1: басқа жауаптар.
2: жауап жоқ. [14]

Қорытынды

Тақырыпты зерттей келе айтарымыз:

1. PISA халықаралық салыстырмалы зерттеуі тапсырмалары білім алушылардың теориялық білімдерін емес, олардың алған білімдерін өмірлік проблемаларды шеше алу құзіреттіліктерін сараптайды.
2. Біздің еліміз оқушыларының PISA халықаралық салыстырмалы зерттеуінде өкінішке орай төмен нәтиже көрсетуі осындай сипаттағы тапсырмалардың элементар математика мазмұнында аз қамтылуы деп ойлаймыз.
3. Зерттеу білім беру жүйелерін PISA ұсынғандай халықаралық бағалау стандарттарына бейімдеудің маңыздылығын көрсетеді. PISA есептерін талдау студенттерден білімді ғана емес, сонымен қатар оларды стандартты емес жағдайларда қолдану қабілетін талап ететін нақты, контексттелген мәселелерді шешуге баса назар аударуды көрсетеді. Бұл дәстүрлі есте сақтаудан сыни ойлауға және аналитикалық жұмысқа ауысуды көрсетеді. Бұл тәсіл оқу бағдарламаларынан теориялық білімді қамтуды ғана емес, сонымен қатар оларды өмірлік мәселелерді шешу үшін қолдану дағдыларын дамытуды талап етеді, бұл әсіресе біздің еліміздің студенттері халықаралық салыстыруда көрсеткен төмен нәтижелер аясында өте маңызды.
4. Зерттеу нәтижелері студенттерді PISA-ны ғана емес, сонымен қатар басқа да ұқсас сынақтарды сәтті тапсыруға жақсырақ дайындау үшін оқу материалдары мен оқыту әдістерін қайта қарауға және өзгертуге білім беру бағдарламалары ынталандыруы керек. Халықаралық аренада білім беру стандарттарының өзектілігі мен өзектілігін сақтау елдің әлемдік рейтингтердегі позициясын жақсартып қана қоймайды, сонымен қатар студенттердің оқу және өмірлік құзыреттілігін арттыра отырып, қазіргі әлемнің нақты сын-қатерлеріне дайындалуына ықпал етеді.

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THE IMPORTANCE OF DEVELOPING SKILLS IN USING THE STEM EDUCATION SYSTEM IN CHEMISTRY LESSONS

Abstract. STEM education, encompassing Science, Technology, Engineering, and Mathematics, is increasingly recognized for its vital role in fostering critical thinking, problem-solving, and innovation skills in students. Chemistry, a fundamental STEM subject, offers a unique platform for integrating these disciplines. By developing skills in using the STEM education system in chemistry lessons, students can:enhance their understanding of chemical concepts: STEM-based teaching emphasizes hands-on activities, simulations, and real-world problem-solving, fostering deeper engagement and conceptual comprehension. Develop problem-solving and analytical skills: Chemistry experiments and projects

encourage students to identify, analyze, and solve problems, honing their analytical thinking and critical inquiry abilities.

Keywords: STEM approach, High school chemistry, Integrative Chemisty.

Introduction

STEM is an integrated approach to learning. That is, within this approach, academic scientific and technical concepts are studied in the context of real life. The goal of such an approach is to establish strong connections between school, society, work, and the world at large that contribute to the development of STEM-literacy and competitiveness in the global economy. STEM is an integrated approach to learning in which academic scientific and technical concepts are studied in a real-life context [1].

However, to effectively implement integrated STEM, teachers must have deep knowledge in the science, technological, engineering, and mathematical content they teach [2].

By introducing integrative STEM classes at an early age, students can explore their interests, develop foundational skills, and access potential career paths in STEM-related fields. Integrative STEM classes often include hands-on, inquiry-based learning experiences that engage students and increase intrinsic motivation. By connecting abstract concepts with real-world applications, students see the relevance of what they are learning and are actively engaged in the learning process.

This technology is a new methodology for teaching students based on a comprehensive method of studying and studying a single problem or phenomenon.[3]

Literature review

In modern society, a rapidly changing society requires all the requirements for humanity and their solution remains only the task of knowledgeable learners.

Modernization of high-quality education is based on the use of new technologies are. Education for Natural Sciences an important area is STEM technology training.

Achieving an applied goal, combining several subjects, including the knowledge gained from science lessons. This approach is a bridge that unites the educational process, career and further professional growth in the education system. It allows, through an educational approach, to prepare children for a highly technically developed world.

One of the main trends in world education - the laboratory workshop is considered the main one for teaching physics, chemistry, biology, etc.and other disciplines. The purpose of STEM Laboratories was to deepen the knowledge gained from theoretical concepts, get acquainted with the methods of measuring different quantities, study the work of various instruments, learn technologies for collecting and processing practical data, develop engineering graphics and design skills.[4]

In 2016-2019, within the framework of the state program for the development of the education system and science, this approach was transferred to the updated content of school education. It is planned to include STEM elements in the school curriculum, which is currently planned to be implemented.[5]

As for the main features of STEM, the main elements that use the technology in the classroom include 3D printers, visualization tools and other tools or laboratory equipment. Thus, the ten main advantages of the approach were considered. Thanks to the new technology: teenagers develop a motor effect, become more interested in theory, understand its importance. We can independently plan project

research work. Talented students are formed who are able to create new devices and are confident in their abilities. The main thing is that competitiveness develops.[6]

Teachers are looking for the best, most effective ways for students when using any technology, methods and techniques. The student receives first theoretical knowledge for the development of knowledge in biology, physics, chemistry, as well as in the disciplines of the Natural Science direction, improving mathematical, scientific and academic literacy. Aspects of its use at a high level in the context of real life are not considered. It is necessary to provide high school students with the opportunity to qualitatively apply the theoretical knowledge gained by studying these natural sciences. In 2017, STEM for the development of Technology, about 6 million for the creation of a laboratory. "I don't know," he said.[7]

STEM is a combined teaching method that addresses academic scientific and technical concepts in real life. The purpose of this method is to create a stable connection between school, community, work and the world, which contributes to the development of STEM literacy and competitiveness in the global economy.

The use of the STEM method in the learning process contributes to the development of the following skills in students:

- solving any problem;
- be creative with the action;
- critical analysis;
- independent thinking;
- work together in a team;
- give initiative to new ideas;
- digital literacy.[8]

The expected results in the development of skills in using the STEM education system are expected: a supportive and motivating atmosphere, continuous scientific, methodological and psychological support for adolescents. The educational process between the student and the teacher is built on cooperation, that is, on the basis of the principle of Subject-subject interaction. It is expected that classes will be held in schools using only new technologies, students will develop critical thinking and problem-solving skills. Improving professional competencies or the literacy of teachers and students in STEM technology.

In modern society, the virtual process in the conditions of Secondary Education is thus aimed at using the pedagogical potential of traditional education, bringing it to the level of new, virtual computer technologies. In chemistry classes, this technology is what we call the most necessary approach for students to learn, because this methodology or context from a foreign country not only teaches chemistry, but also integrates topics within chemistry. Integrated learning means that it increases the competence of students to understand this topic. This means a good opportunity for students of the Republic of Kazakhstan. In general, the future of our state is connected with educated youth.

Research question

What is the importance of developing skills in using the STEM education system in Chemistry Lessons?

Methodology

In accordance with the topic of the article, the theoretical foundations of this technology should be determined. The study of scientific works carried out in the direction of research, the developed teaching aids allows us to identify mainly theoretical bases, concepts of research using the method of analysis.

Sampling

To achieve the goal, we reviewed 10 scientific works, including scientific journals, articles, methodological books.

Article name (author, year of publication)	Description
Aydin-Gunbatar, S., Ekiz-Kiran, B., & Oztay, E. S. (2020).	STEM education integrated with a problem-based learning in the study of stoichiometry.
Mutakinati, L., Anwari, I., & Kumano, Y. (2018).	This research is to investigate the students` critical thinking skill by using STEM education through Project Based Learning.
Sutaphan, S., & Yuenyong, C. (2019, October).	To develop theoretical framework for STEM teaching strategies in school setting.
Sari, N. A., Mulyani, S., Hastuti, B., & Indriyanti, N. Y. (2021, March)	To analyse the level of STEM literacy and problem solving of students in chemistry materials.
Hacıoğlu, Y., & Gülhan, F. (2021)	To research the effects of engineering design-based STEM education on the middle school students' critical thinking skills and STEM perceptions.
Dare, E. A., Keratithamkul, K., Hiwatig, B. M., & Li, F. (2021).	STEM-focused professional development and implementing integrated STEM lessons into their classrooms.
Baharin, N., Kamarudin, N., & Manaf, U. K. A. (2018).	STEM approach in the learning and teaching process that is able to enhance thinking skills among students.
Sari, N. A., Mulyani, S., Hastuti, B., & Indriyanti, N. Y. (2021, March).	To analyse the level of STEM literacy and problem solving of students in chemistry materials.
Asghar, A., Ellington, R., Rice, E., Johnson, F., & Prime, G. M. (2012).	A problem-based approach in the teaching of STEM.

Aminah, S. (2022).	Critical thinking skills has to be sharpened particularly during the COVID-19 pandemic. This circumstance leads to the lack of student's passion to apply their thinking skills in doing something necessary.

Data collection

During the research, I searched for articles on the topic of building skills in using the integrated STEM education system in chemistry education in Google Scholar. I studied various academic databases to find relevant literature and critically evaluated, familiarized myself with the suitability of each article for solving research goals. This process helped to ensure that only relevant and high-quality articles were included in the analysis, which contributed to my full understanding of the subject of chemistry on the formation of skills for use not only in the educational system, but also in the education system as a whole.

Data analysis

The frequency and percentage of students` competencies were calculated and analyzed.

№	Skills	Frequency	Percentage
1	Critical thinking skills	6	60%
2	Problem-solving skills	1	10%
3	Scientific thinking skills	1	10%
4	Creative thinking skills	1	10%
5	Explorative skills	1	10%
6	The application of knowledge in life	1	10%

Result

If we analyze the tables presented above,we studied 10 articles and analyzed 6 skills.As shown in the table, we can see that the most critical thinking skills are found in 6 articles , i.e. 60%, i.e. 10 articles. It can be seen that the rest of the articles came across only one in the article I received.

In conclusion**,** developing skills in using the STEM education system in chemistry lessons is crucial for fostering comprehensive learning and preparing students for success in STEM fields and beyond.

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DETERMINING INTERACTIVE ONLINE RESOURCES IN TEACHING CHEMISTRY LABORATORY

Abstract. In this review paper we will determine the interactive online resources. Here, we analyzed educational research studies related to the specifically chemistry laboratory courses. This paper provides us the types of virtual lab, learning platforms, simulators, educational web sites that used to teach chemistry laboratory in nontraditional format. And we can see that the impact of COVID 19 to the educational research on online learning boosting.

Keywords: interactive online resources, teaching chemistry laboratory, chemical Virtual laboratory, learning platforms.

Introduction

In the field of education, the use of online interactive resources has revolutionized to a new level of teaching and learning methods. These resources provide students with easy access to materials and interactive tools that enhance their understanding of complex concepts in science. The explosion of technology has also made possible teaching outside of the traditional classroom laboratory. It helped to solve the problems that accrued when the chemistry laboratory courses needed to be conducted online. Laboratory instruction unifies conceptual and procedural knowledge, and constitutes an important part of chemistry education practice (Reid and Shah, 2007). Also, it was beneficial on the case of shortage of tools and reagents in the laboratory, leading to limited hands-on experience. This creates a challenge in teaching chemistry laboratory. Therefore, this heeded find alternative ways to optimize learning in the laboratory. The Virtual laboratory environments have emerged as a potential solution of the faced problem. By offering students a simulated laboratory experience that can be accessed online. Virtual laboratories or laboratory simulations have been used for two main purposes in chemistry education. Firstly, they have been used to provide students with visual representations of chemistry concepts, and secondly, they have been used to prepare students for their laboratory sessions. (Dalgarno, Bishop, Adlong, Bedgood Jr., 2009, 854). Also, learning platforms and multimedia resources allow students to visualize and interact with the feelings that will be experienced during experiments, improving their understanding of the traditional laboratory environment.

Literature review

The study carried out by a literature review and analyzing research from previous studies. To get the only relevant studies defined the inclusion and exclusion criteria to limit the searching process. The criteria for eligibility include a) the paper must emphasize on interactive online chemistry laboratory