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USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES DURING THE FORMATION OF GEOGRAPHICAL CONCEPTS OF 5TH GRADE STUDENTS

The article considers the formation of geographical concepts while teaching an integrated course in the natural sciences educational branch "Learning about nature" in the 5th grade through the use of information and communication technologies (ICT). It is noted that the teaching of natural sciences requires new approaches to the educational process, one of which is the use of information and communication technologies. An analysis of pedagogical literature and practice has shown that the introduction of information and communication technologies into the educational process of basic secondary schools is currently necessary and appropriate. It is emphasized that ICT provides teachers and students with ample opportunities for an interactive, accessible and more interesting way of mastering geographical knowledge through active interaction with information, studying geographical concepts using visualization tools, interactive maps, animation materials and virtual tours. It is confirmed that modern ICT tools activate students' cognitive activity, contribute to a deeper assimilation of the material and allow teachers to create interactive tasks, virtual laboratories, online geographical games and simulations. The use of the Kahoot! service is characterized, which allows for interactive lessons and assessment of students' knowledge through the use of online testing, the MS PowerPoint presentation program, and the Canva resource, which significantly contribute to the visualization of educational material. The importance of the Google Earth and Google maps web resources for the formation of geographical concepts, as well as LearningApps.org, which is designed to create interactive exercises, Google Classroom, Google Meet, Microsoft Teams, Cisco Webex, Zoom, Class Dojo, Classtime, Viber for communication between teachers and students, is clarified. The use of immersive technologies, particularly augmented reality, which allows students to observe the real environment right before their eyes, is proposed. The research confirmed that information and communication technologies contribute to forming a stable and deep understanding of geographical concepts in 5th grade students while studying the integrated course "Learning about Nature."

Key words: information and communication technologies, geographical concepts, integrated course "Learning about nature."

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ВИКОРИСТАННЯ ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ ПІД ЧАС ФОРМУВАННЯ ГЕОГРАФІЧНИХ ПОНЯТЬ В УЧНІВ 5 КЛАСУ

У статті розглянуто формування географічних понять під час навчання інтегрованого курсу природничої освітньої галузі «Пізнаємо природу» в 5 класі шляхом застосування інформаційно-комунікаційних технологій (ІКТ). Зазначено, що навчання природничих дисциплін вимагає нових підходів до навчального процесу, одним з яких є використання інформаційно-комунікаційних технологій. Аналіз педагогічної літератури та практика засвідчили, що впровадження інформаційно-комунікаційних технологій у навчальний процес базової середньої школи є в нинішній час необхідним і доцільним. Підкреслено, що ІКТ надають учителям і учням широкі можливості для інтерактивного, доступного і більш цікавого способу засвоєння географічних знань завдяки активній взаємодії з інформацією, вивченню географічних понять за допомогою візуалізаційних засобів, інтерактивних карт, анімаційних матеріалів та віртуальних турів. Підтверджено, що сучасні ІКТ-інструменти активізують пізнавальну діяльність учнів, сприяють більш глибокому засвоєнню матеріалу і дозволяють учителям створювати інтерактивні завдання, віртуальні лабораторії, географічні онлайн-ігри та симуляції. Схарактеризовано використання сервісу Kahoot!, який дозволяє проводити інтерактивні уроки та здійснювати оцінювання знань учнів шляхом використання онлайн-тестування, програми презентацій MS PowerPoint та ресурсу Canva, які зна-

чно сприяють візуалізації навчального матеріалу. З'ясовано важливість для формування географічних понять веб-ресурсів Google Earth та Google maps, а також LearningApps.org., що призначений для створення інтерактивних вправ, Google Classroom, Google Meet, Microsoft Teams, Cisco Webex, Zoom, Class Dojo, Classtime, Viber для комунікації вчителів і учнів. Запропоновано використання імерсивних технологій, зокрема доповненої реальності, що відкриває учням можливість спостерігати реальне оточення прямо перед своїми очима. Проведені дослідження підтвердили, що інформаційно комунікаційні технології сприяють формуванню стійкого та глибокого розуміння географічних понять в учнів 5 класу під час вивчення інтегрованого курсу «Пізнаємо природу».

Ключові слова: інформаційно-комунікаційні технології, географічні поняття, інтегрований курс «Пізнаємо природу».

Problem statement. New information and communication technologies are entering all spheres of human life, and in education in particular. Modernity requires new approaches to the educational process, new methods, forms of presenting educational information. New approaches are also needed in teaching natural sciences: chemistry, biology, geography, ecology, integrated courses in the natural sciences. One of such approaches is the use of information and communication technologies (ICT) during the educational process. The use of ICT in teaching natural sciences allows to intensify the educational process, accelerate the transfer of knowledge and experience, and also improve the quality of teaching and education.

Research analysis. Recently, the number of studies that have focused on the use of ICT in the educational process has increased significantly. The issues of organizing a modern information and educational environment, integrating the Ukrainian education system into the world educational space are reflected in the works of Ukrainian scientists V. Yu. Bykov, A. M. Gurzhiy, M. I. Zhaldak, Yu. O. Zhuk, V. V. Lapinsky, M. I. Shuta and others. The topic of using ICT in the educational process is devoted to the studies of such scientists as O. M. Bondarenko, V. F. Zabolotny, G. O. Kozlakov, O. A. Mishchenko and others. The development and implementation of new information technologies in the educational process are actively engaged in by such researchers as O. I. Dymtreeva, S. U. Novikov, T. A. Polilov, O. P. Pinchuk, O. V. Shestopal and many others.

The purpose of the article is to consider the formation of geographical concepts through the use of information and communication technologies during the teaching of the integrated course of the natural science educational branch "Learning about nature".

Presentation of the main material. In the modern educational context, the use of information and communication technologies (ICT) is an integral part of the educational process. One of the important components of their application is the formation of geographical concepts by 5th grade students. ICT opens up vast opportunities for teachers and students to learn geography in a more interactive, accessible and engaging way.

Through the use of ICT, students can actively interact with information, learn geographic concepts through visualization tools, interactive maps, animations, and virtual tours. This contributes to better understanding and memorization of complex concepts, and also helps students see the relationships between geographical phenomena. Many modern ICT tools allow teachers to create interactive tasks, virtual laboratories, online geographical games and simulations that activate students' cognitive activity and contribute to a deeper assimilation of the material. Among such technologies, one can single out the Kahoot! service. It is an educational platform that allows you to conduct interactive lessons and assess students' knowledge using online testing. Several question formats are offered: in the form of regular tests; choosing a true or false statement; placing the answer in the correct order; voting; labeling (players will put labels on the image: for example, when forming the concept of "geographic map", students can mark the mountains and rivers of Ukraine on the image); a word cloud (especially relevant when forming geographical concepts), where students enter their short answers, limited to 20 characters; these answers are displayed in the form of a cloud on a large screen (the question can be a concept, and students enter the signs of this concept); open-ended question, where participants record and send answers of up to 250 characters, which are then displayed in the form of text cards; brainstorming. Kahoot! also offers ready-made interesting question templates that will help in the learning process.

In modern learning conditions, one cannot do without using the MS PowerPoint presentation program, which greatly contributes to the visualization of educational material. It is very promising to use the Canva resource, a more modern and convenient analogue of PowerPoint, which has even more features, including interactive features.

Also, the Google Earth and Google Maps web resources will be useful for the formation of geographical concepts. Google Earth is one of the available free platforms that helps to search for geographical objects. This program offers a virtual globe on which you can view aerial photographs and satellite images

of different parts of the Earth. A significant part of the images is provided with high detail, especially for certain regions. In addition, Google Earth can be used as a means of viewing outer space, including the surfaces of the planets of the Solar System and their satellites, such as, for example, Mars and the Moon. To increase student engagement, you can use Google Earth Studio. This tool allows you to create videos based on 3D images of the Earth. Students can create panoramic videos with views of landscapes, cities, and other types of aerial photography.

It is also necessary to consider the importance of web resources that provide the opportunity to conduct virtual excursions. These resources can include excursions to various natural history museums in Ukraine and around the world, as well as to specific natural objects with which various geographical concepts are associated. For example, you can virtually visit the National Museum of Natural Sciences of the NAS of Ukraine (National Museum of Natural Sciences of the NAS of Ukraine, 2023).

It is worth noting that such a service is already known to all teachers as LearningApps.org. This is a platform designed to create interactive exercises. A set of services is offered for communication between teachers and students: Google Classroom, Google Meet, Microsoft Teams, Cisco Webex, Zoom, Class Dojo, Classtime, Viber, and others.

An important innovative method that can be used to form geographical concepts is immersive technologies. This is a virtual expansion of reality, which helps to better perceive and understand the surrounding reality; these are various technologies of full or partial immersion in the virtual world or various forms of “mixing” real and virtual reality (Sypchenko, 2021: 295). There are several types of such technologies: virtual reality, augmented reality, real reality, mixed reality, extended reality. The concept of augmented reality is defined as a set of technologies and methods that allow objects from the real environment to be superimposed on 3D virtual objects using AR devices. This enables the interaction of virtual objects with the real environment to create predictable scenarios. Augmented reality technology allows students to observe the real environment right before their eyes (Slupska, Shkurenko, 2022: 83). One of the methods of using AR technology in lessons to form geographical concepts is to use the Aurasma application, which is similar to the popular QR code recognition technology. This application uses the mobile phone camera, GPS, Bluetooth, Wi-Fi, and accelerometer to identify various objects in the surrounding space, including historical and recreational ones. These objects are then displayed on the device screen with added video,

images, photographs, and other elements known as “auras” (Nalivaiko, Ievleva, Alesandrova, 2021: 164).

Virtual reality uses computer technology to create a simulated environment where students can virtually move to a completely new digital space, separating themselves from reality. Without being able to see what is happening outside the headset, the student is completely transported into this virtual world, which allows the teacher to use new and previously inaccessible methods of visualizing information to fully immerse the student in the geographical world. The NYT VR application is an important tool for using VR technologies in lessons to form geographical concepts. This application conducts experiments with virtual reality, allowing students to be transported both to the surface of the planet and to the depths of the ocean. If the class has virtual reality glasses, then for virtual travel, we can recommend the Orbulus application, which realistically demonstrates the best and most famous tourist destinations in the world, which are currently impossible to visit in person (Nalivaiko, Ievleva, Alesandrova, 2021: 165).

During the study, a set of methodological materials was developed and created aimed at the systematic and effective formation of many geographical concepts that 5th grade students were to master while studying the integrated course “Getting to Know Nature” according to the model program of the author T. V. Korshevnyuk (Korshevnyuk, 2021).

In the process of studying the topic “Structure of the Earth” at the stage of motivation of educational and cognitive activity, innovative technologies were used, in particular, Google Earth demonstrations. One of the effective methods was the use of video materials, such as recordings from outer space provided by NASA, which provided students with an impressive visual experience.

Starting with a general view of the Earth from space, the video can gradually approach specific city streets and, ultimately, an object related to the topic. This created an opportunity for students to examine the features of a particular object in detail, contributing to the formation of geographical concepts.

It is important to note that in the absence of an Internet connection, the teacher can record the video in advance and use it for demonstration in class. This ensures the accessibility of the material and effectively integrates modern technologies into the process of studying natural science material, contributing to high-quality student activity.

At the stage of updating basic knowledge, the process of studying geographical concepts was improved by using such interactive methods as blitz-surveys, which were conducted in the Google Meet chat or on

the Wordwall platform. In particular, the use of the “Random Wheel” exercise turned out to be extremely effective in engaging students. While scrolling this “wheel”, which is virtual and available online, a random question was selected from it. This created a dynamic and interesting atmosphere in the lesson, as each student had the opportunity to participate in answering questions related to the topic. This approach activated the cognitive activity of students, contributing to a deeper understanding of the material and the formation of geographical concepts. At the stage of studying new material, a 3D demonstration of an excerpt of the Earth’s internal structure was carried out using the YouTube resource. Since the experiment showed a high level of formation of the concepts of “earth’s crust”, “mantle”, “core”, more attention was paid to the concept of “rocks”. In conditions of distance learning, it was advisable to use advanced technologies, such as the demonstration of three-dimensional models of rocks using the Sketchfab resource. In particular, by viewing models of marble, granite, limestone, peat and coal, students were able to interact with the material in the most convenient and accessible way. Thanks to 3D models, students not only deepened their understanding of rocks, but also interacted with each sample in a virtual environment. By rotating, zooming in and out, they were able to examine the structure and features of each sample in detail. Such interactive learning contributed to good assimilation of the material, allowing students to feel the reality of rocks even at a distance through the use of virtual resources.

Further, during the study of rocks at the stage of motivation of educational and cognitive activity, Google Earth tools were used, which allow for effective visualization of the location of rock deposits in Ukraine. To accurately determine the locations of these rocks, appropriate labels were placed on the map of the country, illustrating their geographical distribution. To ensure the convenience and efficiency of learning, a screen recording was performed while marking these labels. Such actions help optimize time, as they allow you to avoid delays associated with downloading the Google Earth map online. Students and teachers were able to view the marked labels and their location on the map in an informative video format, which contributed to more effective assimilation of the material.

At the stage of generalization and systematization of the acquired knowledge, the interactive educational platform Wordwall was used in the form of an exciting game “Correspondent”. This method allows students to systematize and consolidate the information learned during the lesson by interacting with pairs of concepts and terms.

As part of the homework, to make the learning more in-depth and practical, students were invited to a virtual excursion to the National Museum of Natural Sciences of the NAS of Ukraine using a QR code. Here they had the opportunity to explore the expositions and exhibits related to rocks, expand their knowledge and feel the practical connection between theory and real examples. To consolidate the material studied, students received tasks to find specific rocks that were considered during the course. This allowed them to apply and test their knowledge in real-life problem solving, developing critical thinking and independent research skills.

During the formation of the concept of “weather” in the process of studying the topic “Weather and its observation”, at the stage of motivation of educational and cognitive activity, students actively described the state of the weather today based on their observations or using the Internet resource Sinoptik.ua. At this stage, their interest in the topic was increased, thanks to which learning became more practical. At the stage of communicating the topic and purpose of the lesson, an effective technique “My expectations” was used. Students were involved in active work on the interactive Jamboard. They had the opportunity to express their expectations using stickers that were attached to the drawn tree on the board. Thanks to this, the lesson became more interesting, in addition, the diversity of students’ points of view was taken into account. This approach helps to create a positive learning environment, supports the development of speech and contributes to the formation of a deep understanding of the concept of “weather” through students’ expectations and observations. At the stage of presenting new material during the study of the topic “Weather and its observation”, an interesting technique was used, during which students were involved in active participation, speaking with messages “Weather forecast according to folk signs”. This contributed to the development of their critical thinking and the ability to apply folk signs to weather forecasting, expanding knowledge in this area. Further, at this stage, a logical game “Interesting Problems” was played, which contributed to the active use of logical thinking by students. Thus, the studied material was consolidated and the development of analytical skills and the ability to solve problems based on the acquired knowledge was stimulated.

At the stage of consolidating the studied material, the interactive Kahoot! platform was used. Students answered test questions in the form of a competition. This approach makes the learning process exciting and creates a healthy competitive atmosphere, which contributes to better awareness and generalization of knowledge.

When determining the homework, a creative task was proposed – creating a project “Three Weathers”. Students created a simulation of the weather: blizzard, rain, and tornado in a jar, according to the instructions and an example of an English-language video. Such a task contributes to the development of students’ creative and practical skills, and also consolidates their knowledge on the topic “Weather and its observation”. It was also proposed to complete a creative task with an “asterisk”, where it was necessary to imagine yourself as the host of a weather forecast program on television, make a video clip and send it to Klasrum for checking.

The formation of the concept of “surface waters” in the study was a key stage in the lesson dedicated to the topic “Hydrosphere, World Ocean, Water Cycle”. Since this concept turned out to be less mastered by students, special attention and more time were given to it for deep understanding.

At the stage of studying new material, the advanced Google Maps tool was used, as well as the wider capabilities of YouTube in 360 format (spherical videos). Students participated in a virtual tour of the rivers and lakes of Ukraine, such as the Danube in the city of Vylkove and the Shatsk Lakes. Thanks to these interactive tools, students received theoretical knowledge about surface waters and felt their reality. Thus, students’ interest and activity in the process of studying the hydrosphere increased.

The homework stage went beyond the usual approach, as students were invited to enter the exciting world of water adventures through a creative quest format developed on the Google Sites platform. This interactive quest not only provides effective repetition and consolidation of the material, but also stimulates students to active learning, simplifying the process of assimilating new knowledge. The topic of the quest “Secrets of Water Adventures” opens on the first welcome page, where students, after studying the information, click on the wheel and go to the next page. Then students received tasks on LearningApps, which is integrated directly into the site. By completing various tasks, such as the game “The First Million” or completing an exercise to insert missing words, students continued their virtual journey. A key part of the quest was for students to receive a “ticket” to an imaginary ship, which requires completing certain tasks and con-

firming their results with screenshots. After completing the mind map and the filword, students studied information that was also a repetition of the topic. The final moment was a test on Google Forms, which served as the final stage. The test was created in such a format that attention is paid to the formation of the concept of “surface water”. Most of the questions are aimed at identifying and understanding key aspects of this concept to ensure that students have mastered the information and can successfully use it in the context of the hydrosphere. The test questions included the definition of surface water, examples of water bodies that belong to this category. Ecological and geographical aspects can also be taken into account to ensure that students can apply their knowledge in various situations. Such a test format not only determines the level of understanding of the concept of “surface water”, but also serves as a tool for active application of knowledge, developing critical thinking and the ability to apply the acquired skills in practical tasks. After completing the test, students received a grade for homework, including completed exercises on LearningApps. This homework format contributed to the active assimilation of the material, the development of independence, logical thinking, and creativity of students, making learning interesting and exciting.

Conclusions. Teachers, using various information and communication technologies in the preparation and conduct of lessons, have the opportunity not only to stimulate students’ interest in studying the course “Learning about Nature”, but also to contribute to the formation of a stable and deep understanding of geographical concepts. These materials, selected taking into account modern pedagogical approaches, can help create lessons that take into account the individual needs of students and promote their active study, developing in them the skills of critical thinking and analysis, which is important for a deep understanding of geographical concepts.

Taking into account the above, it can be argued that the systematic use of information and communication technologies in lessons contributes to improving the quality of the use of visual teaching aids, increasing the effectiveness of lessons, provides an opportunity to introduce interdisciplinary connections and contributes to the growth of students’ interest in the material to be studied.

BIBLIOGRAPHY

1. Модельна навчальна програма «Пізнаємо природу». 5–6 класи (інтегрований курс) для закладів загальної середньої освіти (авт. Коршєвнюк Т. В.) («Рекомендовано Міністерством освіти і науки України» (наказ Міністерства освіти і науки України від 12.07.2021 №795)). Державна наукова установа «Інститут модернізації змісту освіти»: веб-сайт. 36 с. URL: https://drive.google.com/file/d/1gkUtn5LuHCaxHrZm-5x-8ASCI_DXfPmf/view

2. Наливайко О., Ієвлева Ю., Александрова К. Використання імерсивних технологій під час проведення уроків географії. *Проблеми та шляхи реалізації компетентнісного підходу в сучасній освіті*. Харків, 2021. С. 162–168.
3. Національний науково-природничий музей: 3D-тур. URL: <https://my.matterport.com/show/?m=Y6RqAyrTyQ1> (дата звернення 20.08.2023)
4. Сипченко О. М. Імерсивні технології в освіті. *Наукові та освітні трансформації в сучасному світі*: збірник матеріалів Всеукраїнської міждисциплінарної науково-практичної конференції (м. Чернігів, 15 липня 2021 року). Суми: ТОВ НВП «Росток А. В.Т.». 2021. С. 295–296.
5. Слупська Я. О., Шкурченко О. В. Застосування віртуальної реальності (VR) в освіті. *Молодий вчений*. Одеса, 2022. №9 (109). С. 82–88.

REFERENCES

1. Modelna navchalna prohrama «Piznaiemo pryrodu». 5–6 klasy (intehrovanyi kurs) dlia zakladiv zahalnoi serednoi osvity (avt. Korshevniuk T. V.) [Model educational program “Learning about nature”. Grades 5–6 (integrated course) for institutions of general secondary education (author T.V. Korshevniuk)] (Rekomendovano Ministerstvom osvity i nauky Ukrainy (nakaz Ministerstva osvity i nauky Ukrainy vid 12.07.2021 №795)). Derzhavna naukova ustanova “Instytut modernizatsii zmistu osvity”: veb-sayt. – State Scientific Institution “Institute for Modernization of Educational Content”: website. 36. URL: https://drive.google.com/file/d/1gkUtn5LuHCaxHrZm-5x-8ASCI_DXfPmf/view (data zvernennia: (дата звернення: 02.02.2023)). [in Ukrainian]
2. Nalyvaiko O., Ievlieva Yu., Aleksandrova K. (2021) Vykorystannia imersyvnykh tekhnolohii pid chas provedennia urokiv heohrafiï [Using immersive technologies during geography lessons] *Problemy ta shliakhy realizatsii kompetentnisnoho pidkhodu v suchasniï osviti*. – Problems and ways of implementing the competency-based approach in modern education. Kharkiv, 2021. P 162–168. [in Ukrainian].
3. Natsionalnyi naukovo-prirodnychiy muzei: 3D-tur. [National Museum of Natural Science: 3D Tour] URL: <https://my.matterport.com/show/?m=Y6RqAyrTyQ1> (data zvernennia 20.08.2023) [in Ukrainian].
4. Sypchenko O.M. (2021) Imersyvni tekhnolohii v osviti. [Immersive technologies in education] *Naukovi ta osvitni transformatsii v suchasnomu sviti: zbirnyk materialiv Vseukrainskoi mizhdystsyplinarnoi naukovo-praktychnoi konferentsii* (m. Chernihiv, 15 lypnia 2021 roku) – Scientific and educational transformations in the modern world: collection of materials of the All-Ukrainian interdisciplinary scientific and practical conference (Chernihiv, July 15, 2021). Sumy: LLC Scientific and Technological Enterprise “Rostok A. V. T.”. 2021. P. 295–296. [in Ukrainian].
5. Slupska Ya. O., Shkurenko O.V. (2022) Zastosuvannia virtualnoi realnosti (VR) v osviti. [Application of virtual reality (VR) in education] *Molodyi vchenyi*. – Young Scientist. Odesa, 2022. No. 9 (109). P. 82–88. [in Ukrainian].