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ORGANIZATION OF DISTANCE LEARNING AT BIOLOGY CLASSES

The article reveals the specific features of distance learning at Biology classes using social networks and web-services.

The peculiarities of using distance learning tools in the educational process have been outlined, the phenomenon of distance learning as an effective tool of conducing Biology classes using web-services and social networks, which contributes to better assimilation of knowledge and enhances motivation of students for secondary education, was defined. The research methodology is based on the dialectic interaction of the following methods: the comparative method – to identify the opportunities for compiling assignments for secondary school students, grading, commenting upon answers, communicating with pupils in the real-time mode; the activity-based method – allows revealing essential characteristics and dependences, which enable understanding the specific features of the given phenomenon; allows researching characteristics of the organization of distance learning at Biology classes in dynamics, its individual characteristics using the Telegram social network, Google Classroom, Google Forms services; the systemic method – for wholistic comprehension of structuring and revising the covered material throughout the whole academic year; the synergic method – to understand the organization of distance learning at Biology classes as an open system that changes according to the multi-factor interaction of the processes of learning, upbringing and self-education, substantiation of the peculiarities of using distance learning tools in the educational processes, using innovative technologies, in particular, the technology of blended education.

It was emphasized that the use of distance learning technologies in the time of the pandemic is a necessary measure.

It was substantiated that working with the use of web-services and social networks allows students for secondary education to master educational material without compaction and adjustment of curriculum, which is essential under the COVID-19 pandemic conditions.

It was stressed that the Telegram service has the prospects for the implementation in the educational process since it makes it possible to set quick rapport with a class, to solve problems in the shortest possible time, as well as to grade home assignments in order to ensure the maximum quality of pupils' getting ready for classes.

It was noted that conducting classes using the distance learning tools enables enhancement of the motivational component and improvement of the quality of education. Biology classes conducted with the use of social networks and web-services contribute to better acquisition of knowledge by pupils and their motivation. Comparative analysis of using distance learning tools in the educational process proves the effectiveness of using modern social networks and web-services and their active implementation during the COVID-19 pandemic.

Key words: distance learning, technology of distance learning, organization, Biology class, students for secondary education, web-service, social networks.

Introduction. The key changes that are going on in education require radical changes in approaches to learning. One of the tools for implementing the concept of the New Ukrainian School is the use of innovative teaching methods at Biology lessons. In the context of updating the content of education, a teacher of Biology faces the problem of choosing such learning technologies that would fully implement the concept of the New Ukrainian School and become the basis for training of a competitive school leaver. The relevance of the problem is strengthened by the safety and health problems of participants in the educational process exacerbated by the COVID-19 pandemic. This requires that a secondary education establishment should improve the educational process, fostering pupils' activity and independence. A teacher should master new forms, methods and techniques of his professional activity. The implementation of these tasks largely depends on the effectiveness of organization of distance learning at Biology classes through social networks and web-services.

Scientific novelty lies in comparative analysis of the use of distance learning tools in the educational process, the study of the phenomenon of distance learning as an effective tool for conducting Biology classes through web-services and social networks, which contributes to better knowledge assimilation and enhances the motivation of learners for secondary education.

The aim of the present research is to find out the features of the organization of distance learning at Biology classes using the Telegram social network, Google Classroom, Google Forms service.

To achieve this goal, a set of research methods was used: analysis, synthesis and systematization of scientific works on the issues under considerations; questioning, talks, external and included observation of educational and learning activities of pupils for secondary education.

Literature Review. The issues of professional training of would-be teachers are studied by N. Volkova, V. Hrynyova, I. Lyakhova, R. Prima, Y. Strelnykov, L. Sushchenko. I. Glazkova investigates the problem of overcoming and preventing the occurrence of barriers in pedagogical activities [1, P.410]. New approaches to the organization of the educational process using modern computer technologies are highlighted in the scientific works by Y. Baturin, V. Bolotov, I. Girkyn, R. Gurevych. V. Kukharenko, V. Bondarenko in his papers pays much attention to emergency distance learning. Some aspects of distance learning in general secondary education institutions were considered by T. Boichuk, E. Demidova, T. Kuryava, O. Levandovskyi. Scientists explore the problems of using computer technologies [2, p.210-211; 3, p.300-309; 3, p.195-199; 3, P.210 - 222; 4, P.012011], application of web services and social networks in the educational process [5, P.61; 6; 7, P.85]. The use of information technologies in education is the focus of research of A. Gurzhii, V. Kukharenko, Y. Pasichnyk.

The development of a computer-oriented educational environment under conditions of multicultural education in the European Union is explored by I. Ivaniuk, V. Bykov and other scientists [8, P.38]. Scientific works by O. Rafalska, N. Ruchynska are devoted to the study of mixed learning technologies as an innovation of distance education. T. Borova, O. Chekhratova, A. Marchuk, T. Pogorelova, A. Zakharova and other scientists study the possibilities of increasing the students' responsibility and pupils' autonomy with the use of educational tools of Google [9, P.99]. A. Trotsko, L. Rybalko, O. Kirilenko and other researchers study professional self-improvement under conditions of introduction of distance learning, focusing on information technologies and teaching facilities [10, P.259]. Despite the fact that scientists pay great attention to the above problem, the issue of organizing and conducting distance learning through social networks and web services at Biology classes remains insufficiently developed.

Methodological concept.

The research methodology is based on the dialectic interaction of the following methods: the comparative method – to determine the opportunities for compiling assignments for secondary school students, grading, commenting upon answers, communicating with pupils in the real-time mode; the activity-based method – allows revealing essential characteristics and dependences, which enable understanding of the specific features of the given phenomenon; allows researching the characteristics of the organization of distance learning at Biology classes in dynamics, its individual characteristics using the Telegram social network, Google Classroom, Google Forms services; the systemic method – for wholistic comprehension of structuring and revising the covered material throughout the whole academic year; the synergic method – to understand the organization of distance learning at Biology classes as an open system that changes according to the multi-factor interaction of the processes of learning, upbringing and self-education, substantiation of the peculiarities of using distance learning tools in the educational processes, using innovative technologies, in particular, the technology of combined education.

Results and Discussions. The transition to distance learning caused by the pandemic has become a serious challenge for all participants in the educational process – educators, teachers, pupils and their parents. It is essential that today's teachers should have the skills to organize high-quality learning at Biology lessons using digital technologies,

to communicate with secondary education students at a distance, to inspire and motivate them to study, and to help parents.

To teach in a new way, a teacher must receive freedom of action – choose educational materials, improvise and experiment. The management process consists of the following formal stages: collection and analysis of information on the state of an object; forecasting; formation of a program of management actions, its implementation; analysis of the adequacy and effectiveness of the program (feedback). To effectively realize the purpose and objectives of the subject “Biology”, it is necessary to meet the following conditions: it is necessary to constantly motivate students to study biological phenomena, healthy lifestyle, safe life; during the training, it is necessary to apply a variety of interactive methods that would ensure the individualization of perception, active participation of each student and group interaction. The pupils’ information and communication competence, the content of which is integrative, is formed as a result of the use of distance learning technologies, innovations in the study of Biology. The curriculum necessarily provides for the contribution of each academic subject to the formation of the specified competence.

To ensure effective organization of the educational process, academic integrity, development of intellectual, personal potential of scientific, scientific-pedagogical, pedagogical staff and learners for secondary education, the following principles should be observed: legality and the rule of law; social justice; priority of human and citizen rights and freedoms; academic freedom; professionalism and competence; scientific character; self-improvement and self-development; humanism, democratism; patriotism; honesty and decency; justice and tolerance; partnership and mutual assistance; collegiality and democracy; integration into the international educational and scientific space; respect and mutual trust.

The organization of distance learning at Biology classes requires compliance with certain laws, ideas reflected in various sciences and relevant educational subjects. These are the lessons of integrated links on several topics. They make it possible to form and more vividly imagine the surrounding relationships and phenomena. The main aspect is not only assimilation of certain knowledge, but rather the development of educational thinking [9, P.103]. The structure of such lessons is characterized by clarity, compactness, brevity, logical mutually agreed material at each stage of the lesson, great informative load and volume of the material.

Google Classroom is a distance learning tool and an application that connects Google Docs (documents), Google Drive (cloud storage) and Gmail (mail), helps create and organize assignments, grade assignments, comment upon them and make effective communication with students in real time. The assignments created by a teacher are convenient to structure and send to pupils. This service provides quite wide opportunities for the organization of distance learning, which is quite relevant during the COVID-19 pandemic.

In addition, it is possible to use under conditions of the class and lesson system of learning (traditional learning). The use of this service is possible:

firstly, to structure and revise the covered material on the subject throughout the whole academic year;

secondly, as one of the resources for implementation of distance learning technologies in the educational process: making presentations, video of lessons, etc.

thirdly, with aim of implementation of innovative technologies, specifically, the technology of blended education, etc.

The main element of Google Classroom is the groups or classes which are created by a teacher. Functionally, the groups can be similar to a class by the structure. Thus, these groups allow users easily send messages to other users, with whom they often communicate within a given group.

Thus, the main advantages of using the above service are:

1. The possibility to set the class for productive work at a Biology lesson. An individual passkey is created for each class. The students and other teachers use it to join the learning course. Another variation of the event is possible – a teacher on his own sends an invitation to his/her educational course, using the e-mail of each student. In turn, when pupils open the received letter, they click “Add to Group” and automatically become participants in the class;

2. Close integration with the Google Disk. When using Google Classroom at Biology classes, the file with classes is automatically created on the teacher’s working Google Disk. The file is also created for students: with their class, as well as nested files for the class they join.

3. A variety of opportunities for creating and distributing tasks. All entries in Classroom are displayed both in the blog, in the stream, and from the very first post. A teacher has the opportunity to use 4 types of posts in Classroom: create announcements, create assignments, create questions, and use an existing post. The Create Quiz feature is designed to create a short answer question or a question that has variations. The Create Assignment feature is designed to create individual assignments The feature of using an existing post allows a teacher to use an assignment or a quiz created in another class. All four types of posts make it possible to use links to files of any kind from Google Drive, an external link, and links to videos from YouTube video hosting. Thus, this provides the conditions for pupils to access the educational material (presentations, lectures, interactive tasks, testing, additional literature and video lessons);

4. Possibility of time management. When a teacher creates an assignment, he can specify the due date and time of an assignment or work. When a student completes an assignment ahead of time, the status of “Teacher Review” appears on his work, which allows a teacher to grade and to mark the work. If a teacher has any questions about the quality of fulfilment of an assignment, he can return the work to a student to improve it. In this case, an assignment automatically goes into the “Student Edit” status and a student continues working on his file. Using the “Plan” option, a teacher can plan publishing an assignment for the due date and time.

5. The possibility to control the assignment completion and grading. The way the assignments are completed can be traced simultaneously. Working on a particular assignment can be controlled in several classes at a time. The assignments can be graded by a teacher himself or automatedly. The grading system can be adapted to score (by default it is 100 points). Once grading is completed, the grade will be sent to each student’s mail using the “Return to Student” icon, but if necessary, you can change the grade. It is also possible to export all class grades to the table;

6. Communication in Google Class. By combining the capabilities of the “Announcements” feature and commenting on assignments in Classroom, teachers, students, and parents can keep in touch, as well as trace the completion / grading of each assignment;

7. Notification reports for parents. One of the very useful features is the ability to send messages-reports to the parents of students. Parents of students receive invitations to their own e-mail address and have an opportunity to receive daily or weekly reports of their children’s performance. If parents want to refuse to receive them, they can do so at any time [7, P.80; 8, P.33].

In the process of organizing distance learning at Biology lessons, it is important to use tests. Thanks to tests with automatic grading, it is possible to make quick assessment of the level of learning educational material by students [10, P.235]. Test systems provide the possibility to compose different types of questions (multiple choice, text or numerical answers, matching tests, sequence tests, etc.).

In addition, there are available databases of ready-made questions, which you can add to those created on your own by modifying them as needed. Most services provide the possibility to create questions, sometimes even with answers, using images, video snippets. This makes it possible to generate a whole strategy of mastering and studying a certain

topic. Among the typical settings of online tests, it is worth noting the possibility to mix questions and answers in them, setting due time, limiting the number of attempts to complete them, as well as the method or time of announcing the test results. If students' testing is used for learning purposes, you can also weaken all of these parameters. In the case of control testing, it makes sense to apply stricter restrictions, and a teacher should remind students of the importance of academic integrity norms and the need to comply with them. It should also be borne in mind that automated grading, which greatly simplifies the routine work of a teacher, may be insufficient to reliably grade the progress of mastering the topic, and therefore a teacher can manually grade written works. Therefore, it is advisable to supplement test tasks with practical works or creative assignments. A teacher can implement individual feedback on test results, or take into account the answers of students during testing for further planning Biology classes [2, P.208].

The research into students' performance was carried out on the basis of the communal educational establishment "Chemical and Ecological Lyceum" of Dnipro City Council. We analyzed the performance of learners for secondary education.

We compared the performance of the learners for secondary education when doing assignments with the use of Google Forms. All learners had similar conditions to complete the assignments.

The performance of students of 9-A form was analyzed (**Table 1**).

The psychological atmosphere of the class fully allowed objective testing, the conditions that were similar for everyone ensured transparency of results.

Table 1 shows the results of 9-A form when comparing the performed types of works.

Table 1. Evaluation of performance of students of 9-A form

	Average result of works, points
Google Form (distance)	6,83
Face-to-face writing	6,67
Google Form (control)	7,69
Face-to-face (control)	7,17

We analyzed the performance of students of 9-A form when using Google Forms (Fig. 1). Conditional designations: on abscissa-axis – the kind of written work; on ordinate-axis – the number of points.

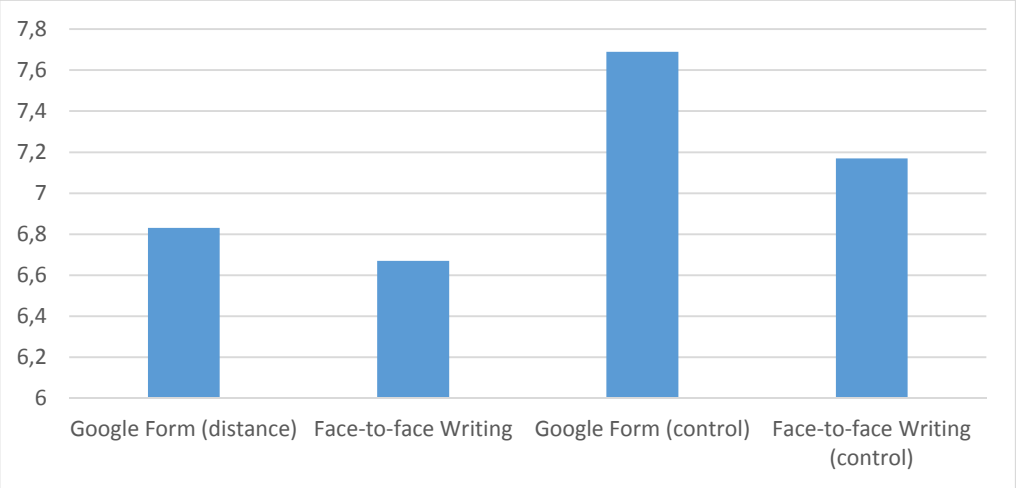

Fig. 1. Performance of students of form 9-A when using Google Forms

According to the obtained results, we can conclude that students can better write the assignments of current assessment using testing through Google Forms, which indicates

their greater interest in working in this format. The control studying proves the fact that students liked this format of writing and they can already consider it as one of the main types of obtaining grades for studying topics. We have not seen any significant difference in control measurement and they were at approximately the same level. The students noted that the use of modern technologies allows them to feel that a teacher is on the "same wavelength" with them, thereby increasing the motivation to study the material.

The obtained data reveal that it is possible to see that the students of this form quickly adapted to the distance form of writing.

We also used the Google Classroom service to organize and conduct Biology classes. This is a free, practical distance learning tool for educational institutions. It is also accessible to anyone who has a personal Account from Google. To work on the service, the developers attracted teachers from around the world, so it can be argued that thanks to this service of communication, learners for secondary education and teachers go to a new level: now cooperation is not limited to the classroom, which is a trend during the pandemic [1, P.111; 5, P.55].

After launching in 2014, this free set of distance learning tools for working with e-mail, documents and storage is constantly updated, new features are being added [1, P.400; 6]. Today, this service is integrated into the work of Khan Academy, which is one of the most famous non-profit educational organizations that introduces distance learning opportunities for different sectors of the population. If you have Internet connection, Google Classroom can be opened on your computer in any browser and anywhere in the world. An unconditional advantage is the prospect of using it from mobile devices based on modern mobile platforms. Google programmers and consultants offer the following scheme of teacher's and student's work in this service. Working on assignments involves three stages.

Stage 1. A teacher creates an assignment or a quiz. He can assign tasks to one, several groups, or individual students. It is possible to specify the time the task is due, parameters of the access to materials, trace the status of assignments, add comments during their completion and keep in touch;

Stage 2. A student submits an assignment. When doing it, he reviews or edits a particular file or the copy assigned to him, attaches a link, files, images, etc.

Stage 3. A teacher grades an assignment. A teacher has the possibility to adds comment to an assignment, give grades and return the assignment to a student, as well as to write a comment for parents. A student sees his grade and the necessity to improve the assignment [5, P.61].

Currently, this type of interaction between students and educators is very convenient and promising, which allows grading home assignment and having communication in a very short time. It should be noted that we have also identified some difficulties associated with this service: problems with access, lack of announcements about forthcoming assignments; students' untimely answer to questions asked; failure to open some files.

While working with the use of Google Classroom, we analyzed the learning quality indicators. To make comparisons, we made measurements of the quality of performing practical works both in the classroom and using distance learning.

The research was performed in class 8-A. The psychological atmosphere in the class allowed fully objective testing, while all necessary conditions to ensure the transparency of the results were met.

Table 2. Comparison of performance of students of 8-A form during blended form of education

	Average result of works, points
Google Classroom (distance)	10,55
Face-to-face answer	9,76

The performance of students of 8-A form when they worked using Google Classroom was determined. Conditional designations: on abscissa- axis – the kind of conducted work; on ordinate-axis – the number of points.

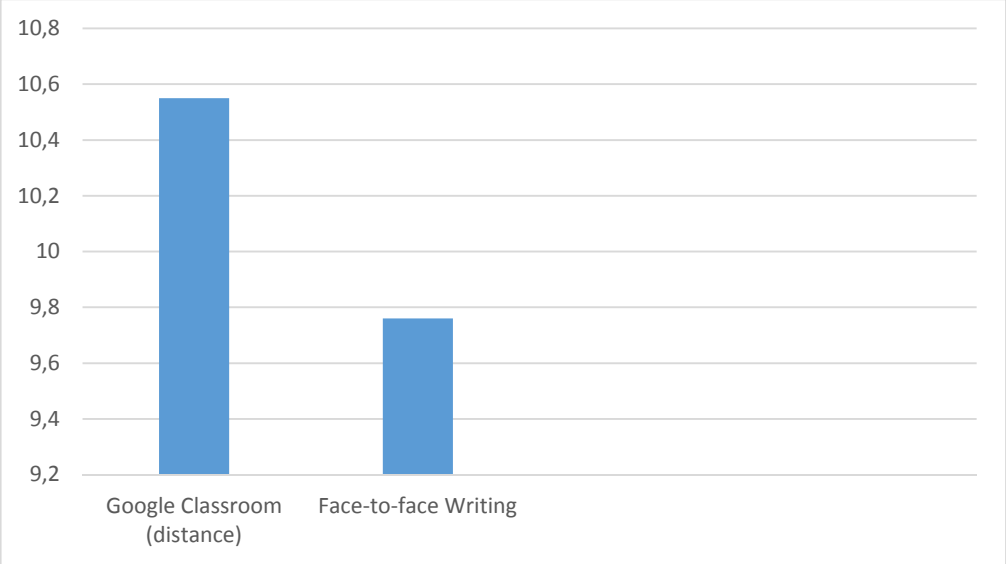

Fig. 2. Performance of students of 8-A form when using Google Classroom

The obtained results allow making conclusion that the possibility of students to complete assignments through Google Classroom enables them to improve their skills of working with computer devices and complete assignments with higher creativity.

Google Classroom has the reference that allows improvement of the skills of using this server, besides, reference materials from social networks are added. The Google Class service is a free, accessible tool to create a distance course. Due to intuitively accessible interface, powerful reference, it is one of the most optimal distance learning tools.

The studies were also conducted in 9-A and 9-B forms. All necessary conditions to ensure the transparency of the results were met. Table 3 shows the results obtained when comparing the performed types of works.

Table 3. Comparison of performance of students of 9-A and 9-B forms at blended form of learning

	Obtained points, 9-A	Obtained points, 9-Б
Google Classroom (distance)	10,77	10,44
Face-to-face writing	10,23	10,35

In addition, we analyzed the performance of students of 9-A and 9-B forms when using Google Classroom (Fig. 3).

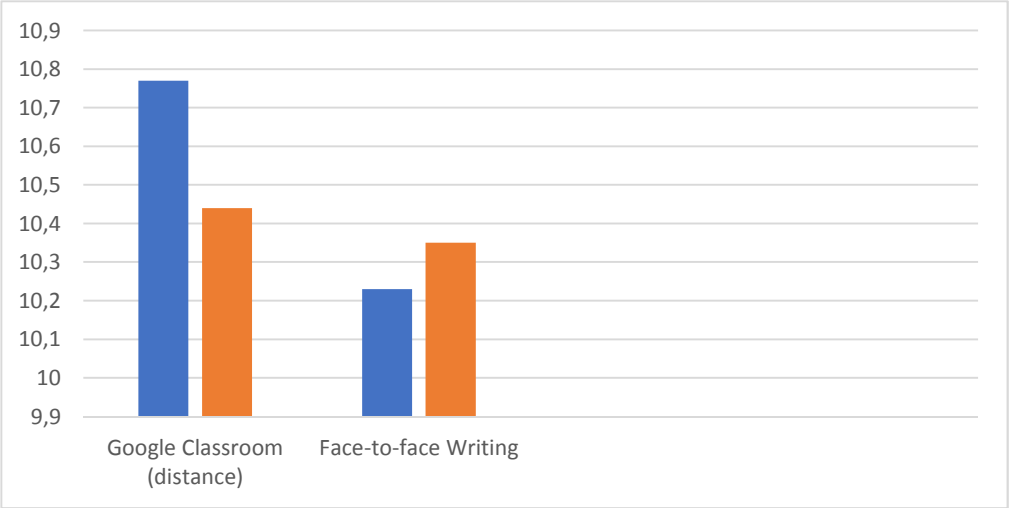

Fig. 3 Performance of students of 9-A and 9-B forms when using Google Classroom

Note: * - Fig. 3. Conditional designations: on abscissa-axis – the kind of conducted work; on ordinate-axis – the number of points; blue color – pupils of 9-A form; orange color – pupils of 9-B form.

According to the obtained data, the results were of the expected character. Google Classroom allows students to have high academic performance (Fig. 3). All students adhered to the rules of academic integrity.

Thus, web-service Google Classroom makes it possible to effectively conduct classes under conditions of self-isolation and complete quarantine.

Besides, we also used the social network Telegram the framework of distance learning.

The basis of modern person of information era is no longer traditional material, but rather information resources. Information technologies are introduced increasingly often. The use of information technologies in learning is the next evolutionary step towards providing the educational process with the properties of adaptability, flexibility, openness and mobility. Learning is transformed into the interaction between a teacher and a student that is not tied to a specific location [7, P.62]. The main features of using Telegram in the learning process include:

– One Telegram chat can unite 200 people;

– There is a whole range of Telegram channels that are closely related to studying Biology and Ecology, which enables a teacher to share interesting links with the group of students;

– Telegram allows sending voice messages, and this, in turn, enables a teacher to pay attention to certain biological aspects even at distance.

– Due to Telegram, it is possible to send files of any format and size [3, P. 215-218].

Using Telegram makes it possible to receive educational materialsimmediately through this social network, the advantages of which are:

– possibility of quick search of information;

– storing information in the channel and possibility to open the necessary presentation or a text format of the class at any moment;

– possibility to share materials with classmates;

– possibility of rapid contact to solve various problems.

We used social networks, specifically, Telegram, at Biology classes in 8-A, 9-A and 9-B forms. We traced the changes in the quality of learning and the way children got adapted to the new type of presenting information. **Table 4** shows the obtained results of assessing the quality of education with the use of the implementation of social network Telegram (Table 4).

Table 4. Comparison of results of assessing the quality of education when implementing social network Telegram in 8-A, 9-A and 9-B forms

	Average points, 8-A	Average points, 9-A	Average points, 9-B
% of those interested in communication via Telegram	95%	93%	90%
Completing home assignments through Telegram	10,23	10,55	10,24
Completing home assignments in a usual way	9,30	9,75	9,54

We used the usual way – completing home assignments face-to-face at the lesson. Performance of students of 8-A, 9-A, 9-B forms when using Telegram was analyzed (Fig. 4).

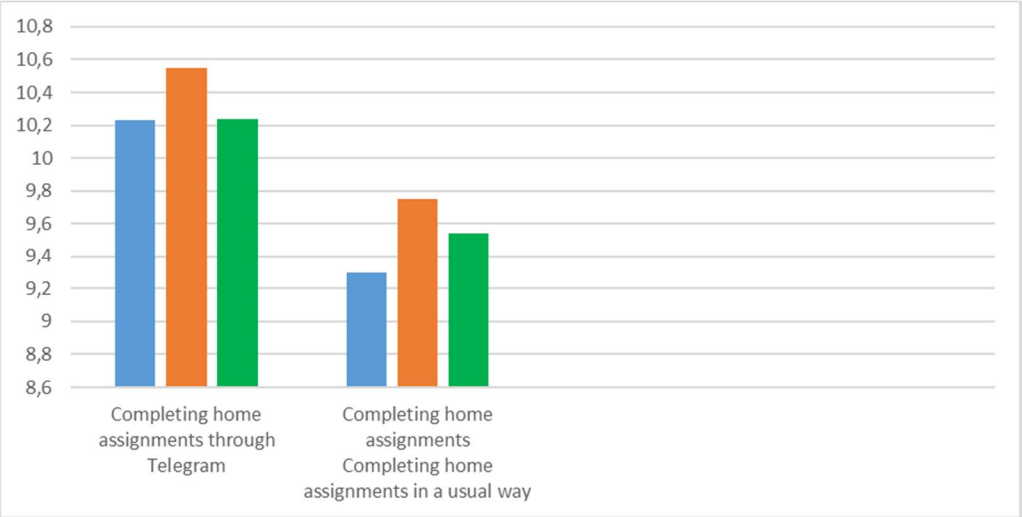

Fig. 4. Performance of students of 8-A, 9-A, 9-B forms when using Telegram

Note: * - Fig. 4. Conditional designations: on abscissa axis – the kind of conducted work; on ordinate axis – the number of points; blue – students of 8-A form; orange – students of 9-A form; green – students of 9-B form.

Besides, we analyzed the interest of 8-A, 9-A, 9-B students for secondary education in communication via Telegram (Fig. 5).

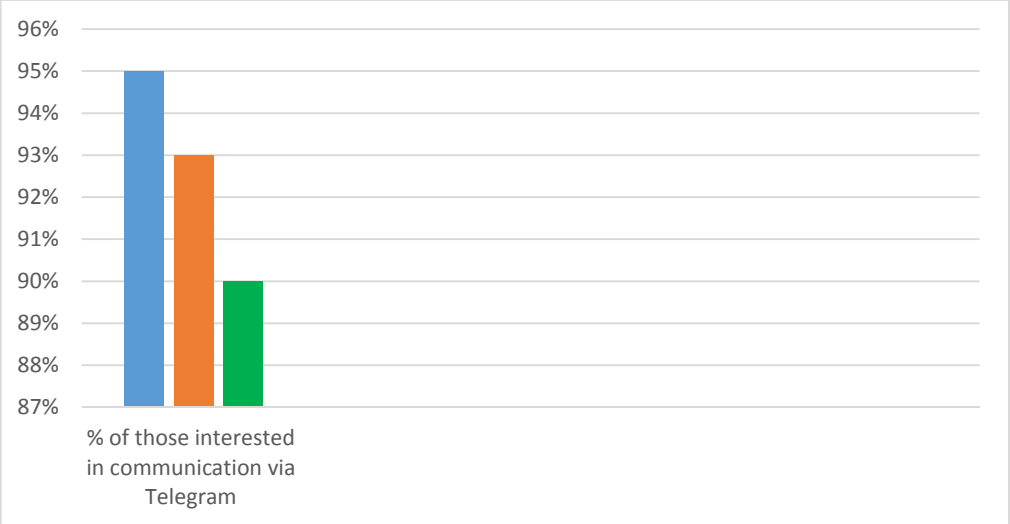

Fig. 5 Interest of students of 8-A, 9-A, 9-B forms in communication through Telegram

Note: * - Fig. 5. Conditional designations: on abscissa axis – the kind of conducted work; on ordinate axis – the number of points; blue – students of 8-A form; orange – students of 9-A form; green – students of 9-B form.

According to the obtained data, we can conclude that regular publication of assignments, updating fundamental knowledge, the use of interesting homework contribute to increasing the motivation of students to study. This is observed on the example of completion of home assignments. The average percentage of interest in Telegram interaction is more than 93 % in three classes, which indicates the great potential of technical capabilities of Telegram, trust from participants in the educational process to this type of communication and desire to learn something new.

Thus, modern education requires new solutions and approaches to communication with students. The use of information and communication technologies for the purpose of organization of personality-orientated learning is a factor of educational environment, which makes it possible to significantly influence the effectiveness of the educational process, systematization of knowledge, individualization of learning [8, P. 33]. Modern children expect the teacher to be able to possess technologies and be always in touch with them. That is why we made a Telegram channel to place lesson materials, home assignments. This, in our opinion, is very important, because students can once again see their home assignments or return to the studied material in case something is unclear.

Regularity of publishing assignments, reminders about home assignments contribute to the motivational component of students. This is observed on the example of completion of home assignments. In addition, it is possible to observe trust in this type of communication, the average percentage of interest in Telegram interaction is more than 90 %, which indicates a technical possibility, the desire to study new material

Thus, the possibility to work through the Telegram service allows students to use modern technologies that will enable quick processing and analyzing information. In addition, it is worth noting the importance of quick communication with a teacher, since the teacher's reply can be obtained in this messenger. It is also possible to make video calls via Telegram, which is an indisputable advantage in choosing this particular program for working by a teacher.

Conclusions and prospects of further research. Thus, students for secondary education worked actively at Biology lessons using Google Forms and willingly took part in testing. It should be noted that the use of distance learning technologies during the pandemic is a necessary measure. There is a whole range of web-services at the moment, but they have some drawbacks. In particular, students can bypass protection measures and the result will not be fair and transparent. When using Google Forms, such risks are minimized if a teacher is trained to work with this service through lectures, seminars that deal with mastering the tools of distance learning.

The results of the study reveal that working with the use of Google Classroom service allows students for secondary education to master the material without compacting or adjusting the curriculum, which is important in the context of the COVID-19 epidemic.

Telegram also has the prospect for implementation in the educational process, as it makes it possible to establish quick communication with the class, solve problems in a short time, as well as to adjust the performance of home assignments so that the quality of students' preparation for classes could be as high as possible.

Besides, the classes conducted using distance learning instruments allow enhancing the motivational component and improve the quality of education.

Thus, conducting Biology classes using social networks and web services contributes to better knowledge assimilation and motivation of schoolchildren. A comparative analysis of the use of distance learning tools in the educational process proves the effectiveness of the application of modern social networks and web services and the prospects of their active implementation during the COVID-19 pandemic.

The results obtained during the study can be of interest both for teachers and for secondary education students.

The conducted research does not cover all the aspects of the outlined problem. We see the prospects of further explorations in this direction in the improvement of the content, forms and methods of organization of learning of secondary education students using the distance learning technologies at classes of Biology and Health care.

Literature

1. Хатунцева С., Глазкова І., Ляхова І. Забезпечення безбар'єрного доступу до здоров'язбережувального освітнього середовища. *Наукові записки БДПУ. Сер.: Педагогічні науки.* 2023. Вип. 1. С.410–418.

2. Екстрене дистанційне навчання в Україні: монографія / За ред. В. М. Кухаренка, В. В. Бондаренка. Харків: Вид-во КП «Міська друкарня», 2020. 409 с.

3. Новітні комп'ютерні технології. Кривий Ріг: Видавничий центр ДВНЗ «Криворізький національний університет», 2014, Том XII: спецвип. «Хмарні технології в освіті». 337 с.

4. Savosko, V., Komarova, I., Lykholat, Yu, Yevtushenko, E., Lykholat, T. (2021). Predictive model of heavy metals inputs to soil at Kryvyi Rih District and its use in the training for specialists in the field of Biology. *Journal of Physics: Conference Series,* 1840, 012011.

5. Alice Keeler, Libbi Miller (2015). 50 Things You Can Do with Google Classroom. *Dave Burgess Consnsulting, Incorporated*, 61.

6. Ways we're making Classroom and Forms easier for teachers this school year / Sarah Wu/ https://www.blog.google/topics/education/

7. Bykov, V. Y. and Mushka, I. V. (2025) Electronic pedagogics and modern instruments of the open education. *ITLT*, 13, 5.

8. Іванюк І. Розвиток комп'ютерно орієнтованого навчального середовища в умовах полікультурної освіти в країнах Європейського Союзу *Освітній вимір.* 2020. № 55. С. 37–45.

9. Borova, T., Chekhratova, O., Marchuk, A., Pohorielova, T., & Zakharova, A. (2021). Fostering Students' Responsibility and Learner Autonomy by Using Google Educational Tools. Revista Romaneasca pentru Educatie Multidimensionala, 13(3), 73-94.

10. Троцко А. В., Рибалко Л. С., Кіріленко О. Г., Труш Г. О. Професійне самовдосконалення викладачів в умовах упровадження дистанційного навчання в закладах вищої освіти. *Інформаційні технології і засоби навчання.* 2019. Том 72. № 4. С. 258–272.

References

1. Khatuntseva S.M., Hlazkova I.Ya., Liakhova I.M. (2023). Zabezpechennia bezbar'iernoho dostupu do zdorov'iazberezhuvalnoho osvitnoho seredovyshcha [Ensuring barrier-free access to a health-promoting educational environment]. *Naukovi zapysky Berdianskoho derzhavnoho pedahohichnoho universytetu. Seriia : Pedahohichni nauky – Scientific notes of the BDPU. Series: Pedagogical sciences,* 1, 410-418 [in Ukrainian].

2. Red. Kukharenka, V.M., Bondarenka V.V. (2020) Ekstrene dystantsiyne navchannya v Ukrayini [Emergency distance learning in Ukraine]. Kharkiv:. Vyd-vo KP «Mis'ka drukarnya» [in Ukrainian].

3. Novitni komp'yuterni tekhnolohiyi (2014). [The latest computer technology]. *Khmarni tekhnolohiyi v osviti – Cloud technologies in education*, XII, 337 [in Ukrainian].

4. Savosko V., Komarova I., Lykholat Yu, Yevtushenko E., Lykholat T. (2021). Predictive model of heavy metals inputs to soil at Kryvyi Rih District and its use in the training for specialists in the field of Biology. *Journal of Physics:Conference Series,* 1840, 012011 [in English].

5. Alice Keeler, Libbi Miller (2015). 50 Things You Can Do with Google Classroom. *Dave Burgess Consnsulting, Incorporated*, 61 [in English].

6. Ways we're making Classroom and Forms easier for teachers this school year / Sarah Wu/ https://www.blog.google/topics/education/ [in English].

7. Bykov V. Y., Mushka I. V. (2025). Electronic pedagogics and modern instruments of the open education. *ITLT*, 13(5), 76–99 [in English].

8. Ivaniuk, I. (2020). Rozvytok komp'yuterno oriyentovanoho navchal'noho seredovyshcha v umovakh polikul'turnoyi osvity v krayinakh Yevropeys'koho Soyuzu

[Development of a computer-based learning environment in multicultural education in the countries of the European Union]. *Osvitniy vymir – Educational dimension*, *55*, 37-45 [in Ukrainian].

9. Borova, T., Chekhratova, O., Marchuk, A., Pohorielova, T., Zakharova, A. (2021). Fostering Students' Responsibility and Learner Autonomy by Using Google Educational Tools. Revista Romaneasca pentru Educatie Multidimensionala, 13(3), 73-94. https://doi.org/10.18662/rrem/13.3/441 [in English].

10. Trotsko, A. V., Rybalko, L.S., Kirilenko, O. H., & Trush, H. O. (2019). Profesiine samovdoskonalennia vykladachiv v umovakh uprovadzhennia dystantsiinoho navchannia v zakladakh vyshchoi osvity [Professional Self-Improvement in the Conditions of Distance Learning Implementation in Higher Education Institutions]. *Informatsiini tekhnolohii i zasoby navchannia – Information Technologies and Learning Tools*, 72(4), 258–272. https://doi.org/10.33407/itlt.v72i4.3088 [in Ukrainian].

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ОРГАНІЗАЦІЯ ДИСТАНЦІЙНОГО НАВЧАННЯ НА УРОКАХ БІОЛОГІЇ

Стаття розкриває особливості дистанційного навчання на уроках біології з використанням соціальних мереж та веб-сервісів.

Окреслено особливості використання засобів дистанційного навчання в освітньому процесі, визначено феномен дистанційного навчання як ефективного інструменту проведення занять з біології з використанням веб-сервісів та соціальних мереж, що сприяє кращому засвоєнню знань та підвищує мотивацію учнів до здобуття середньої освіти.

Методологія дослідження ґрунтується на діалектичній взаємодії таких методів порівняльний метод – для виявлення можливостей укладання завдань для учнів загальноосвітніх навчальних закладів, виставлення оцінок, коментування відповідей, спілкування з учнями в режимі реального часу; діяльнісний метод – дозволяє виявити суттєві характеристики та залежності, які дають змогу зрозуміти специфіку досліджуваного явища; дає змогу дослідити особливості організації дистанційного навчання на уроках біології в динаміці, його індивідуальні риси з використанням соціальної мережі Telegram, сервісів Google Classroom, Google Forms; системний метод – для цілісного осмислення структурування та повторення пройденого матеріалу впродовж усього навчального року; синергетичний метод – для розуміння організації дистанційного навчання на уроках біології як відкритої системи, що змінюється відповідно до багатофакторної взаємодії процесів навчання, виховання та самоосвіти, обґрунтування особливостей використання засобів дистанційного навчання в освітніх процесах із застосуванням інноваційних технологій, зокрема, технології змішаної освіти.

Підкреслено, що використання технологій дистанційного навчання в умовах пандемії є необхідним заходом.

Обґрунтовано, що робота з використанням веб-сервісів та соціальних мереж дозволяє учням середньої освіти опановувати навчальний матеріал без ущільнення та коригування навчальної програми, що є важливим в умовах пандемії COVID-19.

Було підкреслено, що сервіс Telegram має перспективи для впровадження в освітній процес, оскільки дозволяє швидко встановлювати контакт з класом, вирішувати проблеми в найкоротші терміни, а також оцінювати домашні завдання, щоб забезпечити максимальну якість підготовки учнів до занять.

Було відзначено, що проведення занять з використанням засобів дистанційного навчання дозволяє посилити мотиваційну складову та підвищити якість навчання. Уроки біології, проведені з використанням соціальних мереж та веб-сервісів, сприяють кращому засвоєнню знань учнями та їх мотивації. Порівняльний аналіз використання інструментів дистанційного навчання в освітньому процесі доводить ефективність застосування сучасних соціальних мереж і веб-сервісів та їх активне впровадження під час пандемії COVID-19.

Ключові слова: дистанційне навчання, технологія дистанційного навчання, організація, урок біології, учні закладів загальної середньої освіти, веб-сервіс, соціальні мережі.