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PECULIARITIES OF TEACHING BIOLOGY IN UNIVERSITIES UNDER CONDITIONS OF DIGITALIZATION

Currently, all areas of society are moving toward the mass use of information systems and technologies. Many countries are introducing information systems into the educational process. Every modern teacher should be fluent in information technology. In this way, it helps to increase student motivation for the class. Changing the system of relations between the teacher and the student, the content, the structure of their activities, they affect their motivational emotional environment. The use of information and technological means allows you to turn the biology lesson into a fascinating and productive lesson. The article considers effective methods of using electronic educational resources and capabilities of educational platforms in the conditions of transition to distance learning in accordance with the requirements of the state program "Digital Kazakhstan". It is emphasized that when teaching students, it is important to use effective modern methods and techniques, as well as visual and auditory elements instead of methods and approaches that make students dependent on the textbook and limit them to what the teacher teaches. The effectiveness of using videos in biology classes was studied. Student performance results are given on the research paper. In particular, the use of video materials during classes allows students to convey the necessary information as accurately as possible, and students, due to their modern capabilities and features, better absorb the material in this way. The results of questionnaires from different regions on the effectiveness of videos were discussed and analyzed. Thus, the study revealed the necessity of using videos in biology lessons to facilitate students' learning and their effectiveness in the learning process.

Key words: information technology, methods, videos, experimental, control, performance, creativity.

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Цифрландыру жағдайында биология пәнін оқытудың мүмкіндіктері

Қоғамның барлық салалары ақпараттандыруға, ақпараттық жүйелер мен технологияларды жаппай пайдалануға көшуде. Бірнеше жыл бойы әлемнің әртүрлі елдері білім беру қызметіне ақпараттық жүйелерді енгізумен айналысты, бұл студенттер мен мектеп оқушыларын оқыту кезінде педагогикалық жұмыста технологияларды пайдаланудың айтарлықтай тәжірибесін қалыптастыруға мүмкіндік берді. Жақсы және тәжірибелі мұғалімнің арсеналында әрдайым техникалық құралдардың пайда болуы мен жетілдірілуіне байланысты көптеген оқыту әдістері бар. Дәл осы фактор бізге оқу процесін жеңілдетуге және оқушылардың ынтасын арттыруға мүмкіндік береді. Өйткені, техникалық құралдарды қолдану биология сабағын қызықты және нәтижелі сабаққа айналдыруға мүмкіндік береді. Мақалада «Цифрлық Қазақстан» мемлекеттік бағдарламасының талаптарына сәйкес Қашықтықтан оқытуға көшу жағдайында электрондық білім беру ресурстары мен білім беру платформаларының мүмкіндіктерін пайдаланудың тиімді әдістері қарастырылған. Оқушыларға білім бере отырып, оқушыларды оқулыққа тәуелді ететін және мұғалім үйрететін нәрселермен шектейтін әдістер мен тәсілдердің орнына тиімді заманауи әдістер мен тәсілдерді, сондай-ақ визуалды және есту элементтерін қолдану маңызды болып табылатындығы айтылған. Биология сабақтарында бейнематериалдарды қолданудың тиімділігі зерттелді. Зерттеу жұмысы бойынша студенттердің оқу үлгерімдерінің нәтижелері берілді. Атап айтқанда, сабақ барысында бейнематериалдарды қолдану балаларға қажетті ақпаратты мүмкіндігінше дәл жеткізуге мүмкіндік береді, ал студенттер өздерінің заманауи мүмкіндіктері мен ерекшеліктеріне байланысты материалды осы тәсілмен жақсы игереді. Осылайша, зерттеу

мәселесі оқушының материалды игеруін жеңілдету үшін биология сабақтарында бейне материалдарды қолдану қажеттілігі болып табылады.

Түйін сөздер: ақпараттық технология, заманауи, әдіс-тәсілдер, бейнематериалдар, эксперименттік, бақылау, оқу үлгерімі, тиімді, шығармашылық.

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Особенности преподавания биологии в вузах в условиях цифровизации

В течение нескольких лет различные страны мира массово занимались внедрением цифровых технологий и информационных систем в образовательную деятельность, что позволило сформировать значительный опыт использования технологий в педагогической работе при обучении студентов и школьников. В арсенале хорошего и опытного учителя много методов обучения, связанных с появлением и совершенствованием технических средств. Именно этот фактор позволяет улучшить процесс обучения и повысить мотивацию учащихся. Использование технических средств помогает превратить занятие по биологии в увлекательный и продуктивный урок. В статье рассмотрены эффективные методы использования электронных образовательных ресурсов и возможности образовательных платформ в условиях перехода на дистанционное обучение в соответствии с требованиями Государственной программы «Цифровой Казахстан». Проблема исследования заключается в необходимости использования видеоматериалов на уроках биологии для наглядности усвоения материала учеником. Подчеркивается, что, обучая учащихся, важно использовать эффективные современные методы и приемы, а также визуальные и слуховые элементы вместо методов и приемов, которые делают учащихся зависимыми от учебника и ограничивают их тем, чему учит учитель. Изучена эффективность использования видеоматериалов на уроках биологии. По исследовательской работе приведены результаты успеваемости студентов. В частности, использование видеоматериалов во время занятий позволяет детям максимально точно донести необходимую информацию, а учащиеся, благодаря своим современным возможностям и особенностям, лучше усваивают материал.

Ключевые слова: информационные технологии, современные, методы, видео, экспериментальные, контрольные, успеваемость, эффективность, креативность.

Introduction

Today, the rapid development of science and technology has a significant impact on our lives. Informatics and computer technology are one of the leading areas that have gained momentum in recent years. It is in this segment that breakthrough ideas and developments have opened up new opportunities for other areas of human activity. Information systems and technologies have begun to have a greater impact on the social sphere, including the educational process. To understand the rapid changes in science, it is necessary to increase the volume of individual scientific knowledge. According to the curriculum, the course of science is aimed at preparing all students as scientifically literate people. Accordingly, one of the important goals of teaching the natural sciences is to educate students about the growing environmental problems based on scientific and technological advances and to teach them to show attitudes and behaviors aimed at preventing these problems. This is possible only

in the case of planned education with specific goals (Biryukova, 2019: 47) [1].

One of the main tasks of teachers is to develop students' interest in learning and creativity. Interest in the learning process is a powerful tool that motivates students to learn more about the subject and develop their abilities. The only way teachers help their students to solve environmental problems is the use of various information and communication technologies (ICT), which allow to diversify the forms and means of teaching that increase the creative activity of students in the learning process. That is, modern society expects new activities that require the development of some skills and knowledge such as searching for and processing necessary information, presenting this information to others, modeling of new objects and processes, planning and creating activities independently from teachers. In addition to reading, writing and numeracy skills, children should be taught to use digital technology as a tool for reading and working in everyday life from the first grade. Computer technology helps us

to answer where to find the necessary material and how to show it.

Analysis of recent research on this issue an highlighted previously as unresolved problem. The process of mass introduction of technologies is making its own adjustments to the educational process. Information and communication technologies contribute to improving the quality of education, increasing the competence of future professionals in various fields. Technology can be used as a solution of various pedagogic problems arising in the field of applied disciplines. Due to the availability of applied computer methods, there are different ways to solve problems in the field of education. For example, the scientific base of analogues is periodically updated, they are optimized as subsequent versions and have less resources and costs (Zakhvatkin, 202: 392) [2; 3].

In accordance with the introduction of technology in the education system there are new methods of teaching students and school children, as well as organizational forms of training, personal development, practical skills and the formation of basic positive qualities for citizens, which meet the expected level of information dissemination. The process of creating and disseminating technologies is a set of sequential actions that lead to large-scale changes in the educational process. This requires significant financial costs for the creation of systems that reveal the essence of new technologies, their implementation, and training of educators. Today, as part of the dissemination of technologies, much attention is paid to the principles of operation of the Open Education System and distance learning technologies, innovative approaches to motivate students, in particular, the development of new systems to encourage and monitor academic achievement (Zakhvatkin, 2013: 392) [4].

The introduction and effective use of information systems and technologies in the educational process related to universal informalization in all areas of human activity is a priority, which is studied by many authors (Komolov, 2019: 184) [5, 6]. It should be noted that this process is only in the early stages of its development. The introduction and development of specialized systems requires time and fund, which hinders its development. In addition, the existing technologies introduced into the educational process are multifaceted and have many aspects. There are many ways to use them. All experts today recognize the systematization of systems and technologies developed to solve the problems of the educational process in this area as

relevant. Lazareva M.V. and Mirkhomitov M.M. used electronic devices as auxiliary equipment to ensure the educational process (Lazareva and Mirkhomitov, 2019) [6].

Electronic devices are understood as hardware that allows as to directly implement a particular technology. Mostly personal computers and smartphones are now the most common type of hardware (Simdykina, 2019: 90) [7].

However, many other tools are being developed today. The choice of devices is determined by the specifics and direction of educational activities.

Research materials and methods

The textbook usually includes a set of programs that carry out the main educational tasks: improving the quality of learning by performing tasks in different forms (automated testing, acquisition and development of learning situations through modeling), increasing student interest, visual presentation of material, wide possibilities of model creation and others (Sokolnikov, 2019: 24) [8].

Learning aids include a set of software that organizes and facilitates the learning process, as well as monitors the dynamics of growth of knowledge, skills and abilities of students. Examples are information systems that take into account the quality of attendance and performance of educational tasks, tools for recording and displaying information (tools for recording, analyzing and processing information, electronic abstracts, mapping technology). Learning aids are as diverse and necessary as other curricula, and in some cases may be considered a special case.

Considering these characteristic and areas of use, it is important to conduct research on modern analogues of information technologies used in the educational process. In this regard, in order to solve educational tasks, it is necessary to evaluate the quality and effectiveness of information technologies. Also there is a need to analyze the functions of education as a subject area of digitalization and identify the main directions of development of ICT technologies in the educational process. Classification of materials and methods is also important.

At the present stage of biology teaching, special attention is paid to the acquisition of ICT technologies by students in the scientific representation of the surrounding world. Students do not search for information in a book in most cases; they try to get it from a computer. The use of new information technologies in the biology

course significantly increases the level of learning when students have low motivation. One of the advantages of using multimedia technologies in teaching is the novelty of activities, improving the quality of training. It would be easy to modulate complex biological processes and patterns using a computer (Sokolnikov, 2019: 24) [8].

To increase the cognitive activity of students and create educational resources, computer programs “Jamboard”, “Kahoot”, “YouTube” and electronic online tests in the Google system were used.

The use of the above-mentioned educational platforms allowed teachers to monitor the effectiveness of modern educational resources and social networks. It was noted that in order to form the skills and abilities of students who are ready to act independently in changing times, each lesson requires the preparation of a unique presentation.

The rapid mobility of changes in educational technology has diversified textbooks and teaching materials, making them more qualified and innovative (Tupikin, 2017: 16) [9]. Learning objects are digital environments created or used to achieve learning objectives, and they cover a wide range from concept maps and graphics to videos and interactive films. A form of digital learning that represents a process or action is a short animation or video, a piece of text, a picture or diagram, and interactive computer modeling (Birkök, 2008: 1) [10]. Thus, educational films as a form of digital learning are one of the most important learning materials used for successful teaching and learning and should be included in curricula (Gobbi, 2021: 71) [11].

According to Bruner, educational films are tools that give students an indirect educational experience and influence the learning process. As learning objects, these films are made to inform students about a particular topic, and they are effective learning tools and therefore allow for socialization. Educational research focuses on the benefits of educational films. According to Demircioglu, educational films increase students' interest and attention to the subject, allow them to evaluate examples from different perspectives, increase academic achievement and positive attitudes, and evoke a lot of emotion (Alirezabeigi, 2020: 193) [12].

The practice began with one of the most common means of displaying educational material – a presentation. But the presentation of the material through the presentation was too limited. We created video materials and used them in the course of the lesson. To create video materials:

- in accordance with the purpose of the lesson, the material was selected and summarized;
- audio, video and illustrative materials are combined;
- the time of display of the material is determined;
- individual and age characteristics of the class were taken into account (Birkök, 2008: 1-12) [13].

For most students, many images of the world explored in the program may be unfamiliar. And with the help of the video we have the opportunity to choose a video with illustrations in addition to the textbook.

You can also use the video at any stage of the lesson:

1. To determine the topic of the lesson.
2. In order to accompany the teacher's explanation
3. as a physical minute

Various videos and slide shows are created with Windows Movie Maker. The use of didactic materials developed in this program allows students to expand the possibilities of the learning process, not only to make it more effective and diverse, but also to increase interest in learning. Lessons using computer technology not only stimulate the learning process, but also increase the motivation to learn. From work experience, we can say that video lessons are a modern and effective method of teaching that can be used in teaching any subject. The use of ICT in the classroom has changed the teaching of traditional subjects, optimized the process of comprehension and memory of educational material, and most importantly, raised the level of children's cognitive motivation (Gobbi, 2021:71)[14].

According to the analytical reports of ATD1, Harvard Business Publishing Education2, Digital Information World3 and Kultura4, the video format proves its effectiveness in comparison with other types of presentations, such as text (Güven, 2011: 47) [15].

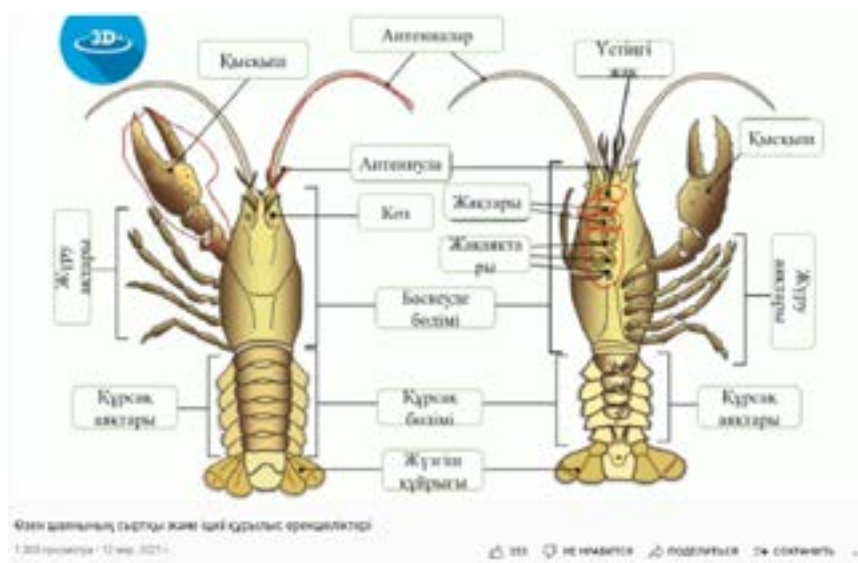
Video materials were used during the pedagogical practice at the university or during the lessons for school children. Ready-made videos on the Internet, as well as videos on the school website for special school programs, make the learning process very effective. It is possible to watch videos in three languages. University students can choose and use relevant videos from the Internet. However, in the course of the study, there was almost no video in the Kazakh language on the subject of zoology, devoted to the chapter on Arthropods. That's why a video on the topic was developed and uploaded to YouTube. The developed video material was

used during the lesson. It has been widely used to design and address environmental issues. During the lesson, students were given tasks of IWS through the development of projects and work on the analysis of eco-physiological conditions (Table 1).

As for the short-term viewing of materials on YouTube, it is worth noting the need for such video lectures prepared by faculty. In general, the number of caregivers is higher than the groups surveyed. This is one of the manifestations of the effectiveness of the work (Picture 1).

Table 1 – Video developed for use during the lesson

Video link	Content	Time
https://www.youtube.com/watch?v=QIf2Jmy9ooQ	Internal and external structure of crustaceans	8.21 min
https://youtu.be/-BfBeh17-FQ	Design learning technology	10.43 min
https://youtu.be/10fmRBWoEPg	Sustainable development goals	16.31 min



Picture 1 – One of the figures used in the youtube video lectures (1300 views in 11 months)

Research participants

The participants consisted of 48 students selected from two groups of first-year students majoring in Biology in the spring semester of the 2020-2021 academic year at the Kazakh National Women's Pedagogical University in Almaty. The experimental research group consisted of students studying through educational films, and the control group consisted of students studying without these films.

In the course of the research, a lesson on “Types of arthropods” was developed with and without the use of video materials. It should be noted that two groups of students were selected so that the average achievement of students in the subject was approximately the same.

The study was conducted in three stages:

1. Development of lessons on the topic “Types of arthropods” with and without the use of video materials, the development of a test showing the level of mastery of the material on this topic;
2. Conducting classes and tests for students on this topic;
3. Summarizing the test results.

In the first stage, a lesson on “Types of arthropods” was developed for the experimental group using video materials (Table 1), and a lesson on this topic was developed for the control group without the use of video materials. The content of the tasks opened in the lessons was the same. A test was conducted to check the mastery of the knowledge acquired in the lesson, which was conducted in both classes at the end of the lesson.

In the second stage, the lessons themselves were held. At the end of these classes, a quiz was

administered to all students. Because videos were used in the experimental group, the pace of the lesson was faster, students enjoyed the work, they gladly answered questions, and even if there were mistakes in the work, other participants in the process helped them to correct their mistakes. In the control group,

the students were often passive in the discussion of tasks. Some students actively participated in the lesson and tried to answer. However, the pace of the lesson was lower than in the experimental group. At the end of the lesson there was a quiz on the quality of knowledge acquisition (Picture 2).



Picture 2 – Student progress in the lessons

The third stage included checking the quiz and summarizing the results of students' learning. The quiz consisted of 15 questions. The test task was evaluated on a 100% scale. 0- not rated, 1-20

– unsatisfactory, 20-50 – satisfactory, 51-80 – good, 81-100 – very good. The results of testing of experimental and control groups are given in Table 2.

Table 2 – Test results of students

Groups	0%	1-20%	21-50%	51-80%	81-100%
Experimental	-	-	2	16	6
Control	-	2	9	11	2

Results and Discussion

As can be seen from Table 2, the percentage of qualitative progress of the experimental group is higher than that of the control group. And according to the results of testing, the number of failed is higher. Therefore, it can be said that the use of video materials in biology lessons improves the quality of students' academic performance.

Taking into account the above, it can be concluded that the use of video materials not only

simplifies the work of the teacher, but also helps students to improve the quality of learning, and thus increase academic achievement in the subject.

The video can be developed and used on any topic of biology. In zoology, the dictate is very useful for acquaintance with the internal and external structure of invertebrates and vertebrates, in order to acquaint with the internal structure of man in anatomy, to acquaint the scientist with the natural zones of flora and fauna (Güven-Yıldırım, 2015: 94) [16].

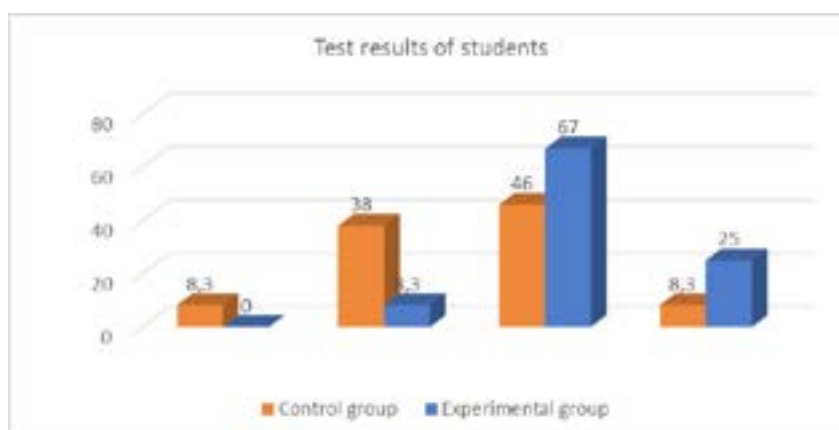


Diagram 1 – Test results of the control group and the experimental group

You can use videos or macro and micro photos to make a video. They cut out the fragments they need, connect them together, and then connect the audio. To connect audio, you can use many special programs to create a narrator. For example, Adobe Premiere Pro, Vegas Pro, Video Studio Pro, and more. Thus, it is possible to make the lesson very digestible with the help of a live video, which can be cut out only the necessary parts of the topic with the

help of a narrator, or with the addition of additions (Starko, 2018: 6)[20].

Depending on the chosen research work, an online survey was conducted to find out the opinions of different categories of students about educational videos. According to the results of this survey, a total of 41 respondents were registered. 53.6% of them are students, 31.7% are undergraduates, and the remaining 14.7% are students.

Table 3 – Regions surveyed

Regions surveyed	Educational organizations in the region
Almaty region, Almaty city	Kazakh National Women's Teacher Training University
Almaty city	Kazakh National Pedagogical University named after Abai
Almaty city	Al-Farabi Kazakh National University
Nur-Sultan	L.N. Gumilyov Eurasian National University
EKR, Semey city	Shakarim University of Semey CJSC
EKR, Semey city	State Enterprise «College of Business and Service»
EKR, Semey city	Avicenna Higher Medical College
EKR, Ust- Kamenogorsk city	«East Kazakhstan University named after Sarsen Amanzholov» JSC
EKR, Semey city	Municipal state institution «Gymnasium №37 named after Ibrai Altynsarin».

According to the results of the survey with undergraduate students, video is not used enough in universities: 20% of respondents indicated that they cannot use video in classes at their universities, since classes are held in classrooms that are not equipped with computers, projectors and screens; about 50% of respondents use video listening once a month, and only 15% of teachers show video at every lesson; the rest of the teachers conduct video-assisted training twice a month on average.

Our research hypothesis is that video resources provide visual support for learners, so video is methodically more effective than audio and oral lessons.

Conclusion

As a result of the study, there was a significant difference in the results of testing between students of the experimental group with educational films and

students of the control group without educational films. It was also found that the performance of the experimental group was higher than that of the control group. A review of the literature has shown that there are a limited number of studies that use educational films in education. The study found that educational films help students learn about environmental topics, environmental issues, information about invertebrates and the development of environmental awareness.

As a result, it was concluded that films about the natural environment have a positive effect on environmental sensitivity. According to Birkök, when using educational films in the learning process, complex information is easily understood, all organized information is provided dynamically, visually and audibly, and the student can be provided with behavioral patterns. The results of other studies have shown that films have a positive effect on knowledge and achievement in the classroom (Birkök, 2008: 1-12)[13].

In addition, students noted the educational films used in teaching the chapter, gave answers and provided some explanations. According to students, educational films have significant advantages for both individual results and the learning process. First of all, students said that educational films allow conducting lessons through visual and video materials.

Students reported that the educational films were useful in the study of the topic, contributed to a better understanding of the course, and thus the class was held regularly. When analyzing the literature, it

can be seen that this result, determined by the views of the student, corresponds to the results of several studies. Barnett, Wagner, Gatling, Anderson, Howle, and Kafka concluded that popular films were effective in helping students understand scientific concepts and develop their mental structures.

The prospect of the study is that the developed methodological developments using video materials can and should be used in the further study of biology.

One of the greatest strengths of television and video is the ability to connect with viewers on both an emotional and cognitive level. Through this ability to reach viewers' emotions, video can have a strong positive impact on both motivation and affective learning. Not only are these important learning components in their own right, but they can play an important role in creating an environment in which deeper cognitive learning can take place. Short Term Satisfaction Theory deals with affective and motivational components such as enthusiasm, persistence and concentration. Finally, interest stimulation theory states that entertainment promotes learning and creativity by generating student interest in a topic.

Visual media messages are processed in a different part of the brain than that which processes textual and linguistic learning, and the limbic system responds to these pictures with instinct, emotion, and impulse. Memory, in turn, is strongly influenced by emotion, resulting in an educational video having a powerful ability to convey experience and influence cognitive learning

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