CHAPTER 2
INNOVATIONS IN THE MANAGEMENT OF EDUCATIONAL INSTITUTIONS

WEB QUEST TECHNOLOGY AS A TOOL FOR THE FORMATION OF IT COMPETENCE OF EDUCATION SEEKERS IN PHYSICS CLASSES

Yulia Reshitnyk[1], Serhii Stetsyk[2], Yevhenia Ivanchenko[3]

[1]*Ph.D. on Physical and Mathematical Sciences , Associate Professor , Associate Professor at the Physics and Natural Sciences Integrative Learning Technologies Department; Pavlo Tychyna Uman State Pedagogical University, Uman, Ukraine , e- mail : dikhtiarenko_iu@udpu.edu.ua, ORCID: https://orcid.org/0000-0002-7937-2880*

[2]*PhD of Pedagogical Sciences, Associate Professor, Associate Professor at the Department of Computer and Software Engineering; Dragomanov Ukrainian State University, Kyiv, Ukraine, e-mail: s.p.stetsyk@udu.edu.ua, ORCID: https://orcid.org/0000-0002-5668-6182*

[3]*Master of education program Secondary Education (Natural Sciences), Pavlo Tychyna Uman State Pedagogical University, Uman, Ukraine, e- mail: yevheniia.ivanchenko@udpu.edu.ua*

Citation:
Reshitnyk, Y., Stetsyk, S., & Ivanchenko, Y. (2024). WEB QUEST TECHNOLOGY AS A TOOL FOR THE FORMATION OF IT COMPETENCE OF EDUCATION SEEKERS IN PHYSICS CLASSES. *Pedagogy and Education Management Review*, (1(15), 17–24. https://doi.org/10.36690/2733-2039-2024-1-17

Received: February 27, 2024
Approved: March 29, 2024
Published: March 30, 2024

Abstract. *The article reveals the relevance and peculiarities of the application of the "Web Quest" technology in the educational process of general secondary education institutions. The main goal of the research consists in improving the methodical system of competence- oriented teaching of physics based on the "Web-Quest" technology. During the research, the methods of comparative analysis, graphical display of results, visualization method, method of systematization, method of processing survey results and method of summarizing research results were used. A key aspect of this technology is the consideration of students as equal co-participants in the educational process, which involves a mutual relationship where the teacher and students together make decisions, determine goals and methods of achieving educational results. An analysis of the latest research is provided, which testifies to the effectiveness of using the "Web-Quest" technology for the formation of information and digital competence of students, increasing students' interest in the subject, developing critical thinking and independence. An example of the use of an educational web quest in physics on the topic "The influence of a magnetic field on living organisms" is given. The stages of students' work on tasks are revealed. R is elaborated methodical tips for teachers of features designing lessons in physics by application educational Web quest.*

Keyword: *Web-quest, competence approach, education seekers, physic, Google sites, Learningapps, Canva.*

JEL Classification: I 23, I 29

Formulas: 0; fig.: 4; tabl.: 2; bibl.: 12

Introduction. The implementation of the competency-based approach in general secondary education institutions of Ukraine has acquired the status of a normative requirement and has become one of the directions for the modernization of general secondary education. During the years of Ukraine's independence, a number of laws and government regulations were adopted in the field of educational legislation, which became the basis for the development and implementation of the modern content of education. The use of innovative learning technologies brought the competency-based approach to a qualitatively new level of development in accordance with European educational standards and led to the transfer of the competency-based idea to the level of mandatory regulatory implementation.

The expediency of the competence approach in modern physical education was investigated by researchers who substantiated that the competence approach has an effective effect on the transition from the cognitive paradigm of education to the activity one, which is oriented towards more relevant and necessary learning results in life.

One of the tasks of implementing a competency-based approach in school physical science education is the development of key competencies of students, the formation of new ways of thinking and activity in them.

During the tasks of the web quest, students develop critical thinking, solve complex problems based on the analysis of information collected by themselves, consider alternative views, make decisions independently and defend their point of view when presenting the results of their work (presentation, website, video clip etc.). Participants of the web quest not only search for information on the Internet, but also learn to effectively use the information space of the network for the development of their creative activities. The web quest provides an opportunity to diversify the educational process, make it more effective and exciting.

The founders of the "Web-quest" technology, B. Dodge and T. March, define it as a reference-oriented research activity, as a result of which students search for information using Internet resources and video conferences.

According to V. Schmidt, web quests are mini-projects based on searching for information on the Internet. Thanks to such a constructive approach to learning, students not only select and organize information obtained from the Internet, but also direct their own activity to the task set before them, related to their future profession.

B. Grudinin defines educational web quest as Internet search , purpose whose is training , that is receiving new ones knowledge , consolidation available knowledge , consolidation skills use network Internet and others subject skills.

According to N. Mentova, this is the e-quest problematic tasks with elements role games.

Modern researchers focus on the fact that the web quest is an innovative resource-oriented learning technology, the main goal of which is the independent search by students of information necessary for learning. The use of this technology has a motivating and stimulating effect on students, ensures the formation of information and digital competence in them, provides for the acquisition of experience in search

activity, expansion of horizons, development of creative potential, processing of large volumes of information, its analysis, systematization and further presentation.

Aims. The main goal of the research consists in improving the methodical system of competence- oriented teaching of physics based on the "Web-Quest" technology.

Methodology. During the research, the methods of comparative analysis, graphical display of results, visualization method, method of systematization, method of processing survey results and method of summarizing research results were used.

Results. We consider the physics "web quest" as an online learning technology that integrates innovative educational technologies (problem-based, research-based learning, game and project-based learning) with information and communication technologies and allows students to effectively use information found on the Internet independently in learning physics.

For these types of projects, but there are also tasks that students need to complete individually. Also, the topic of physical "web quests" can be diverse and should show signs of problems. Oral speeches, essays , web pages, web animations, etc. presented by the winners are the final product of the specified online technology .

Like any educational technology, the researched "web quest" technology is characterized by a logical structure and reveals the following components:

– "Introduction" (brief description and name of the quest);
– "Quest task" (formulation of a problem-oriented task and description of the final product);
– "Algorithm of work and necessary resources" (description of the sequence of actions, roles and resources necessary for completing quest tasks, supporting materials);
– "Evaluation" (description of criteria and parameters for evaluating the web quest - evaluation form);
– "Conclusion" (a brief description of what learners can learn);
– "Used materials" (links to network resources used to create the webquest), etc.

The analysis of physics curricula showed that during its study in the 11th grade, students are expected to complete the following topics of educational projects (tentative list) [11]:

1. The effect of an electric field on living organisms
2. Semiconductor devices and their application
3. Effect of magnetic field on living organisms
4. Electromagnetic waves in nature and technology
5. Quantum generators and their applications

Here is a sample of the educational web quest "The influence of a magnetic field on living organisms", which was implemented with students within the school course "Physics. 10-11 grades" (standard level).

The web quest "The influence of a magnetic field on living organisms" is developed in the form of a site on the E-platform - google .com, located by vocation (https://sites.google.com/) and contains the following attachments (pages):

–"Home page" - the purpose and tasks of the web quest are presented. The goal is to form students have positive motivation, interest in studying physics, skills of independent and research activity through the use of information and communication

learning technologies (ability to use Internet search engines, online services and platforms for creating physical interactive content); deepen and expand students' knowledge about the magnetic field, in particular: deepen and systematize students' knowledge about the magnetic field, its properties and regularities; establish the influence of the magnetic field on living organisms; to cultivate responsibility, the ability to work in a team, to defend one's opinion in front of the audience (Fig. 1).

–

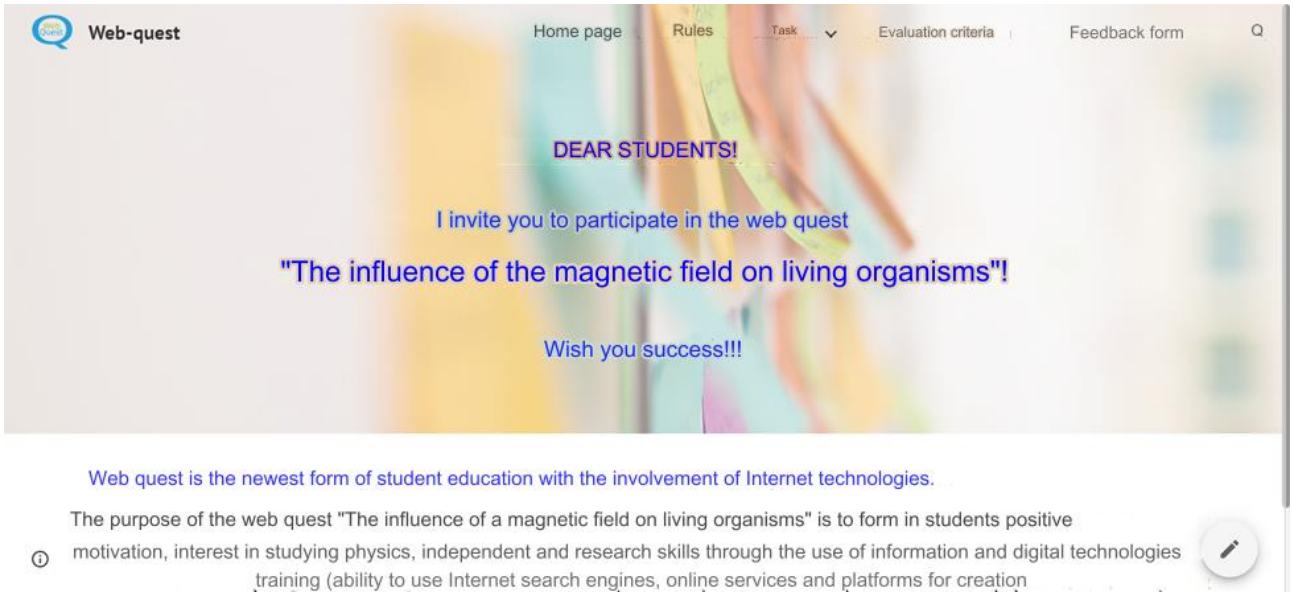

Figure 1. The main page of the physics web quest developed using the online service

Sourse: https://sites.google.com/

–"Rules" - the rules of the participants' work during the quest are described, the Web Quest Participant's Note is posted (adapted from [12]):

1) familiarize yourself with the topic and problem of the quest;
2) choose one of the proposed roles;
3) familiarize yourself with the tasks of your role;
4) study the list of Internet resources;
5) make a plan for finding information according to your role;
6) process information resources according to your role;
7) make a report in the form of a multimedia presentation, interactive exercises, a poster or in another suggested form;
8) familiarize yourself with the evaluation criteria for your report;
9) rate your role in the web quest;
10) discuss the results of work in a microgroup;
11) prepare to defend the web quest.

–"Task" - students are asked to divide into 3 teams: (to act in one of the roles): 1. "Physics"; 2. "Biologists"; 3. "Practices". Participants perform tasks of different levels of complexity simultaneously according to the chosen roles. Because the goals of Web research are not competing, team members teach each other how to use Internet applications and resources. The team sums up the joint performance of each task, and the participants exchange materials regarding the achievement of the collective goal.

–"Evaluation criteria". The web quest is a complex task, so the assessment of its performance should be based on by several criteria focused on the type of problematic task and the form of the presented result. Table 1 presents a description of the parameters and criteria evaluation of the web quest.

Table 1. Evaluation criteria for web quest participants

Structure work	Evaluation criteria	The maximum number of scores
Content	Complete disclosure of the topic; understanding the task (the answer is clearly oriented to the questions); logical sequence of presentation of the material; timeliness of task performance; having a creative approach to the task	5 points
Conclusions	Availability of logical conclusions to each task and a general conclusion to a set of tasks in accordance with the chosen role	2 points
Design	Adherence to a uniform design style; absence of grammatical errors; maintaining the harmony of the color palette; expressed individual approach to task performance; drawing up a report in the form of an oral presentation; web pages ; web animations; booklet; computer presentations etc.	5 points
General rating		12 points

Source: developed by authors

Self-evaluation of the participant's work in the group" is also provided in the specified attachment (Table 2).

Table 2. Self-assessment of the participant's work in the group

No	Assertion	Answer		
		Did not complete the task	50x50	Performed perfectly
1.	I studied the goal and set tasks			
2.	I offered hypotheses			
3.	I selected theoretical material for the project			
4.	I selected pictures from articles and publications			
5.	I rallied our mini-group			
6.	I defended the project			
7.	Helped friends who couldn't make it			
8.	I participated in the creation of the presentation			
9.	I participated in the generation of new ideas			
10.	I drew conclusions			
11.	I found and fixed errors			
12.	the project's questions			
Overall assessment				

Source: developed by authors

–"Physics group task"

- to the duties of "Physicists" includes: to investigate the causes of the Earth's magnetic field, magnetic storms and anomalies; describe changes in the magnetic field.

First, they are offered Internet sources to search for information, and then the tasks they must complete (Fig. 2):

1) using learningapps (https://learningapps.org) make an interactive crossword puzzle;
2) using the Canva app (https://www.canva.com), create a presentation on the topic "Earth's Magnetic Field".

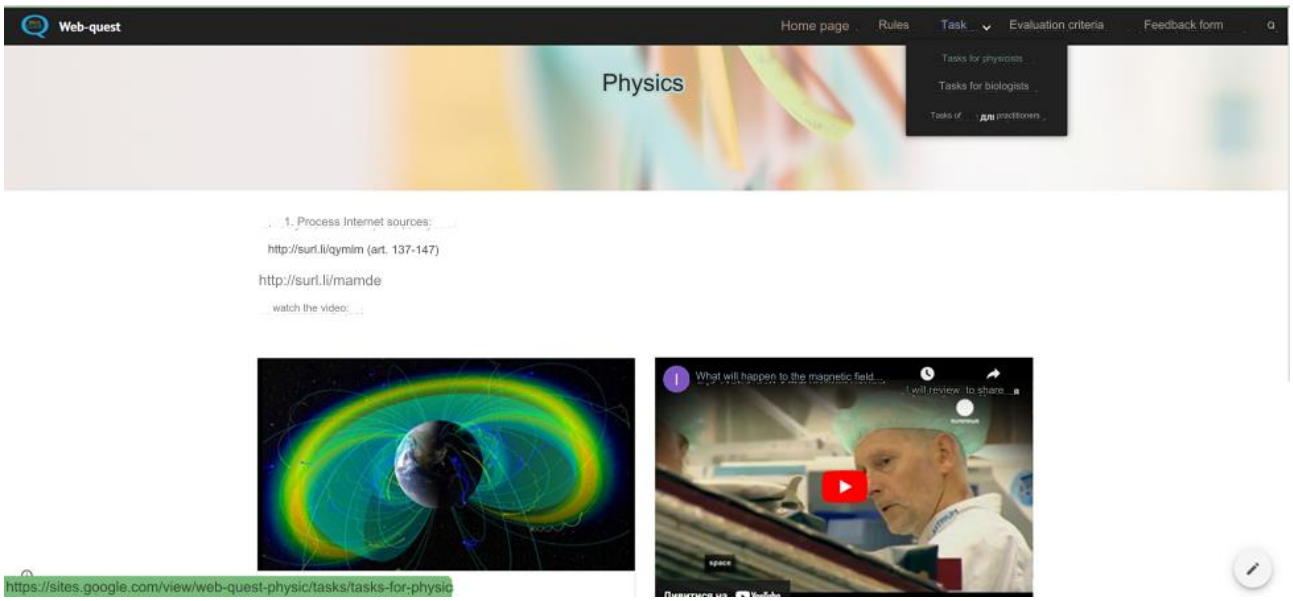

Figure 2. Interface of the page "Tasks for the group "Physics"

Source: developed by authors

–"Task for the group "Biologists""

- the responsibilities of "Biologists" include identifying and characterizing the impact (positive and negative) of a magnetic field on living organisms.

Having processed the sources proposed by the teacher, students must complete the following tasks:

1) using the learningapps application , complete the interactive exercise "Write in the blanks";

2) using the Google Sites application (https://sites.google.com), create a site on the topic "The effect of magnetic field on living organisms".

– "Tasks for the "Practice" group the duties of "Practitioners" include describing the interaction of man with the Earth's magnetic field in laboratory conditions.

Having processed the sources of the Internet, students must complete the following tasks:

1. using learningapps (https://learningapps.org), develop an interactive exercise "Find the word" on the topic "Can you feel the Earth's magnetic field?"

2. conduct a video review "Can a person feel a magnetic field?" (https://www.youtube.com/watch?v=Bb_1azm94uM). Create a booklet " Can you feel

the Earth's magnetic field? ” using the Canva online application (https://www.canva.com);

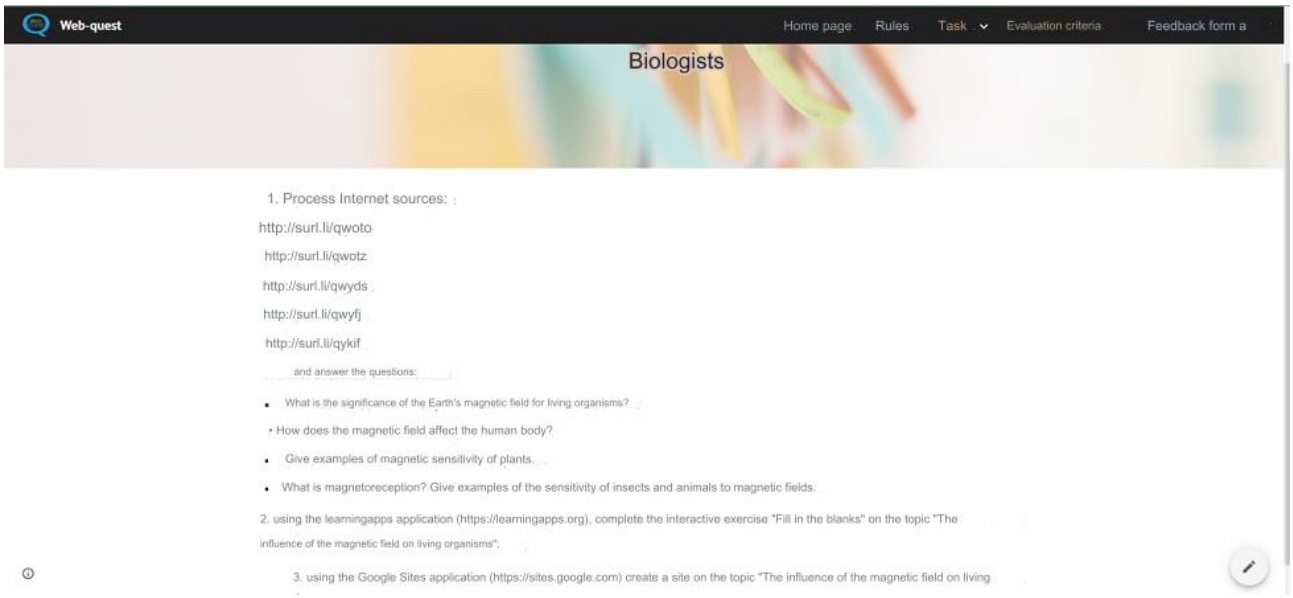

Figure 3. Interface of the page "Tasks for the group "Biologists"

Source: developed by authors

– "Feedback form"

– it added a Google Feedback Form, with the help of which students sent their performances, project works and links to them, discussion of each performance, evaluation of work results. Also, in this section, all the materials completed by the students during the web quest are displayed.

–

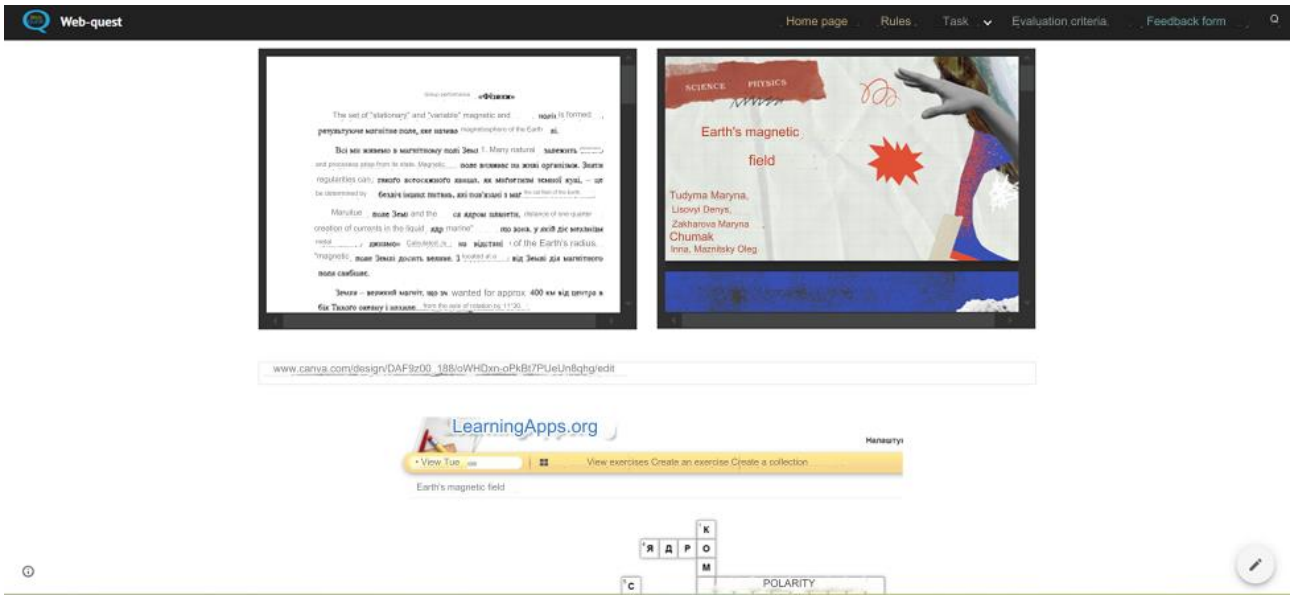

Figure 4. "Feedback form" page

Source: developed by authors

Conclusions. At the current stage of the development of digitalization of the educational system, the role of modern pedagogical technologies in the teaching of the subject "Physics" in general secondary education institutions is increasing, the use of which significantly increases the level of cognitive activity of students. As practical experience proves, it is the "web quest" that has a powerful didactic potential. The use of the "Web-Quest" technology by physics teachers in the educational process allows students to learn how to solve new, unusual tasks. Education seekers have: an increase in the level of motivation to study the subject; development of self-organization and a responsible attitude towards the execution of the quest; formation of information and digital competence, communication skills and concentration on the creation of the final project product, which is much more effective than traditional forms of education.

Author contributions. The authors contributed equally.

Disclosure statement. The authors do not have any conflict of interest.

References:

1. Law of Ukraine "On the main principles of development informative society in Ukraine for 2007-2015" №. 537. (2007, January 9). *Vidomosti Verkhovnoyi Rady Ukrayiny*, 12, 103 [in Ukrainian].
2. About education: Law of Ukraine № 2145-VIII. (2017, September 5). *Vidomosti Verkhovnoyi Rady Ukrayiny*, 38-39, 380 [in Ukrainian].
3. State basic standard general secondary education. (2020). Approved by resolution of the Cabinet of Ministers of Ukraine from 30 September 2020 № 898. Kyiv: Derzhstandart Ukraine [in Ukrainian].
4. Professional standard for professions "Teacher initial classes of the general institution secondary of education", "Teacher of a general institution secondary education", "Primary teacher education (with a junior diploma specialist)" (2020). Approved by order Ministry development economy, trade and agriculture economy of Ukraine from 23 Desember 2020 № 2736-20. Kyiv: Professional standard [in Ukrainian].
5. Kankovskyi, I. E. (2014). *Professional system preparation engineers teachers of the motor transport profile: monograph*. Khmelnytskyi : FOP Tsyupak A. A. [in Ukrainian]
6. Schmidt, V. V. Technology Web quest in learning English students of non-linguistic specialties. Retrieved from : http://winner.se-ua.net/page26/1/10/ [in Ukrainian].
7. Grudinin, B. (2011). Technology web - quest in educational process in physics in general education school. *Psychological and pedagogical problems rural schools : Coll. scientific works Pavlo Tychyna Uman State Pedagogical University*, 39 (2), 103–110 [in Ukrainian].
8. Mentova, N.O. (2013) Using web-quest technology in physics lessons as a means of implementing new educational standards. *Proceedings. Series : Problems of physical-mathematical and technological methods education*, 4 (2), 165-166 [in Ukrainian].
9. Sharko, V.D., Bogatyrenko, Yu. O. (2017) Application of web quest technologies while studying physics students main schools as a way their involvement in STEM education. *Search young. Issue 17*: *Collection materials All-Ukrainian student scientific and practical conference "STEM - education as a direction modernization of teaching methods natural and mathematical disciplines in secondary and higher education educational institutions"* (pp. 36-38). Kherson: PP Vyshemyrskyi V.S. [in Ukrainian].
10. Seredenko, I. O., Pecherska, T. V. (2019) Web-quest of technology while studying physics and mathematics. *Man in the world of high technologies : a collection of works of the XVII International Youth Scientific and Practical Conference "Worldview Significance of the Scientific Picture of the World"* (pp.183-185). Kyiv [in Ukrainian].
11. Educational programs for grades 10-11 (State basic standard general secondary education, 2011). [in Ukrainian]. Retrieved from: https://mon.gov.ua/ua/osvita/zagalna-serednya-osvita/navchalni-programi/navchalni-programi-dlya-10-11-klasiv.
12. Dovhopola, L.I., Stepura, T.O. (2023) The use of online technology "Web-Quest" in teaching biology to high school students. *Perspectives and innovations of science. "Pedagogy" series.* 10 (28), 155-166 [in Ukrainian].