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Research Article

Distance Learning at Nikola Vaptsarov Naval Academy Utilizing Online Platforms during the COVID-19 Crisis

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ABSTRACT:

In the current digital world, using information technology in the study process is necessary and in some situations is even mandatory. In some cases, distance learning is the only option. The choice of a suitable platform or a combination of platforms to conduct distance learning can be quite challenging. The main reasons for this are the multiple platforms available, and the numerous criteria and limitations when scoring and using these platforms. This article examines some of the technologies, used for distance learning. After a comparative analysis, an option is presented for the integration of the Microsoft Teams platform in Nikola Vaptsarov Naval Academy's distance learning system.

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Introduction

The educational institutions in Bulgaria are all on a different stage of employing distance learning. Often in the actual study process, methods and systems from the distance learning form are used, with their goal being to support classroom learning. Enabling distance learning is embedded in educational strategies, but the readiness for such a form of education is often very little. In connection with the complicated epidemic situation, regarding the spread of COVID-19 on the

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territory of Bulgaria, by order of the Minister of education RD-01-124/ 13 March 2020, every educational institution has ceased to conduct attendance classes. The educational process has to become distance. The administration of Nikola Vaptsarov Naval Academy chose Google Classroom as its main online distance learning platform. During an online department meeting, based on our previous experience, the academic staff of the Department of Information Technologies chose to use a distance learning model based on Moodle and Microsoft Teams.

E-based education platforms

Nikola Vaptsarov Naval Academy has a long experience in the use of distance learning as a subsidiary form of education. The distance learning system Moodle, available at http://dlc.naval-acad.bg, has been used since 2005 and is maintained by academic staff from the Department of Information Technology. At the moment, students have access to 69 electronically based courses, including 4 in English. Of these, 40 support disciplines taught in the Department of IT. In 2016, all teachers at Nikola Vaptsarov Naval Academy and part of the administrative staff took a course – "Using modern software and hardware in the learning process," which was intended to introduce them to various technological solutions to ensure distance learning, including the Moodle platform.

To expand the capabilities of the Moodle system in use, it is integrated with the video conferencing system based on the Apache OpenMeetings product and available at http://meetings.naval-acad.bg. This video conferencing system is used mainly for outsourced classes of students with representatives of companies in the IT sector. Apache OpenMeetings was also used in the preliminary defence of a dissertation before an expanded department council, as some of the participants were in Sofia and others in Australia.

Since 2016, Nikola Vaptsarov Naval Academy has been using Microsoft cloud services, available through the https://portal.office.com portal. The services that Nikola Vaptsarov Naval Academy used through Microsoft, related to the provision of distance learning, are e-mail, shared disk space, video-sharing channel, video conferencing and chat. Microsoft services are integrated with the local active directory in the school, as well as with the Moodle platform used. In this way, the integrity of the user data and access to the various information services is achieved. In this way, users, whether learners or teachers, have the opportunity through a single account to access all information resources and services, including and providing distance learning in Nikola Vaptsarov Naval Academy.

Microsoft currently provides educational institutions with two video conferencing options with built-in file sharing and collaboration on tasks and projects. In view of the steps taken by Microsoft to suspend support for this service, the Department of IT is transitioning to the use of Microsoft Teams to support not only administrative activities in the department but also to conduct distance learning, especially in the current situation, from the beginning of the year, in the country and the world.

Moodle with OpenMeeting

The Moodle distance learning system provides a wide range of tools for creating and managing e-based courses. It focuses mainly on asynchronous learning. To include video conferencing in the learning process it is necessary to add a separate tool. Apache OpenMeeting is used for this purpose in Nikola Vaptsarov Naval Academy.

Using the Apache OpenMeeting as a video conferencing environment has its advantages, but it also poses many challenges in implementing and sharing with Moodle. Among the main advantages of the Apache OpenMeeting is that the software is distributed under one free software license. Hence the possibility to adjust the system according to the needs of the organization that implements it. The system also has some advantages in conducting video conferencing over other video conferencing platforms, especially in terms of how to visualize the participants in the virtual meeting.

Skype for Business

Skype for Business is an enterprise software platform for voice messaging and video conferencing, developed by Microsoft. It is now a service in the Office 365 suite and is designed to replace Microsoft Lync. The software uses Skype, familiar to the public, and additionally allows up to 250 users to participate in an online meeting, provides corporate security, allows you to manage employee accounts and is integrated into Office applications. Microsoft plans to stop supporting Skype for Business on July 31, 2021, after which date Microsoft Teams will remain as the main service they offer for video conferencing, including online broadcasts.

Google Classroom

The e-learning system is based on Google's cloud technologies.[2, 9, 11] It provides opportunities to create virtual classrooms. In each of them, the teacher can create a video conference room with his students, set them tasks to perform and check their work.

The main advantage of Google Classroom is that the system is free. In addition, it can be stated that it is web-based and its interface is familiar to most e-learning participants.

The rapid introduction of Google Classroom also leads to possible security breaches. The students, some of the teachers and the administrative staff do not have profiles in the established system. In-home mode, the rules for accessing the system are published in the open web space and anyone can acquire the rights of a teacher. Google Classroom has a limited ability to create and organize online tests. In addition, it can be pointed out that administration tools are also limited.

Microsoft Teams

Both Google Classroom and Microsoft Teams provide the opportunity to create virtual classrooms, share materials, set performance tasks, tests and assess students' knowledge.[3, 5, 8] An important advantage of Microsoft Teams is that it is used free of charge for educational institutions after concluding a contract with Microsoft and checking whether the institution is in fact educational. It also should be mentioned the possibility of integration with a local active directory, as well as with all other services provided by Microsoft.

Microsoft Teams, as well as Google Classroom, are video conferencing systems with added functionality to support the presentation of educational content. Both systems have common functionalities, but there are also certain differences, both in the scope of the offered function and in the way of its provision to the end-users.

Comparison between Microsoft Teams and Google Classroom

First, a characteristic difference between the two systems should be pointed out in the way, which these systems are accessible to their end-users. With Microsoft Teams, there are two options - using an Internet browser or using an installed application, either on a computer (desktop PC or laptop) or on a mobile device (tablet or smartphone). There are certain advantages and disadvantages to both system options. The use of an Internet browser allows for independence from the workstation, while the installed application allows for the use of the full functionalities of the system.

With Google Classroom, both access options are also possible - through a browser and through an application. However, there are differences to how these two solutions are used compared to Microsoft Teams. For Google Classroom it can be said that there are more functions when access is through an Internet browser, i.e. all system functionalities can be accessed from one place, either by opening individual tabs or windows. With regard to the installation of an application on the workplace or mobile device, the lack of such an application for personal computers can be considered as a disadvantage, and for mobile devices, it is necessary to install and use several separate applications to access the various functionalities of learning content and access to virtual classrooms.

Regarding the way of accessing the platforms, it is not possible to make a definite assessment of which system better solves this task, as for some users the option with the use of a browser is more convenient, and for others - the use of a single installed application, both on a personal computer and on a mobile device. It is important to note that on both platforms the installation and use of the application are free. The requirement remains that the user has to have a user profile with the appropriate access rights to the relevant resources.

It can be seen that under certain conditions both manufacturers can be classified in the same way in terms of the value of using their services for educational organizations - both companies provide free basic licenses as well as additional services for a fee. It is important to emphasize that both platforms can be fully successfully implemented as supporting distance learning through the use of free

licenses. Also, the possibility of their joint use in order to supplement and eliminate certain shortcomings and lack of functionality should not be ruled out.

In addition to the above features, another extremely important function that should be evaluated in the process of selecting an implementation system is the method of creating user profiles for access to the services provided. In both considered platforms the user profiles can be created in two ways - in the online portal of the respective platform (cloud-based profiles) or by synchronization with a local user database (synchronized profiles). The local user profile database is, in both cases, synchronized using the LDAP protocol. However, some differences can lead to the process of selecting a specific technical solution to a certain result.

Since in both systems cloud-based accounts are created in a completely similar way using the corresponding online portals (Microsoft portal for Microsoft Azure or Office 365 administration and Google portal for GSuite administration), it is more interesting to consider and comparing the method of synchronizing user profiles from a local database. With regard to cloud-based profiles, it is possible to indicate what functionalities for their administration are available, namely:

- Creating a single profile;
- Creating multiple profiles using a CSV file;
- Assign roles to work with the system;
- Assign software licenses (for Microsoft);
- Setting a user password for access;
- User profile data management - adding nicknames, contact information, etc.

Some of the listed functionalities are also applicable in the administration of synchronized users, depending on the configured rights of the tools used to perform the synchronization.

Comparing all the functionalities mentioned so far, it can be concluded that they are similar in terms of educational organizations using any of the considered video conferencing systems. The opinion of the authors is that Microsoft Teams has a minimal advantage over Google Classroom in terms of how to implement the services, and this advantage is due to better developed licensing policy and easier synchronization of user-profiles with a local database when it is implemented through an active directory.

Although both video conferencing systems have been implemented to a certain extent, it should be noted that the use of one does not preclude the use of the other, as there are tools for their integration and sharing, i.e. user profiles from one system to be used to access services in the other system and vice versa.

Comparative Analysis of e-Learning Platforms

When performing software analysis, the methods of program evaluation can be used: Evaluation with control tables, Method of digital weights and summation and Method of quality weights and summation.[1]

In the first method with a control table, the necessary and desirable parameters of the software products are entered. Their presence is only reported, without making a qualitative assessment. The main disadvantage of the method is that it does not take into account the weight of the individual criteria and the evaluation is performed freely by a specific practical solution. Only one specialist, using one license of the product, which reduces the cost of the study, can perform the analysis.

In the method of numerical weights and summation (Numerical Weight and Sum - NWS) the relativity of each criterion is established by using a digital linear scale, and its evaluation is independent.[1, 10] The result is obtained by multiplying the estimate by weight. As a disadvantage of the method, it can be pointed out that at present there is no referenced, tested, standardized and agreed linear scale for the qualities of e-learning software. Also, an additional complication occurs in obtaining zero final results, as the use of a metric scale leads to the use of the empirical value of zero.

The Qualitative Weight and Sum - QWS method overcomes the methodological difficulties of the previous method (NWS) as it is not based on a digital linear scale. The weights of the individual criteria are defined by symbols: "E" - extremely necessary, "*" - very valuable, "#" valuable, "+" - less valuable and "0" – zero.[1, 10]

When determining the final evaluation, auxiliary rules are used to minimize the results:

- elimination of assessments that do not meet the criterion of necessity (E);
- elimination of zero criteria;
- elimination of criteria with identical results.

The use of qualitative criteria in this method introduces subjectivism in the evaluation. Reducing the error introduced by the human factor can be done by increasing the number of experts and their specializations in the group evaluating the software.

When performing the comparative analysis, the methods “Evaluation with control tables” and “Method of quality weights and summation” were used. The criteria and their weights are determined by an expert assessment that consists of habilitated personal from Nikola Vaptsarov Naval Academy and are accepted by the department council, held in a virtual on-line room. To facilitate the determination of the final results, the evaluation criteria are grouped into 3 areas: system administration, communication tools and training sites.

The following software platforms were studied: Moodle; Skype for Business; Microsoft Teams and Google Classroom. When performing analysis through “Evaluation with control tables” the following number of positive criteria were

obtained: Moodle -17; Skype for Business -12, Microsoft Teams -20; Google Classroom -19.

The summarized results of the analysis performed by the Quality Weights and Summation Method are shown in Table 1. Three criteria for necessity are introduced (E): video conferencing supported learning content formats, saving video content, creating tests.

Table 1. Summarized results using the Quality Weights and Aggregation Method without removing estimates that do not meet the criterion of necessity (E)

	E	*	#	+
Moodle	2	6	6	7
Skype for Business	1	5	1	5
Teams	4	7	7	6
Classroom	1	2	7	11

All analysed platforms meet at least one criterion of extremely necessary." For this reason, the results cannot be minimized. Of the four platforms under consideration, only Moodle is a complete learning management system (LMS). At the same time, without the use of additional applications, it does not allow synchronous learning via video conferencing.

Teams, Classroom and Skype for Business do not meet the didactic requirements for LMS and do not allow the creation of an e-based training course. Of the three systems, Teams received the highest number of "essential" and "very valuable" ratings.

The fast introduction of the Google Classroom platform as an environment for providing distance learning leads to possible breaches in the security system of Nikola Vaptsarov Naval Academy. System administrators have created Google accounts for everyone. As most of the lecturers, the administrative staff and all the students are not in the area of the university, the accounts, together with the official password for access, are published in open Internet space. This allows outsiders to register in the system not only as students but also as teachers who have an extended number of rights.

Regarding the implementation of a video conferencing system in support of distance learning at Nikola Vaptsarov Naval Academy there are several important facts. Both systems are currently in use. The management of the school decided to introduce the Google Classroom system because of an incorrectly formulated proposal by a limited number of employees without conducting a discussion in a wider circle. At the same time, the Department of Information Technology successfully uses the technological solutions of Microsoft Corporation, including their video conferencing services - Microsoft Teams and its predecessor Skype for Business. The reason for the introduction and use of these services in the ongoing learning process in the department is the easy integration with the Moodle platform, designed for learning content management and implementation of e-learning and distance learning. At the same time, the possibility for synchronization of

user-profiles with the active directory of the school has been realized. In this way, the possibility for full integration of several separate systems is realized, which together should support the conduct of distance learning at the university, without compromising the security policies adopted by the Academic Council of Nikola Vaptsarov Naval Academy.

Because of the analysis, Microsoft Teams was chosen to be used as a software platform for video conferencing.

Model for e-based Learning

The established distance learning system in the Department of IT integrates into a common model an asynchronous distance learning system Moodle and synchronous system for video conferencing Microsoft Teams. Both platforms are accessed with the same user account.

The already created e-based courses in LMS Moodle are used as a basis for the e-learning of the disciplines. For each of them, it forms a "learning path," which has a strictly fixed sequence of learning resources and classes. It is defined in the curriculum of each discipline. For each lesson, students have access to study materials in electronic format, which are located in the local data centre of Nikola Vaptsarov Naval Academy.

The e-learning model is open. It allows you to add, remove or modify individual modules during the course. The only requirement from a pedagogical point of view is the change in the provided information and tasks for implementation to be coordinated with the incoming and outgoing control of knowledge.

The main subject in the e-learning model is the individual learner. Looking at it through the prism of the Felder-Silverman model,[6, 7] it can have a certain learning style: sensory, intuitive, visual, verbal, active, reflexive, consistent or global. In order to cover the maximum number of characteristics of the learning process of individual learners, different formats of learning materials have been created, as well as different types of assignments and questions in the process of control of the acquired knowledge and skills. The lecture material can consist of text documents in pdf, doc, html format; multimedia: video files, presentations, flash-animation; online help: links to sites on the Internet. Each practical lesson is provided with a separate assignment. Short tests can be additionally included, with which to check the acquired knowledge on the given topic. In order to stimulate the independent preparation of the students, they are also given assignments for independent work.

In times of crisis, the synchronous platform for video conferencing Microsoft Teams is used to compensate for the impossibility of personal contact between teacher and students. Each teacher creates a separate Team to provide classes in a given discipline. The users include the students from the given stream or group and an employee from the training department of Nikola Vaptsarov, Naval Academy who performs control functions on the learning process. For convenience, when training in large streams, the exercises from the curriculum are organized as separate channels in Teams. The platform allows you to record the online meeting. The video file is automatically uploaded to the shared disk space in the

Team's cloud, which is part of the Microsoft Office 365 cloud and can be added to the learning materials database using the built-in tools in Moodle.

Although Microsoft plans to stop supporting Skype for Business, the app can be used as a backup. The proposed model allows in case of failure of the Teams platform, online classes can be conducted with Skype for Business, and users use the same accounts. In this case, the recorded video files are stored in the teacher's cloud.

The distance learning model is flexible regarding the presence of learners in online classes. Despite the synchronous nature of video conferencing, video recordings of meetings allow their use in an asynchronous environment. In case of technical obstruction (malfunction of the computer or mobile device, limited or interrupted Internet access) or medical reasons, the student may subsequently review the provided video materials and independently perform the tasks of the practical lesson. Moodle logbooks allow teachers to monitor and control student activity in the e-course.

When creating the model for distance learning and choosing Microsoft Teams as a system for a video conferencing platform, the following factors affecting the cybersecurity of the entire system were taken into account:

- One person, who is also part of the academic staff of the IT department, carries out the administration. This helps with the rapid removal of occurred software problems;
- Users use a single account to access both platforms. The accounts are distributed and used by employees and students, even before the crisis and the transition to absenteeism and work from home.

For the short period of learning in a complete distance environment, the following disadvantages can be pointed out:

- impossibility to perform practical classes with equipment that must be actually disassembled and assembled, administered or when working with valuable and expensive equipment (router, switch, etc.);
- there is no direct contact between the teacher and the students;
- he lack of technical staff providing online communication does not allow for effective control over the presence of students in the sessions;
- in some of the cases the students have a restriction when working from home: a computer with low productivity, with which they cannot fully perform the practical classes; a computer that does not work or the family has only one that several people work with; disconnected or limited in volume or speed of Internet connection;
- additional physical exertion for both teachers and students;
- dependence of the entire training on a software platform maintained by an external company.

Based on the experience gained for working in a virtual environment, the need to create its own array in the area of Naval Academy Nikola Vaptsarov, in

which to store video files from the conducted semester and state exams and defence of diploma theses.

In the context of the crisis caused by the spread of COVID-19, the IT industry is leading in the extreme development and implementation of innovations. At the time of writing, Microsoft and the Moodle community are working to increase the integration of distance learning applications. Free plug-ins for Moodle and applications for Microsoft Teams have been developed, which integrate the two platforms. Through them, learning participants who have a Microsoft Office 365 account can create virtual classrooms directly in Moodle using Microsoft Teams. The team from the Department of Information Technology, which supports Moodle at Nikola Vaptsarov Naval Academy, after the end of the school year will upgrade the current version of LMS, which will allow the implementation of these specified software solution.

In addition, it can be stated that the state exams held in the IT department will be conducted online. For this purpose, a specialized security browser (Safe Exam Browser) will be used, compatible with LMS Moodle when accessing test tasks.

Conclusion

In conclusion, during crisis, in a fast-paced mode of decision-making, the addition of the online functionality of Microsoft Teams to the already integrated LMS Moodle, led to a rapid and smooth transition from face-to-face to virtual training in the Department of Information Technology of the Nikola Vaptsarov Naval Academy. Meanwhile, when choosing a system for video conferencing, a main aspect is the security of the application. The possibility of integrating Microsoft Teams in the distance learning system and the continued usage of the already available user accounts, lowers the possibility of cyberattacks aimed at online services provided by Nikola Vaptsarov Naval Academy.

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