



# Mechanisms of Developing Students Professional Competence in Engineering Activities

**Avazov Jo'rabek Donievich**

Lecturer at Termez Institute of Engineering and Technology  
Termez, UZBEKISTAN

## ABSTRACT

The article describes the mechanisms of development of professional competence of students in engineering activities in higher education institutions on the example of the development and use of data maps in the form of a systematic list of textual and graphical data on specific topics of "Engineering and Computer Graphics".

## Keywords:

Higher, Educational, International, Student, Educational, Professional, Competence, Engineering, Computer Graphics, Text, Graphics, Imagination, Activity, Intellectual, Creative, Cognitive, Ability, Efficiency.

There is a growing need in the world for the training of engineers, the formation of a creative personality, the improvement of professional graphic competence in order to achieve success in the economic development of science, various spheres of production.

Global Engineering Excellence Initiative (GEEI) according to the report, the qualification of the engineer is characterized by the ability to creatively solve problems of creating new equipment, developing modern high technologies, optimizing the production and operation of technical facilities.

According to international best practices, International Office of Science and Engineering [OISE], American Society for Education and Development [ASTD], National Society of Professional Engineers (NSPE), Institute of Engineering and Technology (ABET), British Engineering Council (ECUK), Australian Institute of Engineers (IEAust), and the Japan Engineering Education Accreditation Council (JABEE), Innovative intellectual centers such as provide professional development opportunities, regulate and provide training for engineers, innovative approaches to the

development of engineering, the formation of professional competencies of future engineers through the application of modern methods in the educational process, the integration of global skills in future engineers.

Therefore, identifying promising areas for improving the professional competence of students in engineering, optimizing various forms of organization of the educational process, developing criteria for assessing the professional skills of future professionals, modern trends in economic development place increasing demands on the professional qualities of the specialist.

The transformation of educational activities in our country depends on changes in the forms and technologies of the educational process, the criteria for assessing the quality of training of engineers. these needs are reinforced by a number of circumstances.

In particular, the Strategy of actions for further development of the Republic of Uzbekistan "Encouragement of research and innovation, creation of effective mechanisms for the implementation of scientific and innovative achievements" and ensuring the development of

innovations in the education system from the main activities of the Ministry of Innovation Development. The identified priorities such as the need to train competitive engineering personnel for innovative activities in the higher education system.

Many scholars A.Abdurahmanov, D.F.Kuchkarova, Sh.K.Murodov, J.Ya.Yodgorov, U.A.Nasritdinova, T.Rixsiboev, D.S.Saidahmedova, studied various problems of teaching and improving graphic education in different periods. S.S.Saydaliev, A.K.Hamraqulov, D.Sh. Dilshodbekovs conducted scientific research on the problems of graphic training and development of graphic design skills.

The problems of studying the following engineering graphics sciences: descriptive geometry, engineering graphics, basics of design, engineering and computer graphics and other geometric-graphic sciences have not been sufficiently analyzed in relation to teaching general sciences, taking into account the characteristics of future professional activity.

It should be noted that the graphic sciences, which include the organizational - pedagogical, methodological and technological basis of the educational process, quantitative and qualitative criteria for assessing the level of professional suitability at the mastering stage have not yet been developed.

1. Decree of the President of the Republic of Uzbekistan "On the Action Strategy for further development of the Republic of Uzbekistan" // Collection of Legislation of the Republic of Uzbekistan. -T., 2017. -P.39.
2. Decree of the President of the Republic of Uzbekistan "On the establishment of the Ministry of Innovative Development of the Republic of Uzbekistan" // QHMMB: 06/17/5264/0339 No 01.12.2017 y.

The above considerations lead us to the need for theoretical justification and experimental verification of the effectiveness of the system of general engineering-graphic training of university students, which is especially relevant in conditions of high demand for the quality of training. Summarizing the practical experience of students in graphic training and the analysis

of scientific and methodological work allowed highly qualified future professionals to identify the following shortcomings and contradictions in the process of graphic training.

First:

- Over the past decade, the results of many studies on the preparation of engineering graphics by professors and teachers of higher education institutions have been published. They addressed the problems of developing spatial imagination;
- There is no integrated methodological theory of the formation of professional skills in the field of engineering and production technology education;
- There is no research to increase the motivation in the study of engineering and computer graphics to ensure a high level of use of graphic knowledge in the course work and graduation work;
- In the process of adaptation of young professionals to practical, design and production activities, the problems of graphic training are not analyzed.

The most important feature of the professional formation of future engineers during their studies in higher education is the quality of graphic training. This requires the creation of pedagogical conditions in which students can ensure the effectiveness of graphic activities, taking into account modern requirements.

In the design and implementation of the process of teaching the subject "Engineering and Computer Graphics" is very important consistency of knowledge, which implies that what was achieved at an earlier stage is taken into account at a higher level of education.

This is especially relevant in the context that all the topics studied by students in the engineering and computer graphics sciences are highly interrelated. Shortcomings in preparation for previous topics of the course will immediately begin to show negative results in subsequent topics of training.

The development of new science-based forms of organizing the teaching process of engineering and computer graphics in the higher education system is based on the analysis of the purpose, structure and dependencies in the education system. Recently, the following trends have

emerged: an increase in the volume of educational information; a significant limitation of the time allotted for its study and the consequent complication of the educational content.

The integrity of the level of education and the implementation of new methodological methods in the structure of teaching graphics allows the science of "Engineering and Computer Graphics" to be integrated into the general system of training. The formation of intellectual, creative and cognitive abilities of students plays a leading role in teaching based on the principles of continuity of teaching materials.

The system, the sequence of the nature of the educational and cognitive activity of students in the forms and methods of teaching are currently based on the work of leading experts - teachers and the issues of professional training of future professionals

U.N.Nishonaliev, A.A.Abdukadirov, A.R. Xodjaboev, R. Khasanov, N.Saidahmedov, K.O.Tolipov, SSBulatov form the basis of scientific researches of scientists of the CIS countries, such as SI Arkhangelsky, VP Bepalko, VA Slastenin.

After an in-depth study of qualification requirements, curricula, sample and working programs, we analyzed the links between 5310600 - Vehicle Engineering, 5340600-Road Engineering, 5320300-Technological Machinery and Equipment and other educational disciplines and came to the following conclusion: technical higher education Accelerated targeted training of specialists in their countries can not be based only on the traditional curricula, work plans that we use. The professional orientation of education seems to have remained in the interdisciplinary space. Each department teaches students in their subject at a higher technical school, and none of them teaches students to apply their knowledge in a comprehensive manner in solving professional problems facing graduates of higher education. In the subject of "Engineering and Computer Graphics," almost all topics are traditionally described at the same level, and it is difficult for students to know exactly what they need to master in order to successfully pursue their

studies and subsequent careers. Apparently, we are training "knowledgeable" professionals, but not "talented" professionals. Students view the final controls as a benefit to themselves. In the minds of many of them, the notion of passing knowledge and skills, rather than passing exams and tests, dominates. In order to eliminate these contradictions, we tried to analyze the experience of designing, conducting and researching the educational process on the example of the subject "Engineering and Computer Graphics" for students of specialties. This process should reveal new aspects of the importance and place of engineering and computer graphics in the training of a specialist, allowing the study of the interdependence of this discipline and the specific disciplines of the program, including the graphical part.

As one of the general technical disciplines, "Engineering and computer graphics" is the main discipline in the training of engineers. Each section of it contains materials related to the content of other disciplines and involved in their study.

Therefore, in the process of studying the subject of engineering and computer graphics, it is very important to ensure an integral connection between this subject and the future professional activities of senior students and students of the University. Such coordination increases the importance of the subject of "Engineering and Computer Graphics", arouses interest in studying and learning the chosen profession. In our study, we relied on the experience gained using different subject teaching methods in secondary schools, vocational schools, technical colleges and universities with different specializations. At the same time we have I.Rakhmonov, Sh.A.Abdurahmonov, T.D.Azimov, N.J.Yodgorov, K.A.Zoyirov, R.Q.Ismatullaev, P.O.Odilov, M.Kh.Pirimjarov, I.T.Rakhmonov, E.I.Ruziev, and foreign scientists: James D. Bethune, GS Phull, HS We referred to the experience reflected in the works of Sandhu, R.B.Gupta, N.D.Bhatt, presented to a certain extent in their scientific and methodological work.

In the research of TV Chemodanov on this issue, the concept of "professional graphic training" is very interesting and sufficiently expressed - it is

possible to solve educational and professional problems using educational and professional problems using geometric modeling of flat and three-dimensional images.

"This graphic cycle is a combination of geometric, engineering-graphic, information-technological, methodological knowledge, skills and abilities in the field of general engineering sciences. There is no methodology for selecting material that actively enhances. The existing forms of organizing the educational process in engineering and computer graphics do not fully correspond to the potential for solving problems in teaching this subject, with an emphasis on the studied specialty.

One of the ways to overcome these contradictions is to look for new content and forms of teaching that fully realize the potential of teachers and students.

The problem under consideration is relevant both in terms of preparing students for academic activities in the departments of general engineering and graduate, as well as in terms of increasing the effectiveness of the educational process and increasing the mental activity of students.

Second:

The leading activity of the student is his educational and cognitive activity, and for the teacher - educational work. All of this requires the teacher to think deeply and reflect on the didactic support of preparation for lectures and practical sessions.

Today it is necessary to further democratize society, to raise the activities of higher technical education institutions to a new level of quality in the conditions of wide opportunities for the activities of private higher education institutions. This should be reflected, first of all, in the rejection of the principle of uniformity in education, the establishment of different types of educational institutions, the creation of new curricula and textbooks, the content of which corresponds to the field of higher education, the revision of teaching methods and tools.

Modern trends in the development of higher education institutions pose a number of new theoretical and practical problems for professors and teachers working in technical universities. One of them is the reflection of the

integration and differentiation of knowledge in the content, essence and activities of education. This problem can not be solved without taking into account the interdependence of the studied disciplines, Uzbek scientists R.H. Djuraev, N.J. Makukhina, A.Musurmonov, M.Q.Muxliboev, B.N.Oripov, A.A.Salomov, N.I.Taylakov, N.S.Fayzullaeva, N.I.Hurboev; and others studied in the works of educators. The sooner higher education abandons forms of teaching that are less effective in the learning process, the faster and better results will be achieved. Research based on current realities is needed. One of the tools that has a positive impact on the training of professionals is to increase their interest in the profession. The research of some foreign experts is noteworthy. The work of these authors is of great scientific and practical importance, but most of them are related to the training of future teachers, who are not sufficiently connected with the teaching process and teaching methods in higher technical schools.

The transformation of engineering and computer graphics education should be associated, first of all, with the shift towards the formation of professional qualities of the future specialist on the basis of arousing interest in the chosen specialty. In our opinion, such an approach in the design, organization and implementation of training helps to form the following basic, professional qualities of future professionals: culture (communication, information), interest in the profession, competence, professional pride, professional pride, intellectual professional self-development and so on.

Third:

Informatization of the field of education is becoming a real force due to the sharp increase in the amount of information that a person needs to understand and process both in the process of professional activity and in everyday life. The outcome of many manufacturing and non-manufacturing processes depends on its quantity and quality. Modern concepts of the education system of Uzbekistan are increasingly focused on the requirements of new ideas, didactic principles, mainly related to the use of ICT - information and communication

technologies. Computers play a mediating role not only in engineering and science, but also in the humanities, business, economics, and education. In general, computer technology has become an integral part of modern human daily life.

One of the priorities of the process of informatization of modern society is the informatization of education. The tools and capabilities of new information technologies allow to intensify and accelerate the learning process, increase its quality and efficiency.

The use of information technology in education creates great opportunities for both teachers and students. With the help of computers, students work with activated learning materials, their activity, competence increases and their creative abilities develop.

Using a computer, students will be able to observe many of the processes previously studied in a textbook or teacher's lecture in dynamics, in addition to the traditional perception of available information. The computer allows to model a variety of possible solutions with a high degree of demonstration on certain criteria, selects the most optimal from the number according to certain characteristics, that is, significantly expands the possibilities of demonstration methods in the educational process.

Improving the quality of training depends on a number of factors:

- The spread of information technology, computer training will become one of the main criteria for determining the professional training and professional culture of a young specialist;

- The use of computer technology in the study of engineering and computer graphics at the initial stage is a unifying link that connects students to a single system of interdisciplinary links between the departments of technical schools.

The analysis of the work done in the teaching of "Engineering and Computer Graphics" shows that the mastery of first-year students in graphic sciences, especially in the first semester, is insufficient. The main reason is that there is a low level of graphic preparation in school in drawing or not at all (not in school).

Based on the above considerations of educators and psychologists, it can be assumed that there are different concepts of the structure of interests, which allows it to develop a methodology for developing and implementing a general theory of interest in pedagogical activity on the example of teaching graphic sciences, taking into account the activation of professional interests.

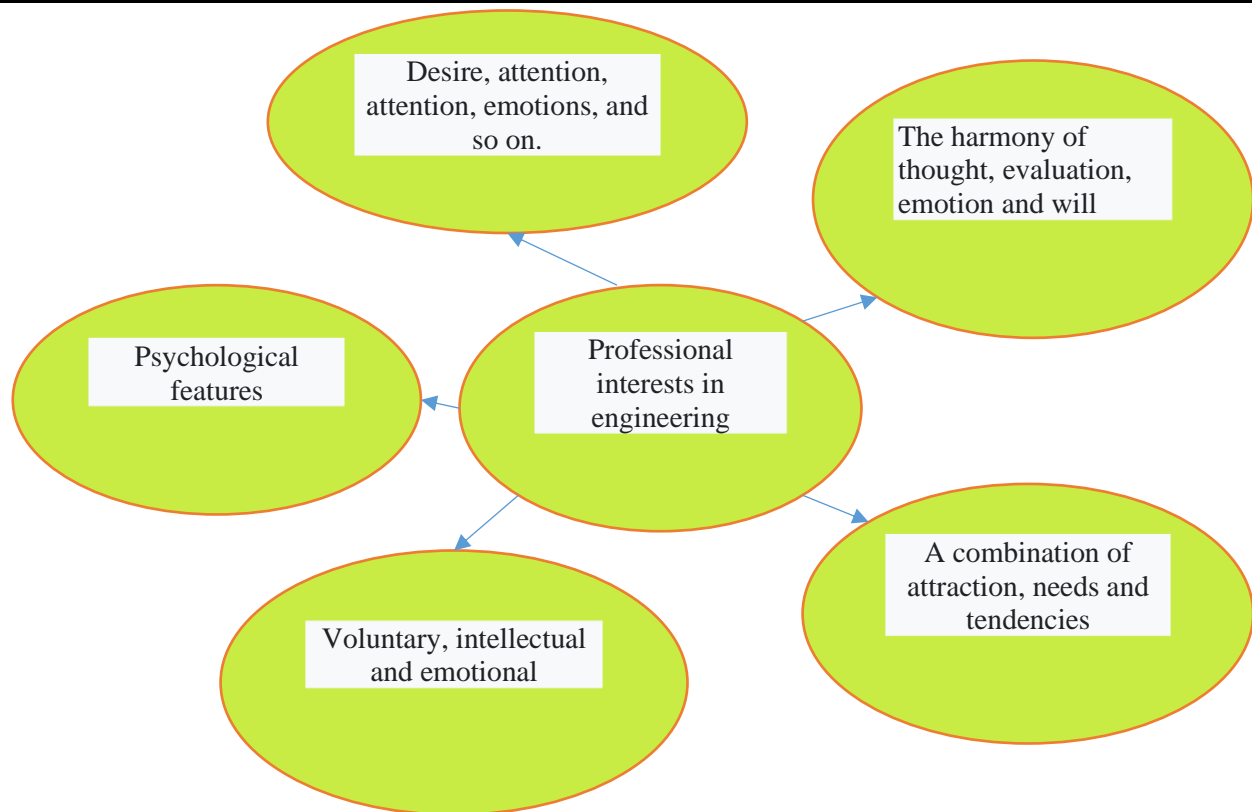


Figure 1. Students were involved in engineering activities scheme of mechanisms for the development of professional competence

Unlike cognitive interest, professional interest is characterized by great clarity, purposefulness, completeness of content, stability, because this type of interest is associated with the chosen profession and is constantly evolving and strengthening as a result of daily learning activities for the individual to acquire a profession.

It should be noted that the concept and place of professional interest in the pedagogical and psychological literature is clearly defined. However, the methods of activating professional interests in the study of engineering and computer graphics in higher education institutions that train engineers, their impact has not been sufficiently studied, and this partly defined the mission and purpose of our research.

As future professionals, students should be able to study curriculum materials creatively, gain the necessary professional skills, and know how to apply scientific and technical advances in practice. The purpose of any educational

process in engineering universities (among other conditions) is to activate the professional interest of students through a specially designed program, which, in our opinion, is the basis of the pedagogical process as a key process in the development and improvement of the specialist.

Taking into account all of the above, the following conclusions can be drawn:

The main criteria for conducting a report are: its necessity in discussing important and contradictory points; ease of learning the most difficult topics for independent analysis.

Lecture courses in engineering and computer graphics have their own characteristics. At the same time, there is a need to change and improve the presentation of the traditionally structured theoretical material.

A methodically organized lecture provides comprehension, comprehension, and recall of the learning material.

It is necessary to create a methodology for teaching lectures at a level that activates and enhances the intellectual potential of students, that is, directs it to the main areas of individual educational research activities.

Given the large amount of theoretical material available to students in a time-limited environment (shortening lecture time), it is important to develop and use information maps in the form of a systematic list of textual and graphical data on specific topics in Engineering and Computer Graphics.

Practical lessons are one of the important elements in the formation of the educational process in higher education.

The rational organization of practical training based on the maximum activation of the process of acquiring knowledge, skills, abilities is very important for improving the quality of professional training of specialists.

Engineering and computer graphics are not new sciences, and the method of conducting practical classes in the classroom is considered to be well developed, but does not fully meet the requirements required for the organization of reading.

A detailed analysis of the many methods of conducting practical training in higher education institutions that train engineers has allowed us to highlight some of their shortcomings.

The quality of the identification of the theoretical material needed to check the scope of homework and correct errors depends on the individual characteristics of the teacher.

There is almost no control over the level of knowledge acquisition of each student individually.

There is no opportunity to organize the learning process at the level of effective and creative activity of students in practical classes.

Not making wise use of the time allotted for training.

The problem of checking homework in practical training in engineering and computer graphics is not sufficiently developed.

The content of the material studied in the practical lesson does not meet the requirements of future educational activities of students in the study of special subjects in senior courses.

To improve the quality of knowledge acquisition, the learning process should be reviewed in a practical lesson.

Any classroom teaching method needs to be reconsidered to enhance independent work.

Organize a qualitatively new level of management of the independent work management system.

Under the guidance of a teacher, students' classroom work should focus on independent extracurricular activities.

If new materials contain theoretical rules that are as complex as possible, it will be effective to engage students in independent work.

In the process of organizing independent work, we believe that it is necessary to establish a chain of personal thinking and feedback of students.

#### List Of References:

1. Decree of the President of the Republic of Uzbekistan "On the Strategy of further development of the Republic of Uzbekistan" // Collection of Legislation of the Republic of Uzbekistan. -T., 2017. -P.39.
2. Decree of the President of the Republic of Uzbekistan "On the establishment of the Ministry of Innovative Development of the Republic of Uzbekistan" // No. 06/17/5264/0339 dated 01.12.2017.
3. Azizxo'jaeva N.N. Pedagogical technology and pedagogical skills: Textbook. - T.: TDPU, 2003. - 174 p.
4. Babanskiy Yu.K. Teaching methods in modern general education school. T.: Teacher, 1990. - 232 p.
5. Ball G.A. Theory uchebnyx zadach: Psichologo-pedagogicheskiy aspekt. M.: Pedagogika, 1990. - 184 p. 120.
6. Bepalko V.P. Slagaemye pedagogicheskoy tekhnologii. M.: Pedagogika, 1989. - 192 p.
7. Skatkin M.N., Kraevskiy V.V., Kiselev A.F. Sovershenstvovanie protsessa obucheniya - M., 1971. - C.97
8. Ziyomammedov B. Advanced pedagogical technology: theory and practice. T.: Abu Ali ibn Sina Medical Publishing House, 2001. - 78 p.

9. Yuldashev J.G., Usmanov S.A. Basics of pedagogical technology. T. : Teacher, 2004. - 236 p.
10. Teacher, 2004. - 236 p.
11. Golish L.V. Active methods of teaching: content, selection and implementation. Methodical manual. T. : O'MKHTRI, 2001. - 128 p.
12. Chekmarev A.A. Nachertatel'naya geometriya i cherchenie: Ucheb. for stud. vyssh. ucheb. zavedeniy. - 2-e izd., Pererab. and dop. - M. : Humanities. izd. VLADOS center, 2003.- 472 p.
13. Yurin V.N. Kompyuternye tekhnologii v uchebnom protsesse inzhenerogo obrazovaniya // informatsionnye tekhnologii. 1999.-№ 3 - p. 45.
14. Shomirzaev M.X. Innovative pedagogical technologies in teaching technology. Textbook. -T. : Tafakkur, 2021. - 226 p.
15. Yakovlev E.V. Upravlenie kachestvom obrazovaniya v vysshey shkole: teoriya i praktika. - Chelyabinsk, 2000.- 427 c.
16. G.S Phull , H.S. Sandhu. Schools for the 21 st Century. - San Francisco, 1990. - P.164
17. Guy R. Lefrancois. Psychology For Teaching. - USA, 1991.- P.449
18. Shomirzayev M. K. Developing educational technologies in school technology education //Asian Journal of Multidimensional Research. - 2021. - T. 10. - №. 5. - C. 73-79.
19. Shomirzayev M. K. Education is personally focused technology //European Journal of Research and Reflection in Educational Sciences Vol. - 2020. - T. 8. - №. 8.
20. Shomirzayev M. K. et al. National handicrafts of Uzbekistan and its social-economic significance //European Journal of Research and Reflection in Educational Sciences. - 2020. - T. 8. - №. 8. - C. 129-138.
21. Shomirzayev M. K., Yuldashov K. K. The Educational Importance of Teaching Knowledge to Secondary School Students //CURRENT RESEARCH JOURNAL OF PEDAGOGICS. - 2021. - T. 2. - №. 08. - C. 132-142.
22. Shomirzayev M. K. Practical lessons in technology: Characteristics of organization and conduct //Asian Journal of Multidimensional Research. - 2021. - T. 10. - №. 4. - C. 991-1001.
23. Shomirzayev M. K. The concept of pedagogical technology and basic principles //ACADEMICIA: An International Multidisciplinary Research Journal. - 2020. - T. 10. - №. 11. - C. 1551-1560.
24. Shomirzayev M. K. The Concept of Pedagogical Technology and Basic Principles. Academicia: An International Multidisciplinary Research Journal.(Affiliated to Kurukshetra University, Kurukshetra, India), Vol. 10, Issue 11, November 2020 Scientific Journal Impact Factor (Sjif 2020-7.13). Part 1554-1563.
25. Shomirzayev M. K. The Ethical Characteristics of Traditional Embroidery of Fergana Valley People //European Journal of Research and Reflection in Educational Sciences Vol. - 2019. - T. 7. - №. 12.
26. Shomirzayev M. K. Technology of Educational Process in School Technology Education //The American Journal of Social Science and Education Innovations. Impact Factor. - T. 5. - №. 02. - C. 212-223.
27. Shomirzayev M. K. Ethnic characteristics of national traditional crafts //European Journal of Research and Reflection in Educational Sciences Vol. - 2020. - T. 8. - №. 12. - C. 216-225.
28. Shomirzayev M. K. Combined In Technology Courses Use Of Technologies //The American Journal of Social Science and Education Innovations. - 2021. - T. 3. - №. 05. - C. 389-396.
29. Shomirzayev M. K. Local features of the traditional embroidery of the Fergana valley //European Journal of Research and Reflection in Educational Sciences Vol. - 2019. - T. 7. - №. 12.
30. Shomirzayev M. X., Karimov I. I. Innovative pedagogical technologies in



- teaching technology //Т.:“Universitet. – 2020. – С. 125.
31. Shomirzayev M. X. Innovative processes in Uzbek national handicrafts //Т.:“New edition. – 2019.
32. Shomirzayev M. K. The Concept of Pedagogical Technology and Basic Principles. *Academica: An International Multidisciplinary Research Journal*. (Affiliated to Kurukshetra University, Kurukshetra, India), Vol. 10, Issue 11, November 2020 Scientific Journal Impact Factor (Sjif 2020-7.13). Part 1554-1563.
33. Shomirzayev M. X. Ways to increase the effectiveness of teaching technology //Methodological manual. – 2019.
34. Исмаилов Х. Х. и др. Матер. конф." Фотоэлектрические явления в полупроводниках-2004. – 2004.
35. Шомирзаев М., Авазов Ж. OLIY TA'LIM TIZIMIDA BO 'LAJAK MUHANDISLARNING TAYYORLASHNING BA'ZI JIHATLARI //ЦЕНТР НАУЧНЫХ ПУБЛИКАЦИЙ (buxdu.uz). – 2021. – Т. 4. – №. 4.
36. Shomirzayev M. K., Yuldashov K. K. Use of Some Historical Materials in Technology Education Classes //International Journal of Multicultural and Multireligious Understanding. – 2021. – Т. 8. – №. 11. – С. 184-195.
37. Shomirzayev M. K., Yuldashov K. K. Student-Folk Craft for Young People Teaching History as a Factor of National Education //International Journal of Multicultural and Multireligious Understanding. – 2021. – Т. 8. – №. 8. – С. 475-486.
38. Shomirzayev M. K. PEDAGOGICAL TECHNOLOGIES-AS A FACTOR TO INCREASE STUDENT KNOWLEDGE IN SCHOOL TECHNOLOGY CLASSES //CURRENT RESEARCH JOURNAL OF PEDAGOGICS. – 2021. – Т. 2. – №. 05. – С. 84-96.
39. Kh S. M. Young People from "Technology" to Profession Training as a Factor of Competitive Personnel Training //International Journal of Multicultural and Multireligious Understanding. – 2021. – Т. 8. – №. 4. – С. 580-591.
40. Shomirzayev M. K., Yuldashov K. K. Carpenter, jewelery, knifecourse development of application methods //Asian Journal of Multidimensional Research. – 2021. – Т. 10. – №. 8. – С. 302-308.
41. Shomirzayev M. K., Pakhratdinova R. O. Characteristics of Organization and Conduct of Practical Courses on National Crafts in Technology //Asian Journal of Research in Social Sciences and Humanities. – 2021. – Т. 11. – №. 9. – С. 182-192.