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DEVELOPMENT OF STUDENTS' TECHNOLOGICAL COMPETENCE IN THE PROCESS OF RESEARCH-BASED LEARNING VIA FOREIGN LANGUAGE ENVIRONMENT IMMERSION BY MEANS OF IMMERSIVE TECHNOLOGIES

Highly developed society has several constants which it relies on as on the necessary components of its development. The main of these constants, without a doubt, can be considered the educational system, since it is the educational system that lays the foundation of everything – it is entrusted to form a citizen to upbring a comprehensively developed, educated person ready to accept challenges of modern life. Ukraine is trying to accomplish this task in a very particular way. Over the 28 years of the existence of the independent Ukrainian state, each and every minister of education began his work with the proclamation of a task to reform the educational system. Moreover, reformation sometimes looked like a reform for the sake of the reforms themselves, and not for a better organization of the educational system.

The development of technological competence is associated with scientific achievements and the rapid development of technology. Technical achievements create new social relations and new social problems. Society needs skilled workers with good vocational training, ready to work in both native and foreign communicative environment. It is a question of formation of the social order for emergence of special educational discipline.

With the acceleration of world scientific and technological progress, there was an urgent need for a large number of English-speaking technicians. The new social model of the student involves the formation of a balanced relationship between technical and humanitarian knowledge. This modelling system saves elements of technocracy and suits modern level of informative - communication technologies. At the same time, the emphasis is shifting from technology to the person for whom favourable conditions for holistic development and self-development are created.

Educational reforms revolve around the same meanings: modernization, Europeanization, computerization, innovation. Innovations in education – a fashion tribute or a time demand? And what is innovation in education? Firstly, it is innovation within the subject itself, due to the specifics of its teaching [1]. Secondly, it is the implementation of non-traditional pedagogical technologies in pedagogical practice [2]. And there are innovations related to the call of time, the need for change, they are the primary basis of all innovations, and precisely they have touched us now, as a specialized school with profound study of foreign languages, and in our opinion, have touched very painfully. Namely, the question as for the existence of the very concept of a "specialized school", its perspectives has been raised.

According to the educational reform, knowledge of a foreign language is one of the key competencies. Knowledge of a foreign language is important for everyone: for mathematicians, and for chemists, for biologists, etc., that is, a foreign language is not the main object of study, but an indispensable means of communication. The computer-based learning environment (COMSRL) "Clever" is based on scientific concepts, including the results of previous researches of advanced scientists: theoretical aspects of the concept of R.J. Pearson *(tailoring Clicker Technology to Problem-Based Learning)* [3], M.S. Patel, D.A. Asch, K.G. Volpp *(wearable devices as facilitators, not drivers, of health behavior change)* [3], R. Shadiev, W.Y. Hwang, T.Y. Liu *(a study of the use of wearable devices for healthy and enjoyable English as a Foreign language learning in authentic contexts)* [4], Rey F. González *(can the Concept of Activity Be Considered as a Theoretical Device for Critical Psychologies)* [5] which are the foundation of new state educational standards and are focused on the practical educational and cognitive students' activity, the formation of the younger generation as the basis of a new society of knowledge; scientific and technical creativity and handicraft; principles of blended and adaptive learning [6]; the practice of training specialists in the field of highly-productive calculations.

Considering that the direct reflection of modern processes in the field of science and the life of society is the participation of students and teachers in experimental work [9], taking into account the vast experience of the creative group, a scientific experimental work "Formation of students' technological

competence via foreign language environment immersion by means of informatized educational process" was carried out. *Technological competence* is understood as the form of intellectual activity of students, which is aimed at searching and designing the principles of a system of actions in order to solve creative technical tasks [7].

The aim and objectives of the study. The aim of this study is to identify the potential of the English language in order to form the technological competence of students to increase the effectiveness of teaching subjects of the natural-mathematical cycle, the intellectual development of students and the formation of persistent cognitive interests using informational and communicational technologies. To accomplish the aim, the following tasks have been set: 1). Formation of geoinformation competencies via foreign language environment immersion by means of informatized educational process. 2). Formation of chemico-technological competence via foreign language environment immersion by means of informatized educational process. 3). Formation of aesthetic-cultural competencies via foreign language environment immersion by means of informatized educational process. 4). Formation of research-technological competencies via foreign language environment immersion by means of informatized educational process. 5). Etymological analysis of the word in the process of students' technological competence formation by means of informatized educational process. 6). Information-communicational technologies as a way of forming students' technological competence by means of a foreign language environment [8].

To achieve the goal of the study, empirical methods were used: observation of the educational process of students during their teaching of mathematics, analysis of the results of students' academic achievements. A set of methods of scientific cognition was effectively used: a comparative analysis to clarify different views on the problem and determine the direction of research; systematization and generalization to formulate conclusions and recommendations; generalization of the author's pedagogical experience and observations in the framework of experimental research [9]. A differential-integration approach was used, taking into account the theoretical and experimental verification of research results, indicators of superiority in the attitude of students to the use of certain information resources, and levels of intellectual development. Each of these methods was represented by a task that students received and solved during research study.

The technique of immersion in a foreign language environment CLIL (Content and Language Integrated Learning) is used providing the teaching of the natural-mathematical cycle subjects of COMSRL in English [10]. In the Ukrainian language the abbreviation CLIL means "subject-integral learning" or "context-lingual". Learning English is considered as a way of mastering other subjects, which forms the desire to learn them [11].

In the framework of *the research-experimental work "Formation of students' technological competence via foreign language environment immersion by means of informatized educational process"*[12], programmers of optional courses were worked up and classes were held (grades7-8). *One of the advantages of COMSRL for a teacher is that he/she can stop being an English teacher for some time, and can become a teacher in a different field of knowledge, which is undoubtedly positive for the effectiveness of learning and the intellectual level of student's development* [13]. *In addition, it was an excellent opportunity for students to try to learn the language in context and in a more natural way with the appropriate and motivated use of ICT.*

The didactic tools of immersion technology include: diagrams, graphs, communicative situations, videos, audios [12]. When studying English in a specialized school, the attention of a teacher and students is concentrated on the language, but in immersion, the language studied goes to the periphery, and *the content of the subject* draws attention of both, the teacher and the students. In the process of conducting optional classes, it became clear that a foreign language, like no other discipline, is opened to the use of educational materials of the natural-mathematical subjects [10].

The use of the English language for the formation of students' technological competence in the process of research teaching creates an opportunity to increase motivation in the context of studying other subjects and the English itself, develops potential and creativity, activates cognitive activity, increases independence and initiative in acquiring new knowledge in technological competencies, creates conditions for professional self-determination and development of students (according to the State Standard of Higher Professional Education of Ukraine, foreign-language professional competence is an obligatory component of the professional competence of any modern specialist). All mentioned above, indicates the relevance and timeliness of the experimental research [13].

Formation of geoinformation competencies via foreign language environment immersion by means of informatized educational process

Geoinformation technologies (GIT COMSRL) significantly affect the life of modern people. Today it is common to search for information about the location of certain objects or phenomena on the Earth's

surface, analyze and select the optimal path in the area and so on by means of GIT. The evolution of GIT is based on a number of fundamental GIT characteristics taking into account the trends of computer technology and Internet technologies. Despite the existence of a great amount of researches of native and foreign scientists on the development and use of geographic information technologies (Esri, Intergraph, Autodesk, GE Network Solutions, Mapping Information Systems, Leica Geosystems) [1], the question of the application of these technologies by means of secondary education, *mainly including foreign language environment immersion, still remains insufficiently researched and relevant.*

Undoubtedly, the study of geoinformatics of COMSRL and its technologies without covering certain sciences (geology, geography, geodesy) is impossible and incorrect [10]. The importance of geography in the people's minds is often underestimated. Geoinformatics has become an interdisciplinary science. That is why the subject of geography was chosen as a profile for the optional course, or more precisely geoinformational technologies, which are formed via foreign language environment immersion. *The purpose of the optional course "Formation of geoinformational competencies via foreign language environment immersion by means of informatized educational process"* is to identify and develop the potential of a foreign language using geoinformational technologies in order to improve the research learning and to form the sustainable cognitive interests of students.

Achieving this purpose involved solving certain tasks: *to test an optional course in natural sciences in English; to motivate students to study geography and GIS- technologies in English by immersing themselves in a foreign language environment; to provide conditions for personal and professional development and self-determination of students.*

During the first classes, students discussed geography as a science about the Earth, learnt to make their own geographical observations and studied the idea of the Earth's shape in ancient times. Besides watching thematic videos and completing the tasks, students made their own projects and presented them to the audience. The following classes were devoted to the study of the world's map, its continents and the ability to navigate the map. The brightest tasks for students were to create puzzles about continents and built a map of the world with their own bodies. Here everyone was able to show not only knowledge of a foreign language, but also erudition.

In the process of implementing the project *"Virtual travel through the cities of the world"* (Table 1), 8th graders investigated the history of the chosen city, collected geographical location data and geophysical features [2]. With the help of a map, measuring instruments and the specified formulas, students determined the distance from Kyiv to the selected cities. From the point of view of geography, 8th graders observed and collected geographical location and geophysical features data of selected cities around the world. From the point of view of cartography, children mastered the orientation of the world's map. From the point of view of computer science, they calculated the distance using a certain formula. This project contributed to the students' formation of foreign language competence, because they practiced working with texts, processing data, describing the cities of the world, expressing their thoughts and ideas orally, working in pairs, in teams and individually [1].

Work on the project "Virtual travel around the world" (8^{th} grade) within the optional course provides students not only with new knowledge, but also promotes the ability to think critically, solve problems, explain clearly, learn GIT and navigate in modern space.

Formation of chemico-technological competence via foreign language environment immersion by means of informatized educational process

The purpose of the optional course *"Formation of chemico-technological competence via foreign language environment immersion by means of informatized educational process"* was to form chemico-technological competence of students via immersion in a foreign language environment using information and communication technologies. Students do not like or do not understand chemistry, which is due to the high level of complexity of the study material. Therefore, the main objectives of the course are as follows: *to motivate students for in-depth study of chemistry; increase the effectiveness of training; to master English better; to read and understand foreign educational and popular science texts of chemical content; to create message texts using foreign language sources; to read in a foreign language and interpret the chemical nomenclature; to explain the chemical terminology of foreign origin; to create conditions for self-improvement and development of students.*

In the classroom, teachers adhere to two principles – *scientific*, when all knowledge to be learned by students must reflect the objective reality, the material world, the laws of its movement and development, and *accessibility*, so that the material is understandable to students according to their age and level of mental development [13]. Learning is organized so that the content of educational material should correspond to the

level of students' preparation taking into account the following rules: from simple to complex, from known to unknown, from near to distant.

Research study in the course involves the implementation of practical work on the following topics: *"The origin of the science of chemistry. Why do we need chemistry?", "Chemicals in our homefirst-aid kits", "Acids and alkali in human life", "Rock salt, technology of its extraction and application", "Technology of metal extraction (copper, silver, gold)", "Technology of clean water obtaining", "Technology of establishing the naturalness of honey", "Detection of starch in vegetables and fruit",* etc. It is recommended to use the following types of exercises: *descriptive* (e.g. Describe what will happen when vinegar interacts with soda); *explanatory* (e.g. Why is calcium vital for humans?); *cognitive* (e.g. What can the addition of sulfuric acid to hot water lead to?) [10].

The organization of the experiment involves the following stages: 1) introductory instruction of the teacher (What will we observe? What conclusions will we make?); 2) study or repetition of the material required in the process of performing the experiment; 3) conducting an experiment and observing its progress by students; 4) conclusions, formation of collective and individual generalizations.

Laboratory practical's can be a means of forming chemico-technological competence of students. They aim at mastering the scientific and theoretical foundations of the subject and modern research methods, using information and communication technologies and devices. In order to increase the effectiveness of students' knowledge, much attention is paid to the development of listening skills. For example, students listen to audio materials about various chemical elements, their properties and applications

Chemistry studies the composition, structure, chemical properties of substances, patterns of chemical processes. Students have the opportunity to get acquainted with the instruction card (rule-guideline) [10], which describes step by step all the stages of the experiment [1]. This helps them to cope with the experiment without the interference of the teacher.

For example, the powerful release of foam from the container with the liquid, as a result of the interaction of Coca Cola drink with soda. The experiment is spectacular and will be remembered by the students for a long time. We study not only the emission of foam, but interaction of orthophosphate acid (which contains in carbonated water) with soda (which is alkali) and within their interaction there is a neutralization reaction. The resulting gas pushes the liquid to the surface. This leads to the formation of a powerful fountain.

The "Elephant Toothpaste" experiment is effective in the lessons [1], during which a significant increase in the volume of reagents occurs as a result of the chemical reaction. Hydrogen peroxide decomposes into water and oxygen, and yeast as a catalyst accelerates the reaction.

Due to the experiments of this type, the practical content of complex chemical reactions is reflected and the interest of students in research training increases. Experiments in this format can be carried out with students of any age and must be accompanied by an explanation of the nature of natural processes. Methods of encouraging interest in research learning are also used: creating a situation of interest in the learning process of a material (the use of cognitive games, quizzes, tests). For example, a version of the game "Bingo", in which instead of numbers students should use the names of chemical elements [10]. To awaken and consolidate interest towards knowledge, teacher's mastership and creativity are determinative which are based on his pedagogical ethics, the level of intellectual development of students and teachers.

It is important to show how certain chemical knowledge is used by humans (for example, why salt is used to sprinkle roads in winter or how to identify chemical elements in mineral waters). Analysis of life situations is of interest to students as a method of applying theoretical knowledge in practice. The purpose of the optional course is to meet the educational needs, preferences and interests of students, to acquaint them with modern achievements of chemical science. Students have the opportunity to turn to popular science literature, chemical journals, engage in chemical experiments, master the methods of chemical science, comprehensively consider issues of their interest to them and study chemistry in depth via immersion in a foreign language environment using ICT [13].

Formation of aesthetic-cultural competencies via foreign language environment immersion by means of informatized educational process. "Music is the universal language of mankind!" – said the famous American poet and translator Henry Wadsworth Longfellow. This statement was taken as a basis in the learning process within the optional course *"Formation of aesthetic-cultural competencies via foreign language environment immersion by means of informatized educational process."* Research learning began with the students' revision of the studied vocabulary and development of new lexical units, with the help of which they describe music and feelings that arise while listening to tunes [1].

The next step was to create cinquain about music in English. Students fulfilled the task creatively and enthusiastically and summarized their achievements by presenting chinquapins to the other participants

of the optional course. It should be noted that once again the close connection between music and a foreign language has been proved. While working, analyzing and doing researches special attention is paid to the need *to find a place for music in the subjects of the natural-mathematical cycle* [10]. Students presented their projects in the form of videos and shared the results in the classroom [1]

Formation of research-technological competencies via foreign language environment immersion by means of informatized educational process. In the optional course *"Formation of research-technological competencies via foreign language environment immersion by means of informatized educational process"* students are involved in practical research activities together with immersion in a foreign language environment that will affect the formation of social, cultural, intellectual, communicative, moral, aesthetic features. Modern life requires the ability to solve problems related to the use of technology, engineering, technological and design documentation (drawings, diagrams, sketches), product samples to demonstrate knowledge and apply international measurements, to determine international standards for the ratio between magnitudes and to be able to use conditional graphic abbreviations.

The purpose of forming technological and research competencies of students is [9]: *the acquisition of knowledge about technology and the main types of technological activities in everyday life; formation of skills to use tools, materials and household appliances of national and imported manufacturers; use of equipment due to the purpose and instructions (if necessary - to demonstrate translation skills from a foreign language); development of interest in technological activities in everyday life; education of the basics of work culture, careful attitude to gadgets and appliances; education of diligence, need for work, social activity; developing a conscious attitude of students to learning, civic development, moral and intellectual development of students' personality; development of creative abilities of schoolchildren in the process of their involvement in technical creative and applied activity.*

The variable modules of the course include educational topics: *1. Cooking technology. Traditions of Ukrainian national cuisine. 2. A brief overview (with a teacher's presentation) of Ukrainian national cuisine. 3. Searching and selecting a dish from Ukrainian national cuisine. Learning interesting facts about the history and origin of this dish. 4. Writing a thorough recipe with all the ingredients and detailed step-by-step instructions. 5. Writing and processing a list of necessary products, making an estimate for their purchase. 6. Preparing a dish, filming the cooking process on video. 7. Presenting the project during the culinary competition program "Master Chef", presenting your dish, evaluating its health benefits, calories, ease of preparation.*

The curriculum of the optional course "Etymological analysis of the word in the process of students' technological competence formation by means of informatized educational process" consists of the following sections: etymology of the word and its types, etymological dictionaries, etymological analysis of the word, project defense [10]. Computer technology has been used in foreign language teaching for decades.

Information-communicational technologies as a way of forming students' technological competence by means of a foreign language environment

The purpose of training within the course *"Information-communicational technologies as a way of forming students' technological competence by means of a foreign language environment"* is to form and develop technological and subject competencies via immersion in a foreign language environment to realize the creative potential of students, their socialization, which will ensure readiness for active life. activities in an informatized learning process. In the process of research training, interdisciplinary connections (English language and information and communication technologies) as well as relevant soft skills, ability to work in a team, ability to speak, manage one's time, ability to adapt, demonstrate one's creativity, show leadership and personal qualities are traced.

The purpose of the lesson-project "Live card: My New Year Resolution" (8th grade) was to make a toy card using Google disk Kinemaster Diamond Pro, QR maker, You Tube, Google Disk. Students discussed and defended their projects in English [1]. Such hardware and software items were used: browser, text editor, smart phones, computer, projector, children's projects of the past years with the text "My New Year Resolution", blanks of toys / postcards (hand made), etc.

In the process of research training children successfully demonstrated their technical knowledge, level of language skills, ability to work in a team and present work results, ability to manage their time, demonstrate their creativity, punctuality, sense of balance, showed their leadership and personal qualities.

Peculiarities of research-based learning via foreign language environment immersion by means of informatized educational process. The experimental study identified three options for the use of computer technology in education [2]: "monotechnology" - training and management of the educational process, including all types of diagnostics and monitoring, carried out by using a computer; "Basic technology" -

defining, the most significant with the use of this technology components (parts); “Penetrating technology” - the use of computer training on individual educational topics, sections in order to solve certain didactic tasks. “Penetrating” technology is used in the basic training of students.

Immersion is a technology that performs a number of functions: removes the barrier of uncertainty of students; educational material is not memorized, but experienced (learning with pleasure); comfortable psychological conditions; the mental processes of schoolchildren are activated, which promote their intellectual development; students' motivation increases. Of course, this method has its drawbacks - trying to perceive the language in this way can become a real and time-consuming challenge for students, but the method is being successfully tested in an informatized learning process within the research [10]. In the process of research training, the classification which takes into account the nature of cognitive activity, sources of knowledge and forms of work of teachers and students was adopted [10].

The need to implement research training is especially important in terms of the development of information and communication technologies. The principles of open education and open resources have great potential for schools, students and teachers. Using information and communication technologies in English, students have the opportunity to work on authentic English-language sites, which improves their speaking skills, allows them to immerse themselves into the language environment, increases learning motivation and allows them to work individually and in groups. And also it gives access to various sources using ICT [19]. To sum up, it should be noted that the knowledge, skills and abilities of students during the experimental work have improved significantly [13].

In the process of pedagogically balanced and methodologically motivated selection of information resources it is necessary to take into account psychophysiological and psychological-pedagogical factors, among which the peculiarities of intellectual development of students are of great importance. Determining the expediency of using COMSRL and information and communication technologies in the process of research training of students in school and assessing the attitude of teachers and students to the identified resources was the purpose of the experimental study [13]. Based on a thorough analysis of the research results, the need to distinguish between different gifted groups of students is confirmed, as there are different aspects of giftedness (high intellectual giftedness and high level of academic success, etc.) and different group differences [2]. The results were significant at the level of reliability [1].

Within the investigation the principles, methods and approaches of research-based learning of students were updated [13]. Children prefer these types of work, because they do not let them get bored and lose interest in learning a particular material; learning something new and improving not only the acquired knowledge and obtaining new one, but also the correct pronunciation, the perception of educational material via listening and the ability to express their own opinions creatively. In the process of research-based learning children successfully demonstrated their technical knowledge, their language skills, the ability to work in a team, their achievements, the ability to manage their time, their creativity, punctuality, steadiness, demonstrated their leadership and personal qualities [10].

The updating of methodological system of teaching English has become an integral part of the experiment, because studying in a specialized school our students are simply required to have a wide range of natural and mathematical knowledge not only in Ukrainian but also in foreign languages.

Within the SIEG (Science, Informatics, English, German) telecommunication project, a glossary of scientific terms was created. Working with authentic textbooks students tried to investigate why insects fly towards the light, why blood is red, why all cats are grey at night, why koalas do not live in Ukraine, etc. [10].

As part of the experiment, an optional course “STEM-STEAM-STREAM as education of the future” was created and tested, which allows to modernize the methodological principles, the content, the scope of educational material, to apply modern technologies while teaching in order to develop knowledge, skills and abilities of high level students. The integration of natural sciences into technology, engineering, logic and mathematics was carried out. The practical part of the optional course involves the implementation of the STEM project “House for the fourth piglet” (the project can be implemented in grades 2-4, 5-6). Reading the original fairy tale and its modern version, children learn why the piglets' houses fell apart. During the project, students conduct the research of buildings made from different materials, properties of building materials, test the strength of building materials and build a prototype of the ideal, strong hut for the fourth piglet.

From a scientific point of view (Science) students conduct observations, learn about the world around them, collect and analyze data on animate and inanimate nature, formulate scientific hypotheses, identify different types of technology at home, in the classroom and in the world, classify objects according to their attributes (for example, physical properties, materials from which they are made). Students also

develop, improve and apply technology (Technology) in order to solve problems effectively and project and design houses (Design / Art). From a mathematical point of view (Math's), children describe the measurable attributes of objects, such as length or weight, compare objects with each other and determine their difference, describe objects in the environment. Logical knowledge (Logics) gives children the opportunity to understand problems and solve them persistently, think logically, consistently, creatively and criticize the opinions of others. Research-based learning also promotes the formation of foreign language competence in English (English), because children work with texts, their processing, characterization of characters, key events, they compose their own statements, cooperate, work in groups. Certainly, the realization of interdisciplinary links in the context of STEM-STEAM-STREAM in the process of research-based learning is a driving force in the development of creative abilities of students, increasing the level of intelligence of students and solving problems needed to overcome difficulties that children may face in life.

The investigation thoroughly represents the possibilities of pedagogical designing with pedagogically balanced use of variable models of computer-oriented methodological systems of research-based learning of natural and mathematical disciplines in schools in the context of continuity of education [10]. The hypothesis that teaching children determines the nature of their mental development is confirmed. Accordingly, the characteristics which are necessary and sufficient for the organization of research education at school, including the use of information and communication technologies and taking into account the psychological and pedagogical characteristics of students in the process of computer-based methodological systems of research-based learning are thoroughly described.

The prospects of introduction of variable models of computer-oriented methodical systems of research-based learning of subjects of natural-mathematical cycle at school are substantiated taking into account the alternative solutions given in the research [1]. The construction of the curriculum as an individual educational project is possible due to thoroughly comprehended trajectories of individual learning of students, taking into account the possibilities of deductive planning of the educational process of natural sciences and mathematics. Undoubtedly, for the successful implementation of such work with students it is recommended to reconstruct the content of education in the logical context of its construction and use of technology (pedagogical tools and methods of implementation) in the process of the research learning of disciplines, including natural sciences.

The main emphasis is focused on project and research activities, and the relevant objectives of subject research projects are to create the conditions for self-realization and the formation of the author's position of students through their active participation in the subject research project; clarification and differentiation of the conceptual apparatus, systematization of students' knowledge, establishment of interdisciplinary links and preparation of Olympiad tasks, preparation for university admissions; correction of the level of formation of various educational activities with the use of project and research activities.

The variable models of designing based on a competence approach in modern education, taking into account the main stages of designing (objective, methodological, factorial, structural, functional, resource, deficit, procedural, prognostic and effective) are represented in investigation. In the process of designing computer-based methodological systems of research-based learning, the subjects perform the following functions: formation of appropriate competences, assessment of impact factors, determination of the strategy of the institution, risk and educational resources assessment, choosing the educational route and variable content of educational process; development of technologies and methods of assimilating the necessary competencies, examination of curriculum and assessment of the competence result.

Designing in the educational process will acquire a developmental character only if it is impossible to use reproductive forms of activity, which will encourage students to search for answers to problematic questions creatively from teachers or literary sources. During designing the process of teaching, it is necessary to take into account the control reflection in order to adjust the time of work at each stage and improve the results of design and research activities.

With the use of components of computer-oriented methodological systems, the possibility of concentration of educational resources is provided; the versatility of learning trajectories and the results of the formation of the necessary competences; accessibility and equal opportunities for students in learning; multifunctionality of interaction of participants of educational process (teachers, pupils, parents, educational administration); orientation of the content, forms and technologies of students' preparation on educational, scientific, research, production integration in the educational process. The study provides a thorough classification of software for research-based learning of natural sciences and mathematics in general secondary education. It is important to take into account the system-conceptual approach to the designing and functioning of computer-based methodological systems of research-based learning. In the context of the main directions and principles of using systems of teaching subjects of the natural and mathematical cycle

with the use of information and communication technologies in education, research teaching approaches are used. On the basis of the research conducted, it can be stated that organized variable models of research education with the help of thoroughly pedagogically designed components of computer-oriented methodological systems is a perspective direction for the modernization of research learning processes in school [1].

Research aiming at creating optimal conditions for permanent improvement of teachers' professional skills, including foreign languages, mathematics, physics, chemistry, biology, ecology, etc., in the context of appropriate and pedagogically balanced use of information and communication technologies in the process of general secondary education are underway. A perspective way of further research of COMSRL is to identify differences in the way gifted students think and the relationships associated with a person's personality, negative experiences or the impact of the educational environment (information and communication technologies) on students' health and their appropriate interactions.

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