloud of words (tags);
2. Internet searching engine;

3. *Google-forms*;
4. *Word processor*;
5. *UML-editor*;
6. *E-mail service*.

TABLE II. SELF- AND MUTUAL ASSESSMENT

Criterion Assessment	Assessment task N
Understanding the task	{0, 1, 2, 3}
Initial knowledge on the topic	{0, 1, 2, 3}
Search for information	{0, 1, 2, 3}
Analysis of information for the answer	{0, 1, 2, 3}
Contribution to the team result	{0, 1, 2, 3}

An alternative to free services is a multifunctional web quest designer, for example zunal [21], an external one that allows you to arrange some tasks within the quest. These types of tools are used only at small levels (e. g., zunal is available for one use).

V. CONCLUSIONS AND PROPOSALS

Quest is a modern and promising component of the active teaching of IT students. The use of the quest increases the motivation of students to study various topics, promotes not just the search for information on the Internet, but also teaches to generalize, specify information, draw conclusions. Participants have the opportunity to use the information space of the Internet to expand their creative and professional activities.

1. The quest has been substantiated as an active form of teaching students of the IT specialty, which allows development of teamwork skills, understanding of group dynamics processes, development of creativity, cognitive flexibility and emotional intelligence.

2. It is proposed to combine a webquest alongside with traditional classroom tasks. Advantage of such method lies in the establishment of teamwork and understanding the group dynamics, which is important for IT professionals.

3. Suggested quest-plan adapted for IT students reduces the time spent on preparation for a quest.

4. Here is presented an example of the quest components developed for students of the first year of the specialty Software Engineering.

REFERENCES

1. "Work in 2020", Available at: <http://21daystory.com/work-in-2020/>
2. **Beckford A.** The Skills You Need To Succeed In 2020. Available at: <https://www.forbes.com/sites/gradsoflife/2019/03/19/the-1-mentality-how-it-can-close-the-gender-and-race-gap/#2e227c943474>
3. **Smith M. K. 2002.** Howard Gardner and multiple intelligences. The Encyclopedia of Informal Education, Available at: <http://www.infed.org/thinkers/gardner.htm>.
4. **Laura H. Lippman, Renee Ryberg, Rachel Carney, Kristin A. Moore, 2015.** Workforce connections: Key soft skills that foster youth workforce success. Child Trends Publication, 2015.
5. **Scott W. A., 1962.** Cognitive complexity and cognitive flexibility. American Sociological Association, vol. 25: 405-414.
6. **Mlodinow L. 2018.** Elastic: Flexible Thinking in a Constantly Changing World. Kindle Edition, Allen Lane (20 Mar. 2018), 272 p.
7. **Dodge B.** Rethinking the WebQuest Taskonomy: A New Taxonomy of Authentic Constructivist Tasks. Available at: <http://www.webquest.org/act/tappedin.htm>.
8. **Dodge B. 1995.** Some Thoughts About WebQuests. Available at: <http://www.Distance-Educator.com>.
9. **March T.** Criteria for Assessing Best WebQuests. Available at: <http://www.bestwebquests.com/bwq/matrix.asp>
10. **Sokol I. M. 2014.** Conceptual content concept "quest". Pedagogy of the formation of a creative person in higher and secondary schools, Zaporozhia: KPU, 2014, vol. 37: 366-373, [in Ukrainian].
11. **Sokol I. 2014.** Quest: metod or technology? Scientific and methodological journal "Computer at school and family". 28-32, [in Ukrainian].
12. **Pradeep R. Vanguri, Cynthia Szymanski Sunal, Elizabeth K. Wilson, Vivian H. Wright.** WebQuests in Social Studies Education. Journal of Interactive Online Learning, Available at: <http://www.ncolr.org/issues/jiol/v3/n2/webquests-in-social-studies-education.html>.
13. **Kademiya M. 2016.** Web-quest technology in students' learning. Modern information technologies and innovative methods of education in preparation of professionals: methodology, theory, experience, problems, Collection of scientific works, ed.45, Kyiv-Vinnycia: 214-219, [in Ukrainian].
14. "WebQuests Explanation. Concept to Classroom Workshop: Webquests. Educational broadcasting Corporation", Available at: <https://www.thirteen.org/edonline/concept2class/webquests/index.html>.

15. **Forsyth, D. R. 2006.** Group dynamics. Belmont, CA: Wadsworth.
16. The Nine Belbin Team Roles, Available at: <https://www.belbin.com/about/belbin-team-roles>.
17. **Ivar Jacobson, James Rumbaugh, Grady Booch. 2005.** Unified Modeling Language: User Guide. The Second Edition, 2005.
18. Welcome To UML Web Site! Available at: <https://www.uml.org/>
19. Wordle. Available at: <http://www.wordle.net/>
20. WordArt. Available at: <http://www.wordArt.com/>
21. Welcome to Zunal.Com. Available at: <http://zunal.com/>