



ISSN: 2350-0328

**International Journal of Advanced Research in Science,
Engineering and Technology**

Vol. 11, Issue 7, July 2024

Developing Natural Science Literacy in Future Chemistry Teachers through Integrated Education

Yakubova Madina

Belarus-Uzbekistan joint inter-sectoral practical technical
Institute of Qualifications Foundation doctoral student

ABSTRACT: This article explores the enhancement of natural science literacy among future chemistry teachers through integrated educational approaches. Despite the critical role of natural science literacy in effective teaching, there is a significant knowledge gap in how integrated education methods can be systematically applied to teacher training programs. This study employs a mixed-methods approach, combining quantitative assessments and qualitative observations, to evaluate the impact of an integrated education framework on the science literacy of chemistry teacher candidates. Findings reveal that participants who engaged with the integrated education model demonstrated a marked improvement in their understanding and application of scientific concepts compared to those who followed traditional training methods. The results suggest that integrated education not only enhances content knowledge but also improves pedagogical skills, thereby better preparing future teachers to foster scientific literacy among their students. These implications highlight the need for curriculum reforms in teacher education programs to incorporate integrated educational strategies.

KEYWORDS: active thinking, independent thinking, creative thinking, intellectual, regulatory, and emotional.

I. INTRODUCTION

Since integration is a specific system in the activity of teachers and not just for students, it must be the result of the overall education.

The results of integrated education will be revealed as follows:

- increasing the level of knowledge of the concepts acquired for the multifaceted interpretation of the student, using data from a complex field;

The activity-based approach, which is the basis of an integrated education system, allows teachers to accurately develop the most important types of student thinking. In the process of training active students to expand and deepen the integration of teachers, who are the most important to comprehensively solve the problems of the formation of their creative thinking activities This process allows teachers of creative thinking to reach the real heights of teaching excellence.

In the context of the widespread introduction of international evaluation programs into the educational system of our country, the future chemistry teacher studied methods and methodological conditions for the development of literacy and creative activity in the natural sciences. Based on the study of the continuing education system, and the analysis of the results of international research, he studied in depth the components of creative activity, methodological structure and literacy formation of natural sciences through interdisciplinary integration, by clarifying the scientific and methodological content that prepares future chemistry teachers for international evaluation.

Development and adaptation of the natural science literacy of the future chemistry teacher in the educational process, methods of formation of the literacy of the future chemistry teacher, and the development of tasks aimed at the correct interpretation of the concept of integration.

It is a generally accepted fact that education in developed countries is a social process that positively affects the domestic policy of the country. It is important to achieve positive results by participating in international educational requirements, student reading, natural science literacy and creative thinking, the formation of capacities for the successful use of acquired knowledge, participating in international evaluation programs of education, quality change, high efficiency.

- Changing the level of intellectual activity presented, it is necessary to consider the material from the position of the main idea and establish a natural relationship between it and the studied problem.;



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 11, Issue 7, July 2024

The designated aspects correspond to the educational and development functions of education. It's a holistic study that helps us grow our students in every possible way and delve into the topic of the lesson.

Development and adaptation of the natural science literacy of the future chemistry teacher in the educational process, methods of formation of the literacy of the future chemistry teacher, and the development of tasks aimed at the correct interpretation of the concept of integration.

It is a generally accepted fact that education in developed countries is a social process that positively affects the domestic policy of the country. It is important to achieve positive results by participating in international educational requirements, student reading, natural science literacy and creative thinking, the formation of capacities for the successful use of acquired knowledge, participating in international evaluation programs of education, quality change, high efficiency. [3; 85-86-page].

The purpose of the study: the development of tasks aimed at improving the literacy of the natural sciences of the future chemistry teacher and the formation of the literacy of the future chemistry teacher based on adaptation to the educational process.

In our country, reforms are being implemented, based on advanced foreign experience, aimed at ensuring the development of modern competency-based approaches that provide the formation of educational and cognitive abilities for the system of continuing education of students in the general secondary education system. Create an educational environment aimed at modernizing the content of modern education and develop the necessary conditions for the realization of internal abilities in the formation of educational and cognitive abilities among teachers [4; 471-477-page].

II. LITERATURE REVIEW

The decision of the President of the Republic of Uzbekistan on the approval of the concept of the development of the public education system of the Republic of Uzbekistan by 2019-4-29 in the PD-5712 ranking of the international program of Pisa established the task of achieving the first best by 2030 to create the world's developed and national systems 30. Degree of knowledge of the problem. The state of preparation for participation in international evaluation studies of the Republic of Uzbekistan and the development of the tasks for the development of scientific literacy of students and the organization of seminars are presented by many experts A. Radjiev, A.A. It was handed over to Ismailov. H.Zh.To daminov, n.A.Karimov, G.O.Togaeva, K.K.Karimberdiyev, Z.A.Kasimova, G.A.Pirimova, D.Askarova, S.R.Akbarova, M.Boymuratova. The curriculum and research seminars created by them reflect aspects of student literacy formation in the evaluation work of international students [5; 9-22-page].

The degree of knowledge of the problem. The state of preparation for participation in the International Assessment Study of the Republic of Uzbekistan and the development of tasks for the development of scientific literacy of students and the organization of seminars are presented by several experts A. Radjiev, A. A. Was handed over to Ismailov. H.Zh.To Daminov, N. A. Karimov, G. O. Togaeva, K. K. Karimberdiyev, Z. A. Kasimova, G. A. Pirimova, D. Askarova, S. R. Akbarova, M. Boymuratova. The curricula and study seminars created by them reflect aspects of student literacy formation in international student assessment work [5; 9-22-page].

Degree of knowledge of the problem. The state of preparation for participation in international evaluation studies of the Republic of Uzbekistan and the development of the tasks for the development of scientific literacy of students and the organization of seminars are presented by many experts A.Radjiev, A.A. It was handed over to Ismailov. H.Zh.To daminov, n.A.Karimov, G.O.Togaeva, K.K.Karimberdiyev, Z.A.Kasimova, G.A.Pirimova, D.Askarova, S.R.Akbarova, M.Boymuratova. The curriculum and research seminars created by them reflect aspects of student literacy formation in the evaluation work of international students [5; 9-22-page].

In order to improve the quality of education and prepare for International Assessment Systems in the CIS countries, several scientists are conducting research. For Example: G. S. Kovaleva, L. O. Roslova, G. A. Sidorova, A. Y. Pentin, N. A. Avdenko, assessment of creative thinking in the context of international PISA studies and developments; from the point of view of the concept of the teacher's creative activity, as well as possible methods of its formation and development I. P. Nikitin, I. P. Goda, N. Ya. Khryasheva; future chemistry teacher I. Succyx, E. Zir, O. The main content of the formation of creative abilities of tutoring.

To evaluate and develop creative thinking in the context of international studies, to analyze the results of students' International Assessment studies, foreign scientists M. Hamilton, B. Maddox & K. Eddy's research work, which focuses on the study, development of natural science literacy, can be cited. Benavo, Barroso De Carvalho, E. Hanushek, W. Ludger, H. Rindermann et al. J. Cesi, Andreas Schleicher, Estado São Paulo.

of literature and scientific research consist of problems identified as a result of its study:

The fact that the future chemist did not conduct research work to improve the literacy of teachers in natural sciences; Integration of science is not used in the formation of literacy in the natural sciences of future chemistry teachers;

It turned out that the future chemistry teacher did not study the methods of scientific interpretation of natural phenomena in the formation of natural science literacy.

Objectives and objectives of the study based on the identified problem:

Development of didactic materials to improve the natural science literacy of future chemistry teachers;

Development of methodologies for using the integration of science in the formation of natural science literacy Future chemistry teachers;

Development of methods of scientific interpretation of natural phenomena in the formation of natural science literacy in future chemistry teachers;

The formation of the literacy of the future chemistry teacher is based on the adaptation of the tasks aimed at developing the literacy of the natural sciences of the future chemistry teacher into the educational process.

III. MATERIALS AND METHODS

The development of literacy and creative activity in the natural sciences by future chemistry teachers in the context of the widespread introduction of international evaluation programs into the educational system of our country.;

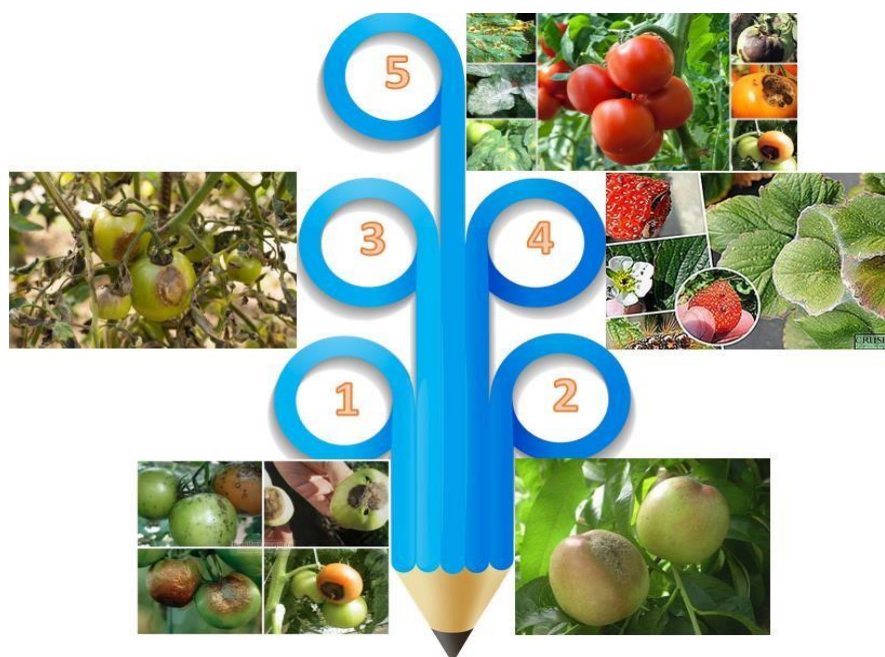
Creative activities, methodological structures and components of the formation of natural science literacy through the study of future chemistry teachers, based on research, clarification of the scientific and methodological content of preparation for international evaluation studies, analysis of the results of international studies in the system of continuing education, interdisciplinary integration;

Develop tools for the development of creative activities and natural science literacy on the basis of integrated scientific and practical competency approach in the functional development of motivational skills of educational and cognitive activity in the development of natural science literacy of the systematic evaluation program and future chemistry teachers;

It consists of the development of methodologies for the use of information and communication and educational technologies in the formation of literacy of natural sciences in future chemistry teachers [6; 300-301-page].

To increase the natural science literacy of the future chemistry teacher, it is necessary to create a database of didactic materials, a collection of practical classes and tasks in the form of project work.

In the process of forming natural science literacy, future chemistry teachers prepare tasks for the development of methods of scientific interpretation of natural phenomena and, based on these tasks, are used to improve the literacy of future chemistry teachers [10].





Task: Carefully read the text above and find out the diseases of the plant, which are represented in the image below. Identify the chemicals used against these diseases. Write your answer in the line below.

Based on the adaptation of the task aimed at developing the literacy of the natural sciences of the future chemistry teacher into the educational process, it is necessary to prepare contextual tasks presented below in the formation of the literacy of the future chemistry teacher and edited using international assessment studies [8; 234-237-page]. The reason is that such tasks are compiled based on the topics included in the training load.

Future chemistry teachers will have the skills to perform tasks based on international assessment studies, form the capacity for scientific interpretation of data and evidence, and prepare contextual tasks related to them. In the process of performing the tasks set for project work, it is necessary to carry out a scientific analysis of the results and conclusions obtained [9; 1570-1577-page].

By teaching the analysis of the performance of the above tasks and their results, you can form your literacy in the natural sciences.

IV. RESULTS

The use of tasks based on the integration of information communication and educational technologies in international evaluation studies has shown excellent results. 3rd grade 2 groups were selected, and 25 people in each group, a total of 50 people participated. The possibilities of students in both groups are equal to each other). The first group is the experimental group, and the 2nd group of students is the control group. In the experimental group, classes were organized by analyzing the above tasks on concepts based on information and communication and educational technologies. In the control group, classes were organized in the traditional way (lectures, mental attacks, table tennis). To analyze the knowledge obtained, both groups were given the same tasks and analyzed according to the results.

As a result, it was found that the natural science literacy of students in the experimental group was 16% higher than that of students in the control group, as shown in the table above.

Quantity	Students in the group	Excellent rating	Good rating	Satisfactory assessment	Unsatisfactory assessment	Quality indicator
An experienced group	25	17	7	1	0	96%
Control group	25	11	9	5	0	80%
Difference in results		6	-2	-4	0	16%

Debate. The purpose of the study is to develop tasks aimed at developing the literacy of future chemistry teachers, based on the development of literacy in the natural sciences and adaptation to the educational process [11].

In the course of the study, based on the tasks, methods of using information and communication, educational technologies and integration of science in the formation of the literacy of the natural sciences of the future chemistry teacher were described [12; 62-68-page].

The research task is completed. For example:

Didactic materials are developed to improve the literacy of the natural sciences of future chemistry teachers [13; 82-85-page];

The future chemistry was introduced into the reading process by developing a methodology that uses the integration of science in the formation of the teacher's natural science literacy;

The method of scientific interpretation of natural phenomena was developed in the formation of the literacy of the natural sciences of the future chemistry teacher [14; 1109-1114-page];

Based on the adaptation of tasks aimed at developing the literacy of the natural sciences of the future chemistry teacher, the literacy of the future chemistry teacher is formed for the educational process [15; 91-93-page].

In the process of conducting research in several areas, concepts such as the correct interpretation of integrals, the execution of tasks and the scientific interpretation of tasks were mastered [16; 147-149-page]. In this way, we were able to achieve the goals we set ourselves and complete the task set completely.



When conducting research, it was relatively difficult for the future chemistry teacher to formulate skills for dealing with tasks.

Recommendations based on research results:

The use of the integration of science in the formation of natural science literacy in future chemistry teachers;

Based on the adaptation of the future chemistry teacher to the educational process, the introduction of tasks aimed at developing the literacy of the natural sciences into the course process was further developed [17; 17-22-page].

It was emphasized that it is necessary to teach the scientific interpretation of natural phenomena using the concept of chemistry.

Based on the content of the attached file, here is a possible conclusion for your scientific article:

V.CONCLUSION

The findings of this study underscore the significant impact of modernizing educational methods through the integration of information and communication technologies on enhancing natural science literacy among future chemistry teachers. The experimental group, which was exposed to these innovative teaching methods, exhibited a 16% higher literacy rate compared to the control group. This demonstrates the efficacy of such integrative approaches in fostering educational outcomes. The implications of this research are profound, suggesting that adopting advanced pedagogical strategies can substantially improve the quality of education in the natural sciences. Future research should explore the long-term effects of these methods on students' overall academic performance and their adaptability to other scientific disciplines. Additionally, expanding the scope of this study to include diverse educational settings and larger sample sizes would provide a more comprehensive understanding of the benefits and challenges associated with these educational innovations.

REFERENCES

1. Lisova G.G., Ashtrafziyanov A.I., Nikiforova T.A., Prilezhayeva L.G., Saliyev N.N. Uslubiy maqolalar to'plami "Integratsiya rivojlanuvchi ta'lim uchun ". ANO SOSH "Premier". 2014 yil
2. On April 29, 2019 PF-5712-son "The Republic of Uzbekistan will have a 2030 implementation of the PF-5712 concept of the Republic of Uzbekistan".
3. Ergashovich, S. I. (2022, December). PREPARATION OF STUDENTS FOR INTERNATIONAL EXAMINATION STUDIES OF FUTURE CHEMISTRY TEACHERS FORMATION OF SKILLS. In Proceedings of
4. International Conference on Modern Science and Scientific Studies (Vol. 3, pp. 121-125). Ergashovich, S. I. (2022). TASKS AND IMPLEMENTATION OF INTERNATIONAL EVALUATION STUDIES IN UZBEKISTAN.PEDAGOGICAL SCIENCES AND TEACHING METHODS, 2(18), 85-90.
5. Ergashovich, S. I. (2022). THE USE OF INTERNATIONAL ASSESSMENT RESEARCH COMPETENCIES IN THE FORMATION OF THE LITERACY OF FUTURE CHEMISTRY TEACHERS. Web of Scientist: International Scientific Research Journal, 3(12), 471-477.
6. Ergashovich, S. I. (2021). USE OF INTEGRATED TECHNOLOGIES IN PREPARING HIGHER EDUCATIONAL INSTITUTION STUDENTS FOR INTERNATIONAL ASSESSMENT PROGRAMS ON" ORGANIC CHEMISTRY". Emergent: Journal of Educational Discoveries and Lifelong Learning (EJEDL), 2(01), 9-22.
7. Ergashovich, S. I. Preparation for the International Assessment System Using Modern Methods in Teaching Students in the General Secondary Education System. International Journal on Integrated Education, 3(12), 300-305.
8. Shernazarov, I., & Xodjabayeva, N. (2022). XALQARO BAHOLASH TADQIQOTLAR MATERIALLARIDAN FOYDALANISHDA ZAMONAVIY TEXNOLOGIYALARNING AHAMIYATI. Science and innovation, 1(B8), 1578-1582.
9. ERGASHOVICH, S. I., & ORIFJONOVICH, T. N. Clear and Natural in Teaching Higher Education Institution Students on the Basis of the International Stem Education Program Characteristics of Integration of Sciences. JournalNX, 6(12), 234-237.
10. Bektosheva, S., & Shernazarov, I. (2022). O 'QUVCHILARDA FUNKSIONAL SAVODXONLIKNI RIVOJLANTIRISH METODIKASINI TAKOMILLASHTIRISH. Science and innovation, 1(B8), 1570-1577.
11. Ergashovich, I. S. (2019). THE IMPORTANCE OF INFORMATION COMMUNICATION AND PEDAGOGICAL TECHNIQUES IN TEACHING ORGANIC CHEMISTRY IN NATURAL SCIENCES AT ACADEMIC HIGH SCHOOLS. European Journal of Research and Reflection in Educational Sciences Vol, 7(11).
12. Berdikulov, R. S. (2020). Developmental factor of chemical thinking of future chemistry teachers. European Journal of Research and Reflection in Educational Sciences, 2020.
13. Berdikulov, R. S. (2017). DEDUCTION OF CHEMICAL THOUGHT. European Research, (5), 62-68.
14. Berdikulov, R. S. (2022). KIMYO TA'LIMIGA MANTIQQ QOIDALARINI INTEGRATSIYALASH TO 'G 'RISIDA. Talqin va



ISSN: 2350-0328

**International Journal of Advanced Research in Science,
Engineering and Technology**

Vol. 11, Issue 7, July 2024

tadqiqotlar ilmiy-uslubiy jurnali, (1), 82-85.

15. Berdiqulov, R. (2022). DEDUCTIVE ANALYSIS TEACHING CHEMISTRY LOGICAL QUALITATIVE FOUNDATION. Science and Innovation, 1(8), 1109-1114.
16. Ismailov, S. A. (2023). ORGANIZATION OF EXPERIMENTAL EXPERIMENTS USING MODERN METHODS OF TEACHING CHEMISTRY. Journal of new century innovations, 20(4), 91-93.
17. Ismailov, S. A., qizi Avazova, K. E., & Dangkalova, A. A. (2022). THEORETICAL BASIS OF USING INTERACTIVE MEDIA RESOURCES IN TEACHING CHEMISTRY. INNOVATIVE DEVELOPMENT IN THE GLOBAL SCIENCE, 1(6), 147- 149.
18. Amanov, R. A. (2023). Formation Of Concepts About the Periodic Law and the Structure of the Electronic Shells of Atoms of Elements. Eurasian Journal of Learning and Academic Teaching, 16, 17-22.