American Journal of Interdisciplinary Research and Development
ISSN Online: 2771-8948
Website: www.ajird.journalspark.org
Volume 11, Dec., 2022

METHODOLOGICAL FOUNDATIONS OF NATURAL SCIENCES BASED ON STEAM EDUCATION OF THE "HEARD-SEEN-DONE" PRINCIPLE IN THE TEACHING

Mirzaeva Nadira Abdukhamidovna
Chirchik State Pedagogical University, Faculty of Natural Sciences
"Genetics and Evolution Biology", Department Assistant, Chirchik, Uzbekistan
nodirabegim.2018@mail.ru

Annotation
The article covers the fact that in the era of globalization, the development of science is associated with the development of Natural Sciences, the methodology for teaching Natural Sciences on the basis of STEAM education is widely covered. In order to train competitive personnel, improve the quality of Education, introduce advanced educational technologies into the industry, train highly qualified specialists with the skills of applying modern knowledge and pedagogical-innovative technologies, the analysis of the method and structure of the principle of "Heard-saw-done" of the STEAM educational innovation cluster based on Natural Sciences is carried out.

Keywords: education cluster, innovation, method, methodology, STEAM education, "heard-saw-did", Natural Sciences.

In order to prepare competitive personnel for the field of pedagogical education of the president of the Republic of Uzbekistan, improve the quality of Education, introduce advanced educational technologies into the field, train highly qualified specialists with the skills of applying modern knowledge and pedagogical-innovative technologies, the development of the Ministry of Higher and secondary special education of the Republic of Uzbekistan, the Educational innovation is associated with achieving qualitative changes through the systematic application of new forms and methods, approaches and technological processes aimed at solving problems associated with the educational system based on the principle of development, in which the innovation cluster of pedagogical education is considered the main solution in solving problems in the field of education and education[1].

Decree of the president of the Republic of Uzbekistan dated September 5, 2018 "on additional measures to improve the management system of public education" PF -

5538 defines as the main directions of reforming the system of public education the importance of introducing advanced foreign experience into the system of public education, modern pedagogical technologies in the educational process, including innovative methods of teaching, creating

Representatives of the political and social sphere of society, in the future, STEAM is justifying the lack of employees and employees, as well as the fact that this circumstance is the greatest impact that threatens national competitiveness, through statistics. "The lack of qualified professionals is reaching this level when there are crises in companies based on high technology," emphasizes Brad Smith, vise President of Microsoft.

Looking at the history of developed countries in the world, we see that reforms aimed at changing the life of society in them began primarily with the education system, kindergarten, school, upbringing. Because it is impossible to change a person, society, without changing the school. The basis, the foundation of education and upbringing is – school. The use of the cluster plays an important role in systematizing, ensuring the strength of the learner, the knowledge mastered by the students.

The cluster" cluster " - in English, giving the meaning of genealogy, chain - link, branching, prepares the ground for the development of analytical-critical thinking skills, making it possible to understand the connections between mastered knowledge, theory, legality and concepts, to understand their continuity.

In the 90s of the XX century, ideas about world production clusters and the practice of organizing clusters in various industries began on their basis. The founder of the theory of Cluster Development M.Being Porter, he explains this approach as an association of related areas in a particular network, acting together.

As the world economy develops, supporters of the creation of various sectoral and territorial clusters are growing. Today, clusters are organized in more than 100 branches of different countries. The earliest clusters were built in Finland (Communications-Information, Nokia), Japan (Automotive, Toyota), Italy (construction industry), USA (information technologies, Silicon Valley), among which the Silicon Valley Cluster stands out for its excellence. It is worth noting foreign scientists A.Marshall, M.Porter, O.Salvel, S.In the scientific research of Ketels, theoretical issues of the cluster system, their role in increasing the competitiveness of specific subjects, as well as the characteristics of educational clusters are studied on the example of the USA and European countries.

The innovation cluster of pedagogical education is based on the principle of" Heard – saw – did", providing methodological assistance to secondary schools of a higher educational institution (teaching Natural Sciences), improving the quality of Education, continuing professional development of teachers, increasing the coverage of higher education by organizing the"electronic platform of Continuing Professional Education" and vocational guidance of graduates, developing the skills carrying out

scientific research work to ensure integration, innovation, continuity, continuity, consistency, effective succession in the field of pedagogical education;

Organization of experience-testing processes of scientifically-based innovative projects, creation of the possibility of rapid re-contact between preschool, secondary education and higher education and other applicants in the training of pedagogical personnel; integration of intellectual resources around topical issues of development of pedagogical education; search and implementation of various forms and types of Educational, Scientific and pedagogical practice in education and

analysis of educational and regulatory documents, creation of educational and methodological manuals, development and introduction of practical training materials into the educational process, study and elimination of existing shortcomings in this regard, ultimately improving the quality of Education;

Cluster of pedagogical education in cooperation with STEAM educational stages to carry out systematic work on the training of competitive personnel, the formation of their scientific, educational and methodological bases, demand and advanced foreign experience in the field of pedagogy, the widespread introduction of modern pedagogical and information and communication technologies in the educational process;

The formation of pedagogical skills in talented students and the achievement of competitive personnel training by attracting students of higher education in their identification and development;

The development of a model for the development of STEAM education, which is adapted to teaching Natural Sciences on the basis of the innovation cluster of pedagogical education, is considered one of the main tasks.

This approach to education is popular in the United States, where the study of STEM is considered part of public policy in the field of Education. In America, STEM is supported by many large corporations such as Intel, Xerox, Time Warner, as well as The New York Foundation and the Bill Gates Foundation. Typically, students who have completed OTM can stay in the US for 12 months under the OPT (Optional Practical Training) Program, but there are more useful aspects for those who have completed STEM programs. According to the US Department of Commerce, the average salary of STEAM graduates is set at about 2 times higher than that of workers in other areas. In general, STEAM specialists are the most in demand in the labor market today, and the demand is only growing. Innovations and digital technologies are considered the basis of what kind of business and progress. This situation is confirmed by research from the US Bureau of Labor Statistics: according to their forecasts, workers in the STEAM industries will be in demand by 70% more than specialists in other industries.[3]

In particular, the stage of the formation of STEAM education involves several processes. The 1990s was the period of the emergence of early STEM education in the

United States, in sanalsa, in 1958, the launch of the Earth satellite of the former Soviet country, and leadership in the field of technology led to the education of natural-scientific disciplines by a developed state at the level of state policy. This was the first time in history that public administration made a significant contribution to education.[4]

The innovative pedagogical project" heard-saw-did " is considered the basis of the structure (model) of the road map - the effective organization and implementation of the educational process. The implementation of the project includes psychological-pedagogical, socio-pedagogical and methodological work.

It is the immersion of theoretical knowledge in education in practical, everyday life processes and the formation of practical skills.

"Heard" - a lecture in the form of a theoretical lesson, a conversation, is conducted in the form of a chicory and acquires the necessary knowledge.

"Saw" - is organized in the form of practical classes, laboratory and seminar classes, and skills and skills are formed.

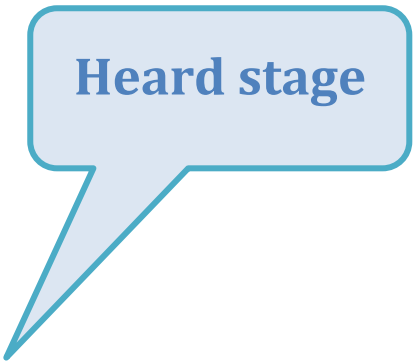
"I did" - in the form of independent education, students translate knowledge, skills and abilities acquired in two stages into competencies.

The basis of the organization of STEAM education according to the national curriculum is organized according to the program of Natural Sciences. In doing so, the following main topics will be adapted to STEAM education:

1. Variety of living organisms
2. Molecule and cell level of vitality
3. Organ and organ system
4. Movement of substances in living organisms
5. Nutrition
6. Breathing
7. Subtraction (expression)
8. Moving
9. Coordination and self-management
10. Heredity and variability
11. Reproduction. Growth and development
12. Species, papules, ecosystem, biosphere

Below is an organizational methodology based on the principle "I heard-saw-did" in teaching the topic "molecule and cell level of vitality", based on STEAM education, which consists in creating results based on this principle that are able to perform a task, specific and dimensional, set at a certain time interval.

American Journal of Interdisciplinary Research and Development
ISSN Online: 2771-8948
Website: www.ajird.journalspark.org
Volume 11, Dec., 2022



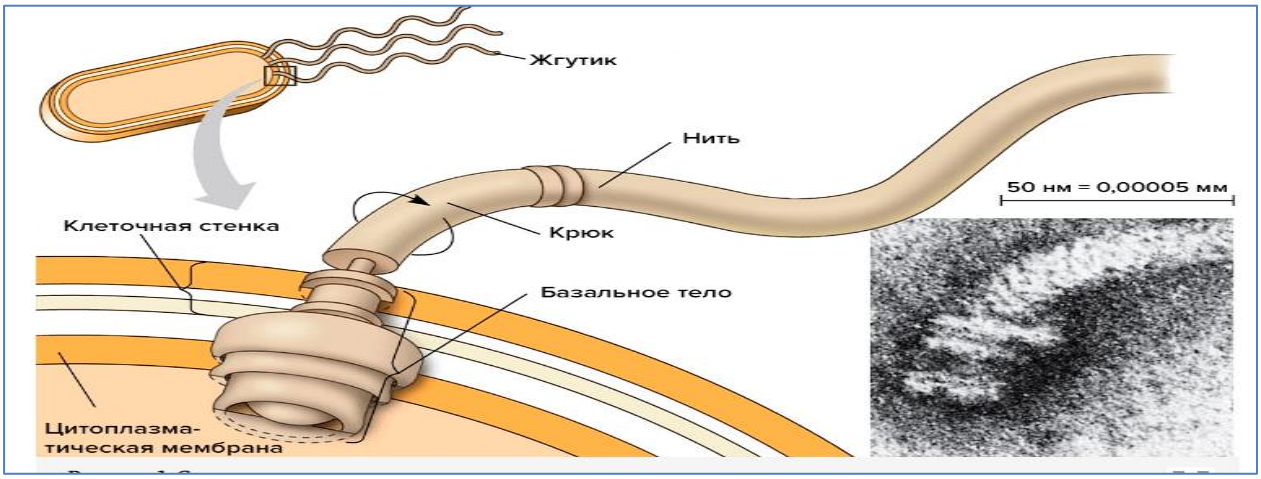
Bacteria are tiny creatures, and many believe that they are arranged quite simply. Of course, each bacterium consists of only one cell, and it does not have legs or arms, eyes and nose, or even individual body parts such as the cell nucleus. But somehow bacteria survive and develop with such a limited volume and capacity, and besides, they find their own solutions to make their lives easier.

For example, to act — that is, to independently influence their own state in space and not wait for the passing current — is the most striking feature of bacteria. Of course, you know about bacteria mosquitoes. What is tweeting? How can bacteria move themselves using sugar?

What types of movement do givchins provide? If the bacterium is in a liquid environment, then mosquitoes will help to swim. Swimming is the fastest way. In addition, the bacterium can well control its movement by changing the direction of rotation of the basal body: the clockwise rotation of the basal body moves the cell away from the hivchins, and walking Clockwise pulls the cell after the hivchins.

Imagine the hivchins shaking on a solid surface moistened with liquid. Bacteria do not swim, but spread in one plane.

In bacteria, it looks like shorter and simpler arranged hairs than in mosquitoes.



Bacteria can change their buoyancy by accumulating atmospheric air inside. Bacteria can specifically select and collect molecules of various gases in a special balloon made of protein. Thus, the cell changes its density, begins to weigh less and swims upwards, pushing with the power of Archimedes. If bacteria have to come back, it can get rid of air or accumulate heavy sugars within itself.

Imagine that you are blowing a balloon. Suddenly, the balloon goes out of your hand, and under the force of the air flow emanating from it, the balloon flies away. Bacteria can also act by pushing themselves in the same way.

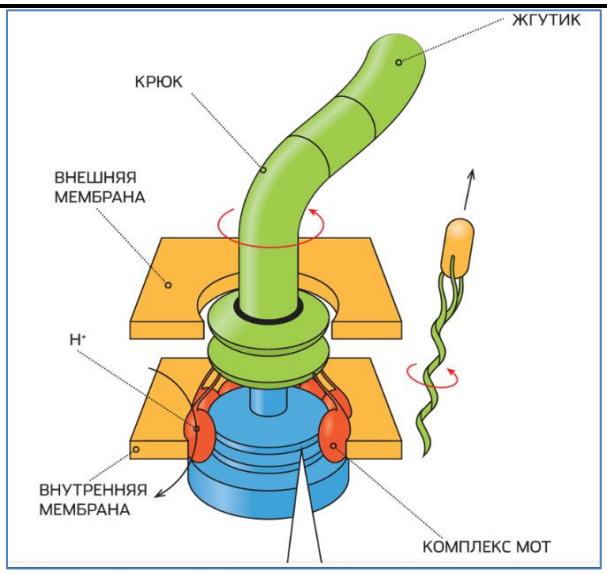
Acquire theoretical knowledge by reading the knowledge provided on the topic.

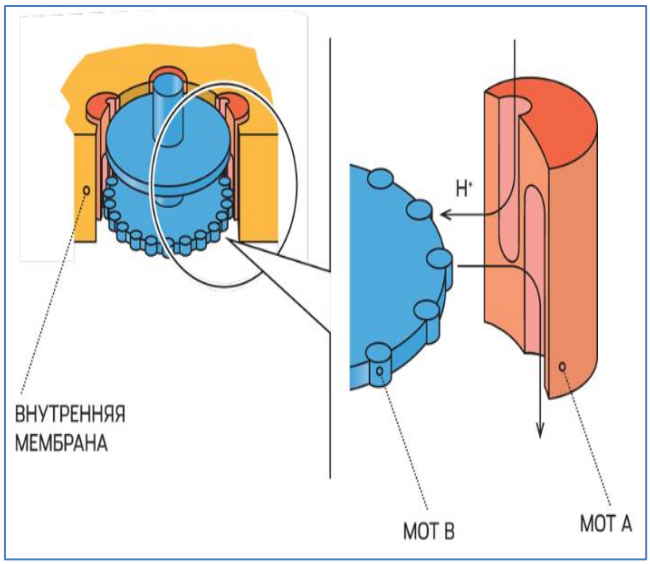
Now let's put an experimental test to visualize the movement of cells!

Bacteria khivchi is a complex nanomechanism, about 240 different proteins are involved in its creation. The internal structure of its engine is also very complex. It consists of more than 50 different molecular parts, each of which performs a specific function of engine rotation, isolation, excitation shaft, regulator switching sequence, coil, etc. The diameter of the engine is only 30-40 nm (1 nm = one billion parts of the meter), but the energy efficiency is more than 95%. Khivchinites are one of the smallest and most powerful motors in nature.

As we can see, bacteria are not primitive fragments of life at all, but rather very complex creatures, the construction of which simply requires intelligence that cannot be compared with a person.

American Journal of Interdisciplinary Research and Development
ISSN Online: 2771-8948
Website: www.ajird.journalspark.org
Volume 11, Dec., 2022





The "electric motor" scheme of a bacterium is more like an engineering drawing than a living organism. The main part of the" Motor " is made up of a matte a protein with ion channels, due to which the flow of protons causes the rotor to rotate like a turbine. There is another internal biological process that drives mosquitoes. In doing so, the bacterium collects excess air into it and releases it with pressure. This ensures that the bacterium is pushed forward at an unusually high speed, that is, it travels a distance of 50 times the length of the cell in a second. If this is an example in the values we are used to, an athlete with a height of 180 cm-a swimmer will have to swim along a 50-meter pool in half a second! It looks like a rubber ball thrown into a stream tied to a

rope: when the rope is released (hydrogen bonds), the fast current (Brownian motion) takes the ball and drags it forward. If the rope is pulled-the ball will go back.

Done stage

At this stage, students independently complete the given task at home. The model made by the reader and its mechanics are captured. The prepared task is corrected in certain programs and a theoretical explanation is given.

To find out the mechanism of operation of the bacterium Hive, an anchor is made and a practical training is carried out:

1. We make a mechanism in the form of internal extruded parts that cause mechanical action.
2. Since this process is suitable for biomechanism that induces the action of the bacterium hivchin, the hivchin action-inducing anchor is best used in the technique.
3. Independently carry out the creative project of anchors that act on the internal structure of microorganisms counted as nanorobots. The following equipment will be needed for this:

We need	Procedure for performing work
➢ **Fast-hardening plasticine** ➢ **Klyonka** ➢ **Plasticine knife** ➢ **10 cm buttons**	1. 1. First we spread plasticine 2 cm thick on a flat surface. 2. 2. From it we cut 3 circles of the same diameter. Then we glue them with the edge in the form of a gear. 3. 3. We correct the teeth of the finished 3 identical anchor wheels and bring them to action.

Capture the process of practical implementation of the independent work you have completed, prepare a vidioy's certificate, adjusting it to the algorithm for performing the task in a row. Vidiotakdimot prepared, take the barcode and place it in the infographic prepared by you.

STEAM education is designed to enhance the relationship between the effectiveness of education and the distance learning platform with its solution in practice, seeking certain pedagogical results. The development process and its implementation will continue in stages in the educational methodology based on STEAM education:
1) analysis of the initial results of the educational process,
2) through the assessment of personnel and consideration of material and technical conditions ;
3) to identify problems and conflicts in educational practice,
4) to form and theoretical justification of the idea, which is the basis for changing the components of the educational process,
5) based on the construction of a modern-electronic platform - based online learning model of the educational process;
6) linking students ' theoretical knowledge with practice through creative laboratory and independent work;
7) achieve the expected result by designing a step-by-step transformation of the educational process;
Heard-saw-the purpose of the fulfilled principle: consists in creating results that are able to perform a task, accurate and dimensional, set at a certain time interval. A clearly defined goal is a guarantee of the perfect and effective completion of the task. In this, the three bases of the principle are considered the leading ones.
If at the 1st stage it is determined that 40-50% of the knowledge that students need to master is mastered, and at the 2nd stage 60-70% of the knowledge is mastered by students, then at the last stage the indicator of the effectiveness of education is predicted to reach 80-100%. The cognitive coeficent acquired by the students involved in the project is proved on the basis of statistical data.

LITERATURE

1. Мирзаева Нодира Абдухамидовна, Табиий фанларни ўқитишда педагогик таълим инновацион кластери (Чирчиқ модели) “эшитдим – кўрдим - бажардим” тамойили методологияси**.** RESEARCH FOCUS | VOLUME 1 | ISSUE 1 | 2022 ISSN: 2181-3833 ResearchBip (14) | Zenodo | Google Scholar
2. Ўзбекистон Республикаси Президентининг 2018 йил 5 сентябрдаги «Халқ таълимини бошқариш тизимини такомиллаштириш бўйича қўшимча чора-тадбирлар тўғрисида»ги ПФ-5538-сон Фармони. Қонун ҳужжатлари маълумотлари миллий базаси, 06.09.2018 й., 06/18/5538/1840-сон, https://lex.uz/docs/3893445
3. Microsoft: Shortage of tech workers in the US becoming «genuine crisis». [Электронный ресурс] // The Hill. 2012. URL:http://thehill.com/blogs/hillicon-

valley/technology/258985- microsoft-lackof- tech-workers-approaching-genuine-crisis
4. https://www.educationindex.ru/articles/professions-in-demand/izuchenie-dizayna-i-iskusstv-za-rubezhom/chto-takoe-stem-spetcialnosti-pochemu-ih-nazyvayut-napravleniem-buduschego/
5. Мерзлякова, О. П. Формирование ключевых компетенций учащихся при реализации вариативной части государственного образовательного стандарта в процессе обучения физике в школе [Текст] / О. П. Мерзлякова // Физика в системе современного образования (ФССО-07): материалы девятой международной конференции, Санкт-Петербург, 4-8 июня 2007 г. – СПб.: Изд-во РГПУ им. А.И. Герцена, 2007. – Т.2. – С. 119-120.
6. Ходжамқулов Умид Негматович Педагогик таълим кластери илмий-педагогик муаммо сифатида (педагогик таълимни кластерлаштиришнинг зарурати) // Современное образование (Узбекистан). 2019. №10 (83). URL: https://cyberleninka.ru/article/n/pedagogik-talim-klasteri-ilmiy-pedagogik-muammo-sifatida-pedagogik-talimni-klasterlashtirishning-zarurati (дата обращения: 22.12.2022).
7. Умаров Абдухамид Саттарович, Атаназар Каримович Рахимов, Мирзаева Нодира Абдухамидовна, ДАРС СИФАТИНИНГ ТАҲЛИЛИ – ТАЪЛИМ ТАРАҚҚИЁТИ МЕЗОНИ , TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI: 2022: Special Issue_Ta’limni modernizatsiyalash jarayonlari muammolar va yechimlar»
8. Атаназар Каримович Рахимов, Мирзаева Нодира Абдухамидовна, РОЛЬ УЧЕБНОГО ПРОГРАММНОГО ОБЕСПЕЧЕНИЯ В ПОВЫШЕНИИ МЕДИАГРАМОТНОСТИ БУДУЩИХ УЧИТЕЛЕЙ БИОЛОГИИ , TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI: 2022: Special Issue_Ta’limni modernizatsiyalash jarayonlari muammolar va yechimlar»
9. Умаров А. С. Узлуксиз таълимда замонавий санъат мактабларини ташкил этишнинг кластер тамойиллари //Research Focus. – 2022. – Т. 1. – №. 1. – С. 23-28.
10. Mirzaeva PhD, N. A. (2021). PEDAGOGICAL INNOVATION EDUCATION CLUSTER IN THE DEVELOPMENT OF NATURAL SCIENCE LITERACY: THE CHIRCHIK EXPERIENCE IS IN PRACTICE. *Central Asian Journal of Education*, *6*(1), 1-11.