

ACCESSIBILITY OF MICROSOFT TEAMS AND MOODLE SERVICES FOR THE IMPLEMENTATION OF E-LEARNING FOR STUDENTS WITH DISABILITIES IN INSTITUTIONS OF HIGHER EDUCATION IN UKRAINE

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Abstracts

The current study investigates the ways to increase accessibility to higher education for students with disabilities. The importance of implementation e-learning for such students as one of the preconditions for effective social and psychological adaptation and further successful integration of persons with disabilities into society is emphasized. A survey of students with disabilities was conducted to identify their needs in educational process. The main difficulties that they overcome in the process of education in institutions of higher education are identified. The main peculiarities and advantages of the distance learning course «Adaptive Physical Education» are described created in the Moodle system. The differences and benefits of Microsoft Teams over the Moodle platform in the process of e-learning for students with disabilities are described. The process of organizing of «Adaptive Physical Education» distance learning course for students with disabilities on the Microsoft Teams platform and the purpose of implementation it in the institution of higher education are emphasized.

Key words: students with disabilities, learning accessibility, e-learning, Microsoft Teams, Moodle, institutions of higher education.

Оксана Хомік, Наталія Бєлікова, Світлана Індика, Оксана Ковальчук, Олена Томашук, Віктор Галан-Влашук. **Доступність платформ Microsoft і Moodle для впровадження електронного навчання студентам з інвалідностями в закладах вищої освіти України.** У поточному дослідженні проведено аналіз шляхів збільшення доступності вищої освіти для студентів з обмеженими можливостями. Підкреслено важливість упровадження електронного навчання для таких студентів, як однієї з передумов ефективної соціальної й психологічної адаптації та подальшої успішної інтеграції людей з інвалідністю в суспільство. Для виявлення їхніх потреб у навчальному процесі проведено опитування студентів-інвалідів. Визначено основні труднощі, які вони долають у процесі навчання у вищих навчальних закладах. Описано основні особливості та переваги дистанційного курсу «Адаптивне фізичне виховання», створеного в системі Moodle. Описано відмінності й переваги Microsoft Teams від платформи Moodle у процесі електронного навчання для студентів з обмеженими можливостями. Наголошено на процесі організації дистанційного курсу «Адаптивне фізичне виховання» для студентів з обмеженими можливостями на платформі Microsoft Teams та на меті його впровадження у вищому навчальному закладі.

Ключові слова: студенти з обмеженими можливостями, доступність навчання, електронне навчання, Microsoft Teams, Moodle, вищі заклади освіти.

Оксана Хомик, Наталья Бєликова, Светлана Индыка, Оксана Ковальчук, Елена Томашук, Виктор Галан-Влашук. **Доступность платформ Microsoft и Moodle для внедрения электронного обучения студентам с инвалидностью в учреждениях высшего образования Украины.** В работе исследуются пути увеличения доступности высшего образования для студентов с ограниченными возможностями. Подчеркивается важность внедрения электронного обучения для таких студентов как одной из предпосылок эффективной социальной и психологической адаптации и дальнейшей успешной интеграции людей с инвалидностью в общество. Для выявления их потребностей в учебном процессе проводился опрос студентов-инвалидов. Определены основные трудности, которые они преодолевают в процессе обучения в высших учебных заведениях. Описаны основные особенности и преимущества дистанционного курса «Адаптивное физическое воспитание», созданного в системе Moodle. Описаны различия и преимущества Microsoft Teams от платформы Moodle в процессе электронного обучения для студентов с ограниченными возможностями. Отмечается важность процесса организации дистанционного курса «Адаптивное физическое воспитание» для студентов с

ограниченными возможностями на платформе Microsoft Teams и цель его внедрения в высшем учебном заведении.

Ключевые слова: студенты с ограниченными возможностями, доступность обучения, электронное обучение, Microsoft Teams, Moodle, высшие учебные заведения.

Introduction. In the context of globalization processes, there is a rapid development of the information society, which is characterized by a large number of various sources of information. Under these circumstances, the educational institutions of Ukraine face the task of forming a person who successfully realizes himself in his chosen profession. The increasing number of people with disabilities in the world, in particular young people who need to obtain the high-quality education, has led to increased requirements for institutions of higher education to create appropriate conditions for the accessibility and support of students with disabilities.

Higher education, as a process and result of professional formation and development of personality, a system of mastering certain knowledge and skills in a specific professional activity, plays an important role in the social rehabilitation of persons with disabilities, as it provides them with orientation in the world of professions, creates a basis for the implementation of the principle equal opportunities for citizens of all categories. One of the effective conditions for the implementation of this principle is e-learning as the most accessible and open form of organizing the educational process for people who have physical limitations to obtain a full education and are forced to study at home.

Information and Communication Technologies (ICT) can be a powerful tool in supporting education and inclusion for persons with disabilities. Technological development can enable people to improve their quality of life [1].

As people with disabilities include people who have medical restrictions for full-time education and for whom mobility is difficult, e-learning may be the only accessible form of education.

The current conditions of the electronic environment development dictate the teachers to use different platforms. They can provide creation of e-learning environment for students with disabilities. They include social networks and blogs, programs for video chat and conferences, 3D communication systems, cloud services. The use of popular social networks one can effectively organize team work, long-term project activities, continuous mobile education and self-education. Resulting from it, institutions of higher education are faced with the question of finding optimal models and technologies for the implementation of inclusive higher education, which allows forming professional competences, and providing effective social and psychological adaptation of students with disabilities with the successful integration into society.

Literature Review and Research Problem. The hope for productive life and new opportunities for persons with disabilities is given by e-learning, which allows overcoming many other problems, such as the street barrier, bureaucracy and injustice, social sphere. E-learning allows obtaining professional education for persons with disabilities who have mobility impairment due to some illness or physical disabilities. It is necessary for modern technical devices to be adapted for use by persons with nosological diagnosis, with mobility impairment, with sensory deprivation, etc.

Dissemination of distance education among student youth was made possible by the widespread introduction of Internet technologies and the need to modernize the educational process. The development and implementation of innovative approaches based on the use of powerful opportunities of information and communication technologies, in particular the Internet, has become one of the priority areas of modernization of educational content. The emergence of electronic educational resources and services aimed at providing distance and mobile learning has led to increased opportunities for basic and advanced education, lifelong learning and etc. Taking this into account, by the term “e-learning” we will understand the learning system that is implemented with through information and communication technologies, in particular the Internet. E-learning can include many types of media that provide text, audio, images, animations, streaming video, and technology programs and processes such as video and audio cassettes, satellite television, computer-based training, web-based training, and things like that.

The continuous progress of ICT raised the need to move toward improving the learning quality applied in education and training systems by addressing new perspective and opportunities. E-learning emerges as the answer to fulfill that need [3] and vouches to attend the learning needs of the students in a personalized and inclusive way. Actually, there is no shortage of optimism about the potential of e-learning to reduce barriers to education and improve the lives of individuals with disabilities [2; 5].

In this context, many researches developed specific tools dealing with specific needs for people with disabilities [6; 7; 10;]. A significant part of researches is devoted to the innovative component of the

e-learning environment. Spanish scientists have set up web-based laboratories for distance education [4] that help illustrate natural phenomena and processes without costly sophisticated equipment. It is interesting to use Internet resources for predicting students' final grades [9] Moodle and social network integration projects are gaining ground. The authors take up the position [8] that Facebook is an interesting interactive tool for learning. Students feel themselves safer and more comfortable with peer feedback, communicating with colleagues in a relaxed atmosphere.

These guidelines are mainly based on the following four criteria:

- perceivable – information and user interface components must be presentable to users in ways they can perceive,
- operable – user interface components and navigation must be operable,
- understandable – information and the operation of user interface must be understandable,
- robust – content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies [7].

Thus, the development of accessible educational environments is the basis for addressing the barriers that people with disabilities may encounter when accessing these learning technologies.

An analysis of the study of this problem indicates that, support for the inclusion and support of person with disabilities in lifelong learning in Ukraine is, unfortunately, not yet well understood. Given this urgency, the problem of choosing the best technologies in an inclusive higher education environment becomes more important. Therefore, the problem of identifying ways to improve the quality of learning of students with disabilities through e-learning is currently of great interest.

Aim and Objectives of the Study. The conducted research aimed to analyze the accessibility of using Microsoft Teams and Moodle services for e-learning of students with disabilities in institutions of higher education of Ukraine.

For this purpose the following tasks were investigated:

- to describe ways to increase the accessibility of higher education for students with disabilities;
- to monitor the needs of students with disabilities in the process of higher education;
- identify the main difficulties that students with disabilities overcome in their studies in institutions of higher education;
- to characterize the main advantages of studying the course «Adaptive Physical Education» created in the Moodle system;
- describe the differences and benefits of Microsoft Teams over the Moodle platform in the process of distance learning for students with disabilities;
- to present the process of organizing the «Adaptive Physical Education» e-learning course on the Microsoft Teams platform.

Research Methodology. To determine the ways of accessibility of higher education for students with disabilities such methods as analysis of philosophical, psycho-pedagogical, scientific and technical literature on this problem were used.

The needs and difficulties of students with disabilities in higher education were substantiated based on a survey of 26 students with disabilities who study in the specialties of physical education at Lesia Ukrainka Eastern European National University (Lutsk) and 18 students of the Academy of Recreational Technologies and Law (Lutsk).

To analyze the main features and benefits of the Moodle and Microsoft Teams e-services, a distance learning course «Adaptive Physical Education» was created. This course was practically tested during lectures, practical classes and during the passing final tests by students with disabilities.

Research Results. The training of students with disabilities in institutions of higher education involves the students' mastering of the higher education standard of higher educations in special adapted conditions, which take into account the special needs of such students. In this regard, determining the needs of students is of key importance. They determine the nature and direction of the necessary adaptation of the environment of the educational institution, which ensured the successful adoption by students with disabilities of the normative content of the educational program. In this case, we mean individual needs, manifested in a particular person, as well as some typological needs specific to persons belonging to a particular nosological group. And it is typological needs that set the general universal framework for adapting the conditions for obtaining knowledge in higher education institutions in an inclusive format.

The range of these needs was determined as a result of monitoring 26 students with disabilities at Lesia Ukrainka Eastern European National University (Lutsk) and 18 students of the Academy of Recreational Technologies and Law (Lutsk) studying in the specialties of physical education.

The results of survey of 44 respondents with disabilities made it possible to identify the following needs for higher education:

- the need for an individual training schedule that provides the possibility of missing classes for medical reasons;
- the need for training audiences equipped with special tools;
- the need for presence and navigation support facilities in educational institutions;
- the need for volunteers to assist with social rehabilitation support;
- the need for internship in a special format and mode;
- the need for training in the development of communication skills;
- the need to diagnose individual psychological characteristics of the individual;
- the need for hardware and technical support for independent work.

In addition, the results of the survey made it possible to identify the main difficulties that students with disabilities overcome in their studies in institutions of higher education. They include:

- difficulties in the perception and fixation of educational information at lectures and seminars;
- difficulties in establishing productive interaction with teachers;
- difficulties in designing and presenting the results of independent work;
- difficulties in establishing informal communication in the student environment;
- difficulties in conducting leisure activities;
- difficulties in orienting on the subject-space environment and social and residential infrastructure of the higher education institution;
- difficulties in using modern technical means of rehabilitation and educational purposes.

The possibility of higher education for persons with disabilities is closely connected with the disability group with the degree and type of health disorder (physical, mental, intellectual or sensory impairment). In particular, people with mental disabilities (mental illness, nervous system disorders and impaired developmental) are less involved in the educational process. They have minimal opportunities for obtaining the higher education.

Persons with visual and hearing impairments, because of the specificity of the diseases, are very limited in their ability to obtain information in the ordinary sense. This leads to difficulties with the simultaneous perception, note-taking and comprehension of the educational material. Hence, there is a need for barrier-free access to teaching materials for such students. The institutions of higher education of Ukraine are minimum equipped with special teaching aids and methods, and they do not have in their staff teachers who have been specially trained to work with this category of students. Equipping the educational process with new training tools is being carried out for all educational recipients. As a rule, there are no separate items of expenditure for the modernization of special educational programs for the persons with visual and hearing impairments. This fact makes impossible the participation of persons with visual and hearing impairments in the educational process.

Considering the conducted research, it becomes obvious that students with disabilities have special needs of the educational plan related to obtaining educational information in accessible format, mastering the content of education in health-saving mode, social needs related to social and spatial orientation, as well as the needs of business and informal communication and integration into society.

The given needs in their totality dictate the need to create in the institutions of higher education conditions that could take into account the opportunities of students with disabilities. The introduction of e-learning is one of the most important areas for improving the students' training with health problems in a contemporary institution of higher education.

Nowadays, it is necessary to use various e-learning organization services that can be applied to the educational process of students in the institutions of higher education. Moodle and Microsoft Teams may be the most appropriate e-learning platforms for students at Lesia Ukrainka Eastern European National University and the Academy of Recreational Technology and Law. To determine the peculiarities and benefits of each of these e-learning systems, we have prepared a training course «Adaptive Physical Education» for students with disabilities.

The Moodle Platform (Modular Object-Oriented Dynamic Learning Environment) is a free, open-source learning management system that implements the philosophy of «social constructivism pedagogy» and is focused on organizing teacher-student interaction, although suitable for organizing traditional courses as well as supporting full-time learning. It is a system that contains all the courses of the disciplines and each student can enter this system and work with some course.

Moodle is adaptable (contains advanced tools and methods that provide individualized learning), long-term (educational platform meets information technology requirements in education and provides the opportunity to make changes to distance courses without reprogramming), accessibility (is possible to work in the distance regardless of place and time, the main condition is to connect to the Internet), economy (this is a free, open source).

The elements and resources of the Moodle Information Environment have provided us with great opportunities to create «Adaptive Physical Education» course. After all, the typical Moodle functionality contains such interactive tools for joint problem solving such as wiki, glossary, blog, forum, chat. They provide for the exchange of information in the mode «teacher-student», «student-student», are communicatively directed and contribute to the formation of professional competence of future specialists. Forums are designed to discuss a specific topic among all participants in the learning process. Messages can include attachments, graphic elements, and more. The forum is convenient to use for discussions, consultations with students, seminars, it allows the teacher to check the degree of mastering students' necessary knowledge and skills on a particular issue.

Chat is an effective online communication tool that allows students to communicate in real time. Chat can be used as a learning element to solve a particular creative problem. In this case, the assessment can be carried out by both the teacher and other students.

The Moodle Glossary is an electronic analogue of the Special Terms Dictionary. Its difference from the traditional vocabulary is that the glossary can be consistently created by students throughout the study period. That is why the designated element of the course is considered interactive. A student can provide a definition of a term and describe its properties by creating a mini-article. Other course participants have the opportunity to comment on this article, to offer their options for defining the concept.

The use of the Moodle system in the process of teaching students with disabilities and the creation of an e-learning course «Adaptive Physical Education» allowed the teacher to create educational and methodological support for it, which can be further modified, expanded, supplemented and adjusted (fig. 1).

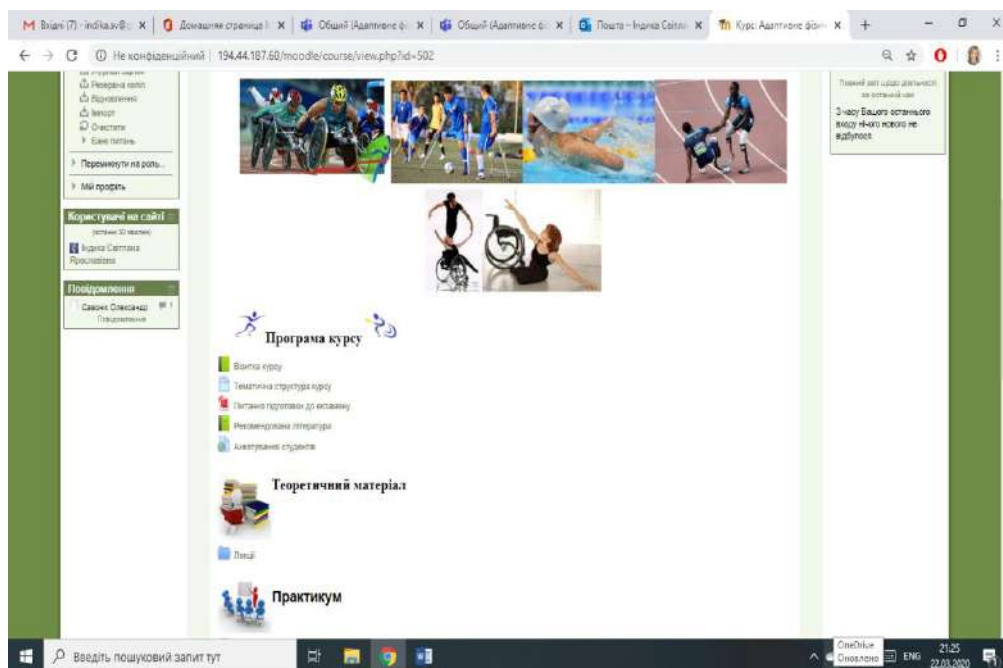


Fig. 1. The View of the Moodle Platform Window, where the Educational and Methodological Support of the Discipline «Adaptive Physical Education» has been Created

The advantage of the Moodle platform is the ability to use text, video and audio materials in the process of organizing the learning process; the use of various types of tests, questionnaires for conducting control and self-control of students' knowledge; setting the required deadlines for students to complete the tasks.

The platform has an automated system for rating students' independent work (fig. 2).

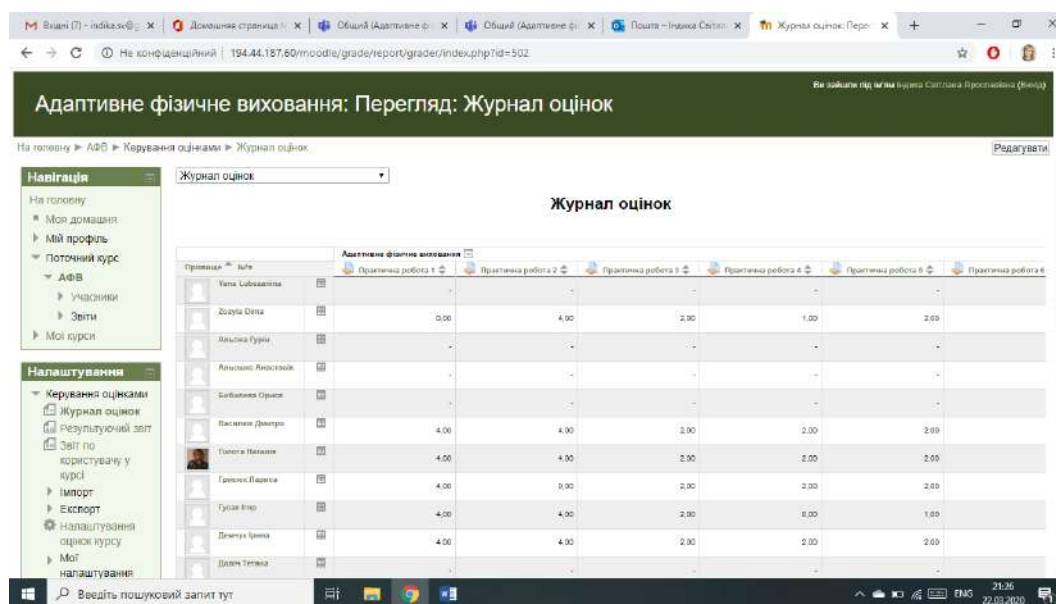


Fig. 2. A View of the Moodle Platform, where Student Assessment Journal for the Discipline «Adaptive Physical Education» has been Created

Therefore, Moodle system provides students with:

- gaining access to logically structured and completed educational and methodical material, improves conditions for self-mastering by the content of discipline;
- extended access to Internet resources;
- distance learning of educational material;
- pre-term session passing.

However, the disadvantage of using the Moodle platform to teach students with disabilities is the lack of personal communication with the teacher and students of the group.

Unlike the Moodle environment, Microsoft Teams has the primary focus of online lessons, collaborating on documents, presentations and applications in real time. With multimedia tools and feedback, the service enables remote learners to be present in the classroom. The teacher, in turn, has the opportunity to conduct interactive lessons in more natural manner, using high-definition video for individual interaction with students. Microsoft Teams offers technologies for clear audio and video transmission, data sharing and individual sessions for collaborative and personalized learning that simplify the learning process.

The Microsoft Teams platform is a new workspace on base of chat in Office 365. It is a new type of workspace where you can connect with the right people, talk, or find the right tools and content. Microsoft Teams allows members of the workgroup to organize online meetings, hold audio and video conferences, publish news and general documents within the team workspace, plan team members' joint activities, and connect additional Microsoft online services.

Microsoft Teams is the only platform that allows you effectively use the full diversity of Office 365 features and capabilities, so it can be called a team center. Word, Excel, PowerPoint, SharePoint, OneNote, Scheduler, Power BI, and Delve are built into Microsoft Teams, so all tools and data are always at your fingertips. Intelligent services based on Microsoft Graph technology help you get and share important information in a timely manner. Microsoft Teams also includes Office 365 Groups, a membership management service that makes it easy to switch from one collaboration tool to another while maintaining context and sharing files with other users.

To study this course, the Microsoft Teams platform allows the creation of online group called «Adaptive Physical Education», which includes students who have studied the discipline and the teacher.

Microsoft Teams has built in services Office 365. This allows the teacher to complete «Adaptive Physical Education» in OneNote. The system provides effective opportunities for organizing a fascinating learning process. The teacher can download documents, PowerPoint presentations, videos, demo software, animated videos, thus keeping students' attention. Group members, in turn, can work together on these documents and take an active part in discussing the topic of the lecture (fig. 3).

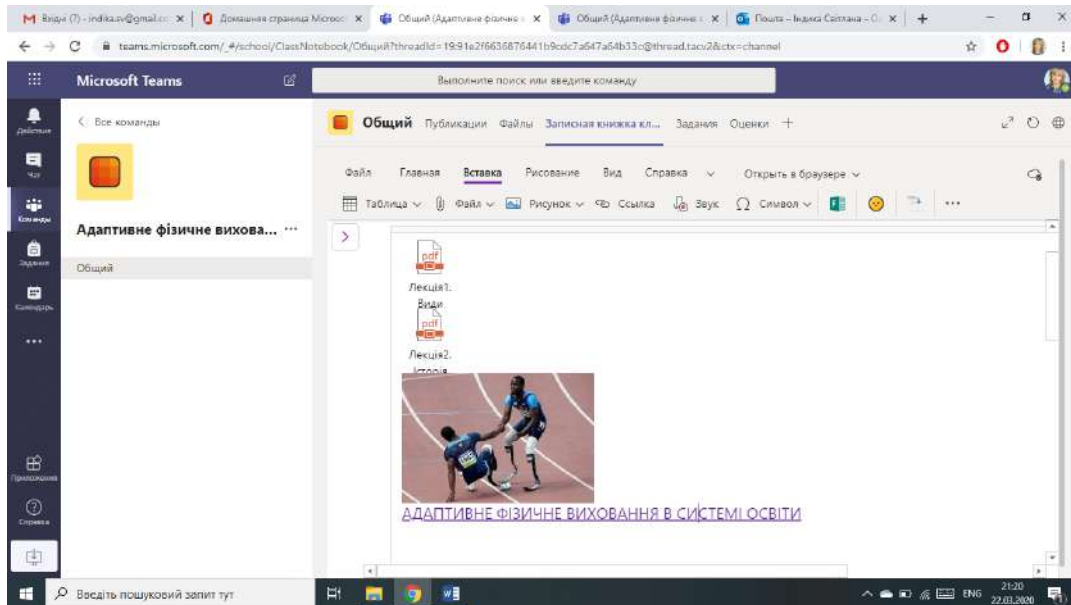


Fig. 3. A View of the Microsoft Teams Platform Displaying the Content of the «Adaptive Physical Education» Course

Through group and private audio and video calls, the Teams platform provides video lectures during which students can see and hear the lecturer and ask questions as they understand unclear concepts. All participants in the training group are provided with a reliable and clear sound transmission using a telephone or a personal computer equipped with the necessary parameters (fig. 4).

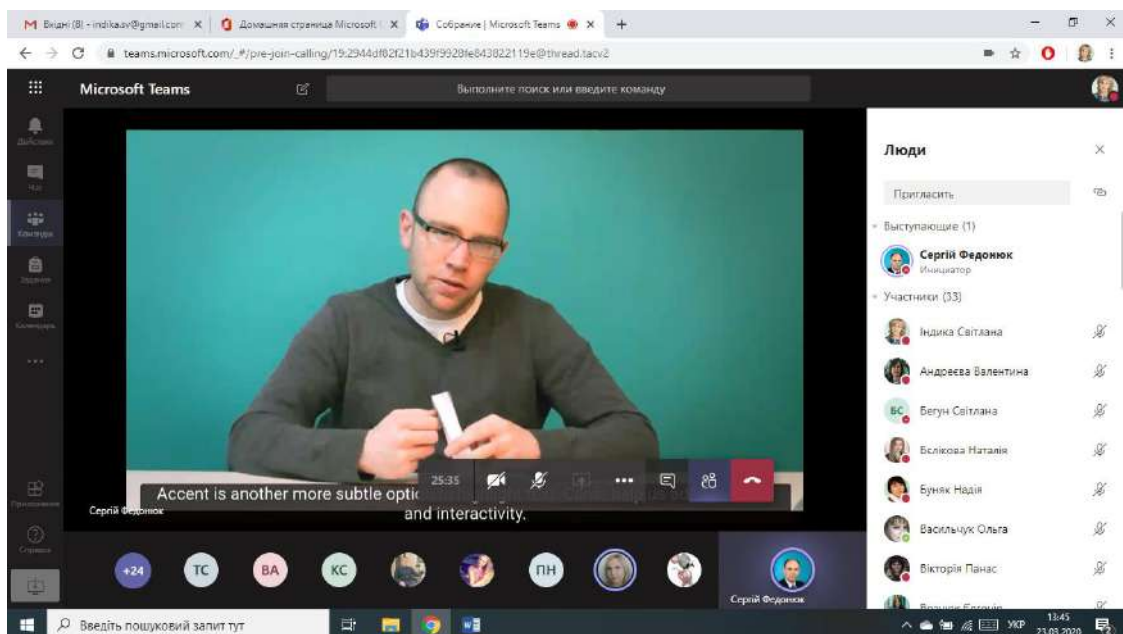


Fig. 4. The View of the Microsoft Teams Platform where the Video Lecturing Process Takes Place

«Teams» is a team-based space based on 4 key ideas: chat, interaction center, individual customization and secure protection. In Microsoft Teams, chats are organized through conversations. Due to this, it is

possible to conduct practical classes in a convenient format, when a created group has the opportunity to actively participate in the discussion of the topic of the lesson, which is presented for elaboration and to show their materials. When organizing communication, group members can create separate topics. Themes can be customized with a help of function Tabs, which provides quick access to frequently used documents and applications. You can apply this function to Office 365 services such as OneNote, SharePoint, and Planner. Chats are divided into collective groups, when the correspondence is visible to all participants of the group and individual, the contents of which are visible only for two participants (teacher and student). Besides using chat, a student during practical class can join the discussion using voice capabilities, including a microphone.

To evaluate the effectiveness of student learning, the teacher may conduct electronic testing. The Teams system supports different types of tests: with multiple answer options, with yes/no answers, with an answer box and an abstract format (fig. 5).

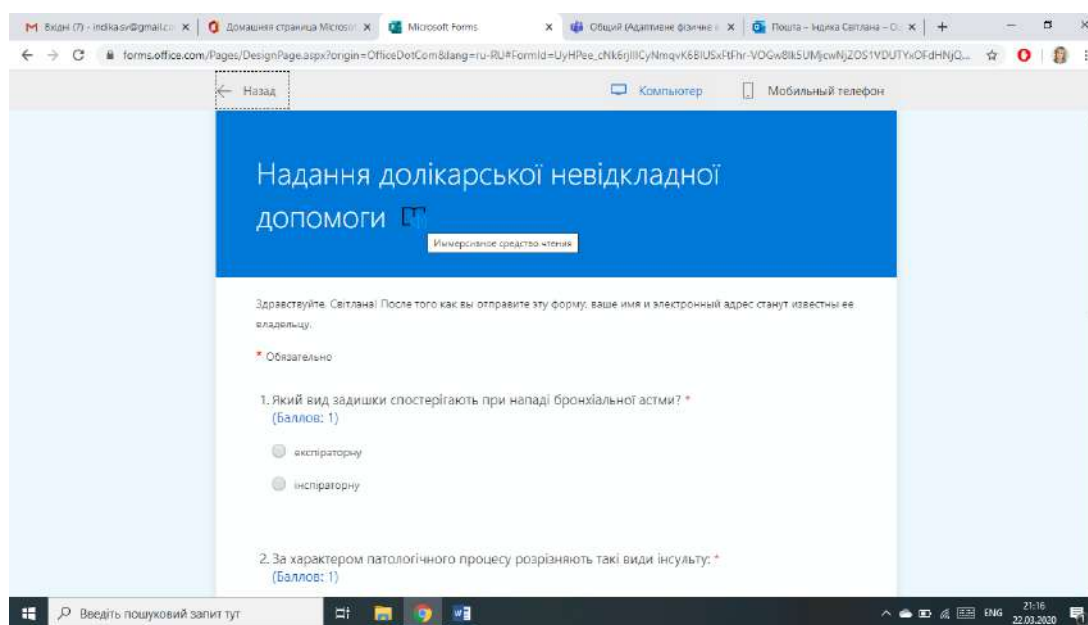


Fig. 5. A View of the Microsoft Teams Platform Showing one of the Options for Student Assessment Tests

The effectiveness of the knowledge-testing process is enhanced by the automatic evaluation function. After the student has completed the test assignments, the teacher receives an e-mail with a completed grade.

One of the peculiarities of Microsoft Teams is the ability to send e-mails to all members of the group, saving formatting (Markdown) and attachments. You can also receive comments on the email and alerts. And a library of emoji, GIFs, custom stickers and memes makes it possible to bring something interesting and personal into the digital workspace.

For convenience in operation, Microsoft has added the ability to schedule and repeat sessions on the team members' employment calendar. Microsoft Teams is also based on the Office 365 Groups service, which helps the group switch between tasks and share information.

Discussion. Higher education plays an important role in the social rehabilitation of students with disabilities, as its main task is the development and formation of a multifaceted personality, ready for organic realization in the modern society. Some of researchers Arrigo, Ben Brahim, Mohsen Laabidi, Mohamed Jemni, Leila Jemni Ben Ayed, Amal Ben Jemaa, stick to this statement.

However, the training of students with disabilities in institutions of higher education involves the students' mastering of the higher education standard in special adapted conditions, which take into account the special needs of such students. This is evidenced by the results of our survey.

Analyzing the above-mentioned needs and the system of views of scientists on this problem [6; 10], it can be insisted that one of the most important directions of improving the students' training with health problems in modern institution of higher education is the introduction of distance learning with the use of various electronic education.

Moodle and Microsoft Teams may be the most appropriate distance learning platforms for students at Lesia Ukrainka Eastern European National University and the Academy of Recreational Technology and Law. The benefits and features of the Moodle service are evidenced by the results of the distance learning course created by us «Adaptive Physical Education», with students with disabilities and a course teacher (fig. 1–2). However, the use of the Moodle platform in the process of higher education does not allow personal communication with the teacher and students of the group.

Unlike the Moodle environment, Microsoft Teams is the main focus of online classes in real time. The Microsoft Teams platform is a new chat space in Office 365. It is a brand new type of workspace where you can connect with the right people, talk, or find the right tools and content. Microsoft Teams allows members of the workgroup to organize online meetings, hold audio and video conferences, publish news and general documents within the team workspace, plan team members' joint activities, and connect additional Microsoft online services.

Microsoft Teams is the only platform that allows you to effectively leverage the full diversity of Office 365 features and capabilities, so it can rightly be called center for a team work. Word, Excel, PowerPoint, SharePoint, OneNote, Scheduler, Power BI, and Delve are built into Microsoft Teams, so all tools and data are always at your fingertips. Intelligent services based on Microsoft Graph technology help you get and share important information in a timely manner. Microsoft Teams also includes Office 365 Groups, a membership management service that makes it easy to switch from one collaboration tool to another while maintaining context and sharing files with other users (fig. 3–6).

Conclusions. It can be concluded that the increase number of young people with disabilities require higher education of high quality. It has led to increased requirements for institutions of higher education to create appropriate conditions for their access to education. It involves taking into account the special personal and typological needs of students with disabilities, which determine the nature and direction of the necessary adaptation of the educational environment. We determined the range of these needs in the process of survey of students with disabilities studying in the specialties of physical education.

One of the ways of improving the training of students with disabilities in contemporary institution of higher education is the introduction of e-learning using educational electronic services, including the Moodle and Microsoft Teams platforms. The use of the Moodle system in the process of teaching students with disabilities, as shown by the results of the e-learning course «Adaptive Physical Education», allows the teacher to create educational and methodological support of the discipline; use text, video and audio materials in the process of organizing the educational process; use a variety of tests; conduct questionnaires to test students' knowledge. In its turn, the Moodle system provides students with access to logically structured and complete teaching and learning materials, which improves the ability to master the content of the discipline independently; increased access to Internet resources; remote acquisition of educational material; pre-term session passing and so on. However, the disadvantage of using the Moodle platform to educate students with disabilities is the lack of personal communication with group members, which is very important when teaching students about health problems.

Unlike the Moodle environment, Microsoft Teams' core mission, as demonstrated in its distance learning course «Adaptive Physical Education», is offering online lessons, collaboration on documents, presentations and real-time applications. By the aid of multimedia tools and feedback, the service provides remote learners to be present in the training audience. The teacher, in turn, has the opportunity to conduct interactive lessons in a more natural manner, using high-quality video for individual interaction with students. Microsoft Teams offers technologies for clear audio and video transmission, data sharing and individual sessions for collaborative and personalized learning that simplify the learning process.

In this way, the use of the Microsoft Teams e-service in institutions of higher education will fully provide the accessibility of higher education for students with disabilities and their successful learning of the content of the educational program.

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