UDC 378.147.018.43/.091.12.011.3-051:373.3/.091.014.6:005.642.4
DOI: 10.52534/msu-pp.6(2).2020.30-40

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Analysis of the Results of the Use of Distance Learning Tools in the Training of Future Primary School Teachers in Quarantine

Article's History:
Received: 29.08.2020
Revised: 24.09.2020
Accepted: 02.10.2020

Suggested Citation:
Sukhovirskyi, O.V., & Liakhnovych, N.O. (2020). Analysis of the results of the use of distance learning tools in the training of future primary school teachers in quarantine. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 6(2), 30-40.

Abstract. The study analyses the results of using software and hardware during distance learning. The basis for the study was the Khmelnytskyi Humanitarian and Pedagogical Academy and the Municipal Institution of Higher Education "Bar Humanitarian Pedagogical College named after Mykhailo Hrushevskyi". A survey of students who studied computer science in the 1st and 2nd year of the specialty "Primary Education" was conducted. This allowed studying the attitude of the future primary school teachers towards different means of distance learning, determining the conditions for organising distance learning for students of both institutions, comparing the results of teaching computer science for the future primary school teachers by distance and conventional forms. It was discovered that most students are positive about the use of the platforms offered by the institution and consider their opportunities sufficient for their learning. Adaptation to the new platforms and tools took several weeks. The most popular among the tools were Google Classroom, blog, cloud documents, video tutorials on YouTube, online tests, and more. Quite a large number of students underestimate the effectiveness of video conferencing and prefer other types of electronic materials. However, when explaining new material, sounding presentations increases the level of knowledge acquisition. The main problems that students face during distance learning are the lack of access to computer devices and the Internet, a considerable number of tasks in various disciplines, which causes overload and deterioration of both students' well-being and the quality of their education. The study of students' grades in the discipline "Computer Science" in 2019 and 2020 made it possible to compare the results at the beginning of quarantine and at the end of the semester. This approach allows determining the effectiveness of the use of distance learning. The results indicate that during the quarantine there was no considerable deterioration in student grades. Statistical analysis confirmed the identity of the results of semester control in groups that studied in the conventional and distance form

Keywords: organisation of the educational process, teaching aids, teacher education, learning efficiency, quarantine

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Аналіз результатів використання засобів організації дистанційного навчання при підготовці майбутніх учителів початкових класів в умовах карантину

Анотація. У статті здійснено аналіз результатів використання технічних засобів та програмного забезпечення під час дистанційного навчання. Базою для дослідження стали Хмельницька гуманітарно-педагогічна академія та Комунальний заклад вищої освіти «Барський гуманітарно-педагогічний коледж імені Михайла Грушевського». Було проведено опитування студентів, які вивчали інформатику на 1 та 2 курсах спеціальності «Початкова освіта». Це дало змогу вивчити ставлення майбутніх учителів початкових класів до різних засобів дистанційного навчання, визначити умови організації дистанційного навчання у студентів обох закладів, порівняти результати навчання інформатики майбутніх учителів початкових класів за дистанційною та традиційною формами. З'ясовано, що більшість студентів позитивно сприймають використання запропонованих у закладі платформ і вважають їх можливості достатніми для власного навчання. Адаптація до нових платформ і засобів відбулася протягом кількох тижнів. Найбільш популярними серед засобів студенти називали: Google Classroom, блог, хмарні документи, відеоуроки на Youtube, онлайн-тести тощо. Досить велика кількість студентів низько оцінює ефективність використання відеоконференцій і надає перевагу іншим видам електронних матеріалів. Втім, при поясненні нового матеріалу, озвучування презентацій підвищує рівень засвоєння знань. Основними проблемами, з якими стикаються студенти під час дистанційного навчання є відсутність доступу до комп'ютерних пристроїв і мережі Інтернет, а також значна кількість завдань із різних дисциплін, яка зумовлює перевантаження та погіршення як самопочуття студентів, так і якості їх навчання. Вивчення оцінок студентів із дисципліни «Інформатика» у 2019 і 2020 роках дало змогу порівняти результати на початку карантину та наприкінці семестру. Такий підхід дозволив визначити дієвість використання дистанційних засобів навчання. Отримані результати свідчать, що під час карантину не сталося помітного погіршення оцінок студентів. Статистичний аналіз підтвердив ідентичність результатів семестрового контролю у груп, які навчалися за традиційною та дистанційною формами

Ключові слова: організація навчального процесу, засоби навчання, педагогічна освіта, ефективність навчання, карантин

INTRODUCTION

The introduction of quarantine measures in the spring of 2020 set new challenges for higher education institutions and exacerbated some existing problems. Most institutions have already established a distance learning system, which was previously actively used to publish independent tasks, homework, accumulate test results, etc. In the new environment, it was enough for teachers to increase the number of educational materials to provide students with a full set of lectures and practical works. However, some institutions did not have full-fledged distance learning platforms or they did not contain enough materials. Despite the level of electronic resources and distance learning platforms provision, all the teachers have encountered difficulties in online classes arrangement, providing for the teacher's e-presence, converting educational materials, receiving a feedback, defining the information supply channels, etc.

Analysis of the choice of teaching tools in quarantine conditions indicates that instant messaging and video conferencing are most popular among teachers. Nevertheless, there are other approaches to organising the educational process. For example, O.S. Kravchuk suggests using the possibilities of social

networks and sees such positive aspects in this [1]:

1. Social media promotes active learning.

2. Using social media during your studies increases student satisfaction.

3. Social networks ensure that online content is available.

The study of ways to combine synchronous and asynchronous distance learning modes indicates a positive experience obtained by the Transcarpathian Institute of Postgraduate Pedagogical Education [2].

Research by M. Antoshkiv, O. Trebenko, [3], M. Aryayev, L. Kaplina, L. Senkivska, V. Pavlova [4], V. Kyrylenko [5], I. Voitovych, S. Trofymenko [6], S. Nakonechna [7] is devoted to separate issues of introducing distance learning tools in the training of specialists of various specialities. O. Korbut and O. Malinko [8], S. Moroz [9], B. Filenko, N. Roiko, I. Starchenko et al. [10], A. Shilinh [11], R. Bart, T. Olney and M. Nichols [12] presented the analysis of the quality of using distance learning tools in their publications. Most researchers specify that at the initial stage of quarantine, school teachers and teachers of higher educational institutions mainly worked with students in asynchronous mode, sending tasks using instant-messaging tools. For example, T. Machacha found that 80% of technology teachers use this inefficient approach, and the materials they publish are generally of poor quality or even anti-scientific [13]. R. Costa, J. Souza, R. Valentim, and T. Castro discovered that students' thinking style does not affect the quality of distance learning [14].

However, there are few studies on the state of the introduction of distance learning in higher education institutions under quarantine. The current basis does not allow evaluating the effectiveness of using various tools and making a choice of the optimal approach to their implementation in the educational process.

The purpose of the article is to determine the effectiveness of distance learning during the national quarantine in Ukraine in the spring of 2020. *Objectives of the study*:

1. To study the attitude of future primary school eachers to various means of distance learning.

2. To determine the conditions for organising distance learning for students of the Khmelnytskyi Humanitarian and Pedagogical Academy and the municipal institution of higher education "Bar Humanitarian Pedagogical College named after Mykhailo Hrushevskyi" in the spring of 2020.

3. Comparison of computer science teaching results for future primary school teachers in the distance and conventional forms.

MATERIALS AND METHODS

The results of using distance learning tools were obtained by interviewing students and comparing grades for individual practical work. The total number of students who took part in the experimental study in 2020 was 83 people. Among them – 53 students of groups PO-21 and PO-22 of the Khmelnytskyi Humanitarian and Pedagogical Academy and 30 students of groups 11-SH and 22-SH of the Bar Humanitarian Pedagogical College named after Mykhailo Hrushevskyi, who studied in the speciality "Primary education". The study of the use of distance learning tools in both institutions took place on the example of the discipline "Computer Science". The introduction of quarantine in the middle of the semester allowed comparing the grades of the same students during conventional and distance learning.

The survey was conducted a month after the start of quarantine in an anonymous form and was aimed at identifying the main problems in the organisation of training, collecting students' impressions about the tools used in online learning, learning conditions, etc. In addition to closed-type questions, the questionnaire contained questions in which students could express their own impressions about the choice of platforms, the selection of tasks, the quality of materials, etc. To specify the identified problems and discovered their causes, after the survey, conversations were held with students. To compare the results of conventional and distance learning, the grades of students who studied at the corresponding courses in 2019 and 2020 were analysed. For this purpose, the first final assessment received at the end of March and the semester assessment were summarised.

To establish the presence or absence of statistically noticeable differences between the results, the χ^2 Pearson consistency criterion was used. The sample and number of students, their distribution by level, meet the requirements that are set for the data for applying this criterion.

RESULTS AND DISCUSSION

The imposition of quarantine in the spring of 2020 was quite sudden and was based on the existing Order on distance learning [15]. Each of the higher education institutions and individual teachers chose different

means of distance learning and adapted the training materials to the new conditions. The Bar Humanitarian Pedagogical College immediately used the Google Classroom platform, Google Form, LearningApps, Quizizz, Youtube videos, etc. The survey of students in this institution was aimed at determining the conditions of study and attitude to the chosen means. At the Khmelnytskyi Humanitarian and Pedagogical Academy, at the initial stage, the publication of educational materials and the results of the testing were performed using a blog and cloud spreadsheets. Afterwards, the Google Classroom platform, blog, cloud documents, and video tutorials on Youtube were used. The survey of students in this institution was aimed not only at identifying the conditions of study but also allowed selecting the best learning tools.

The survey, which was conducted a month after the start of quarantine, showed that the majority of students are satisfied with the means that were used in each of the institutions. In particular, in the Bar Humanitarian Pedagogical College, 90% were satisfied with the choice of the GoogleClassroom platform. They noted that the quality of tasks, resource availability, and ease of use facilitated learning in quarantine. In the Khmelnytskyi Humanitarian and Pedagogical Academy, 83% of students indicated that there were enough published educational materials. Nevertheless, 7.5% considered this approach incorrect. Otherssug-gested adding more modern tools to the existing blog. As evident, in both institutions, the level of satisfaction with the chosen means is quite high and has a difference of 7%. This can be explained by the fact that within a month most students mastered the proposed tools, got accustomed to using them, learned to easily find material. Furthermore, the main role is still played by educational materials in the form of documents, presentations, videos. It is the effectiveness of using these resources that should be evaluated during the analysis.

Students rated the demonstration of the material in the form of presentations quite positively. Thus, 84.3% of students of both institutions are satisfied with the published presentations and note the compactness of the material, its structure, and visibility. However, 15.7% need additional explanation. Interestingly, converting a presentation to a video format and adding voice accompaniment to read text from slides considerably reduced the number of students who could not understand the topic. Notably, despite the lack of additional explanations in the video, voicing the text reduced the percentage of those who did not understand the material to 7.2%. This is a fairly impactful indicator, which can be explained by the fact that some students need other channels of information transmission and visual support is not enough for them.

Having summarised the results of a survey among students of both institutions regarding the availability of new materials in presentations and video tutorials based on them, this method can be evaluated highly. However, other approaches should be suggested (Fig. 1).

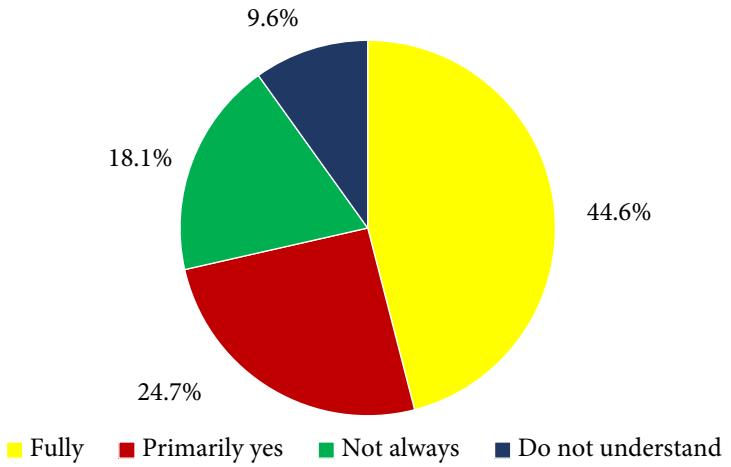

Figure 1. Results of students' answers to the question "Do you understand the new material that is presented?"

The use of an exclusively electronic form of educational materials changes the need to prepare a lesson summary. Lectures and presentations in electronic form can be processed and stored to prepare for independent work, exams. However, the survey results show that a considerable part of students continues to take conventional notes (Fig. 2). Notably, teachers of the analysed courses did not put forward such a requirement, and students were not required to do so. After an anonymous survey during a conversation with students, it was discovered that this form of working with materials improves the perception and memorisation of information.

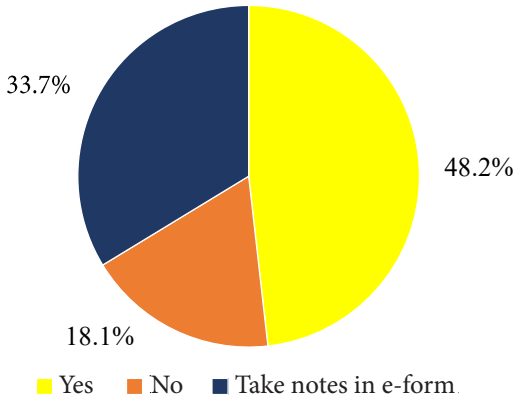

Figure 2. Results of students' answers to the question "Do you take notes on educational materials in a notebook?"

The description of work with various software tools can be quite voluminous and incomprehensible, so recorded videos are mainly used for computer science classes. These can be either video tutorials by other teachers, or author's recordings. To check the attitude of students to this form of submission of educational materials, a corresponding question was provided in the survey. It was established that 19.3% of students do not need video explanations and the text of lectures and presentations are enough for them. It can be assumed that such a considerable percentage is due to difficulties in connecting to the Internet in rural areas. A quarter of students (25.3%) suggested using YouTube videos as an alternative means of publishing materials. The remaining respondents (55.4%) were inclined to compromise the combination of different means. As evident, the attitude of students to video tutorials is quite polarised, which makes it difficult for the teacher to choose the best approaches to publishing educational materials.

Video conferences have become quite popular during quarantine in secondary and higher education institutions. Zoom and Google Meet are mainly used. This approach provides effective feedback, emotional contact, and makes distance learning similar to conventional learning. However, the results of a survey among students indicate a certain contradiction in the perception of these tools. Thus, to the question "Should video conferencing tools be used?" only 6% of students gave an unambiguous positive answer. Another 19.3% agree that some classes should be conducted via videoconferencing, but the rest (74.7%) were against such a tool. Additional conversations allowed establishing the reasons that prompted students to choose this answer option. Most of them indicated the low effectiveness of such classes. Students believe that using a variety of digital resources can be more effective than conventional listening to lectures. When agreeing on the need for live communication with the teacher, they noted that it is better to get basic information from electronic sources, and they suggest using video conferences during consultations for students and individual explanations.

To study the state of use of video conferencing when studying other disciplines, students were asked a corresponding question. The answers to this question were quite subjective. Thus, 3.6% of respondents state that such a tool is used quite frequently, 24.1% – 1-2 times a week, 41% – very rarely, and 31.3% – never use it. Analysis of the responses received in the context of academic groups shows that the subjectivity of evaluating the frequency of video conferencing use is also noticeable at this level. That is, students of the same group give a contradictory evaluations. Provided that ("very rarely" or "very often") can be considered a subjective result, the options "never" and "1-2 times a

week" do not provide for such an interpretation. The explanation for such contradictions may be the difficulty of adapting students to new learning conditions.

As evident, in addition to analysing the state of use of various tools, it is necessary to study the training conditions during quarantine. When evaluating the technical component of students' access to resources, it is necessary to focus on the availability of computer equipment and the ability to connect to the Internet. As was discovered, 12% of respondents do not have computers and laptops. Despite the fact that the use of mobile devices when studying other subjects is quite possible, performing practical work in computer science frequently requires the presence of specific software that is not adapted to mobile platforms. Nevertheless, 41% of students barely have any problems with access to computer equipment. The others noted that although they have limited opportunities, they are mostly enough for learning. The organisation of distance learning in modern conditions requires a high-speed Internet connection. The survey results indicate an existing problem (Fig. 3).

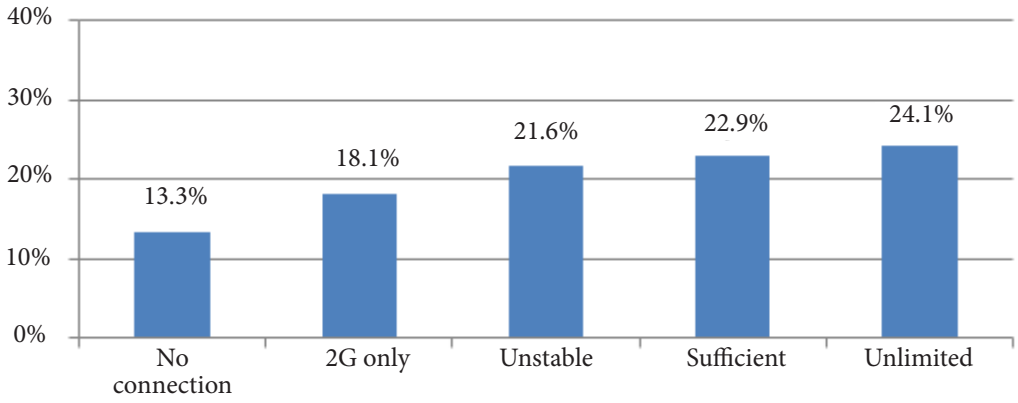

Figure 3. Results of students' answers to the question "Evaluate the quality of your Internet connection"

That is, 31.4% of students do not have conditions for participating in video conferences and watching video tutorials on Youtube. The difficulty with accessing the Internet was not only in the speed of the connection but also in accessing places that had such a connection. During an additional conversation, it was established that individual students from rural areas had to travel several kilometres to a zone with stable Internet or stay outside their homes for a long time, including in public places, which calls into question the effectiveness of their quarantine restrictions.

The attitude to the use of distance learning platforms in different institutions was quite different. In the Bar Humanitarian Pedagogical College, the vast majority of students positively assessed the experience of working with Google Classroom, and in the Khmelnytskyi Humanitarian and Pedagogical Academy, during the survey, students rated the need and prospects for implementing appropriate platforms rather low. 67.9% of students of this institution noted that they are satisfied with the existing approach to publishing materials and do not need other means. A considerable part of students used one of the platforms regularly or occasionally. In other words, they were familiar with the main features of this approach. At the beginning of the quarantine, only 17% of students of the Khmelnytskyi Humanitarian and Pedagogical Academy did not know about the existence of appropriate platforms (Fig. 4), but even after the introduction of Google Classroom in the educational process, a great part of students ignored the opportunity provided and continued to use the tools that were offered at the beginning of the quarantine.

In the Bar Humanitarian Pedagogical College, grades were published on the Google Classroom platform, and in the Khmelnytskyi Humanitarian and Pedagogical Academy for the discipline "Computer science" using an electronic journal. However, there were no discrepancies in the students' responses during the survey. Therefore, generalised results based on data from both institutions can be presented (Fig. 5).

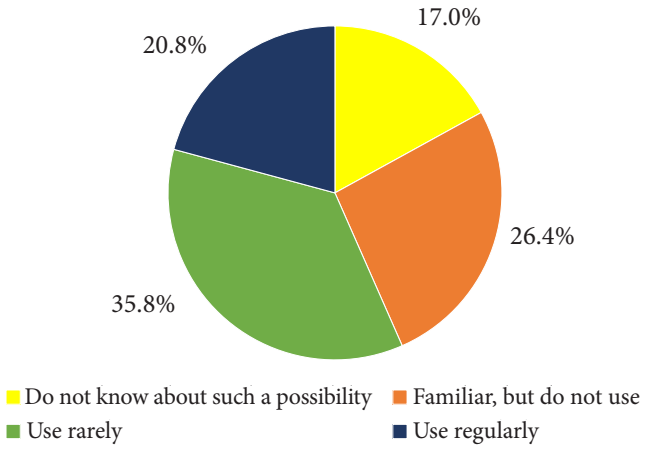

Figure 4. Results of KHPA students' responses to the question "Have you used distance learning platforms (Moodle, Google Classroom, Edmodo, etc.)?"

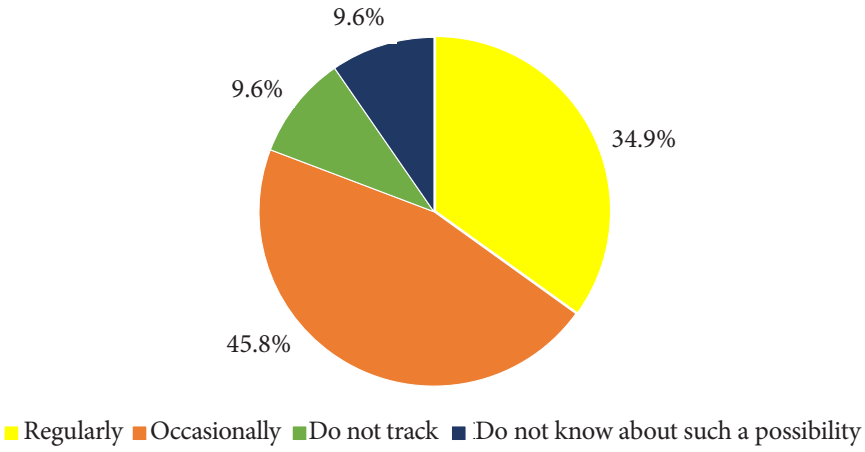

Figure 5. Results of students' answers to the question "Do you track your grades on electronic resources?"

Notably, even a month after the start of quarantine, 9.6% did not know about the ability to track their grades. The reason for this can be either problem with access to resources or certain disorientation at the beginning of distance learning. The idea that students with low academic performance do not care much about grades and do not carefully review messages related to their studies should also be mentioned. The analysis of students' responses in the context of their grades in computer science and other subjects was not the purpose of this study.

One of the biggest problems that students faced was their overload during distance learning. Independent processing of materials, performing practical work, and converting the work in a suitable for delivery electronic form takes quite a long time. The overwhelming majority of respondents (78.3%) point to a full overload, lack of free time, an increase in the duration of training compared to the conventional form, and complain of constant fatigue. 22.9% of them spend more than 12 hours a day studying. Such a survey result sets the objective for teachers and the administration of the HEI to coordinate the level of academic load and the number of tasks for students. The study of the duration of practical work on the course "Computer science" also indicated the need to optimise educational materials and tasks. In particular, only 36.1% stay within 2 hours for each lesson. Considering the duration of lessons and homework, this period can be considered optimal, and 21.7% spend more than 3 hours on each lesson.

To determine the effectiveness of distance learning in comparison with conventional learning, the students' outcomes in 2019 and 2020 can be compared. For that purpose, records and grades in groups of the

corresponding course in 2019 were analysed. The final assessment in Computer science was conducted at the end of March. It can be compared with a similar final assessment in 2020 and considered the result of the conventional form of education since the quarantine could not yet affect it. The assessment for the semester in 2020 is affected by the distance form and may differ from the previous year. Students' grades at the Khmelnytskyi Humanitarian and Pedagogical Academy and Bar Humanitarian Pedagogical College were divided into 4 levels (low, medium, sufficient, and high). There were no considerable differences in the assessment of students in these institutions, so the results obtained were combined. The first final assessment in computer science among students in 2019 and 2020 does not have notable deviations (Fig. 6). The calculated empirical value of Pearson's χ^2-criterion is 1.933398, which is much less than the critical value. This indicates that there is no statistically noticeable difference between student results in 2019 and 2020.

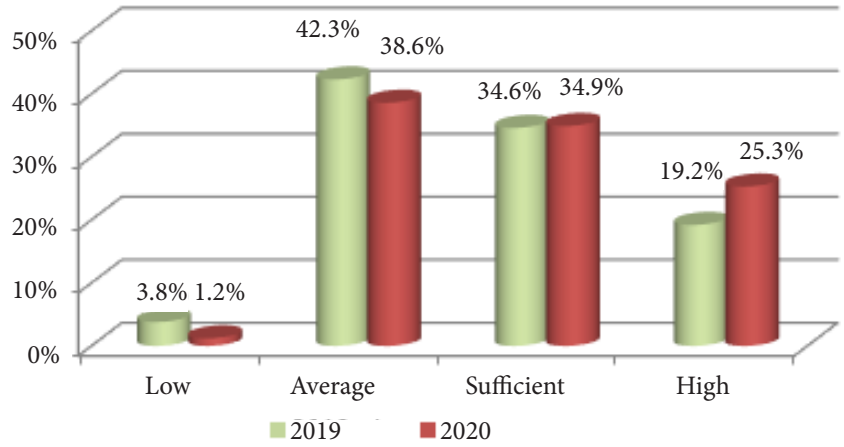

Figure 6. Distribution of the first final grade among computer science students in 2019 and 2020

A comparison of the semester grade in Computer science in 2019 and 2020 indicates that there is a slight decrease in student outcomes during distance learning (Fig. 7). However, the empirical value of Pearson's χ^2-criterion, in this case, is equal to 1.658924, which is much less than the critical value. Therefore, it can be concluded that there were no statistically noticeable differences between the groups that were trained in conventional and distance learning.

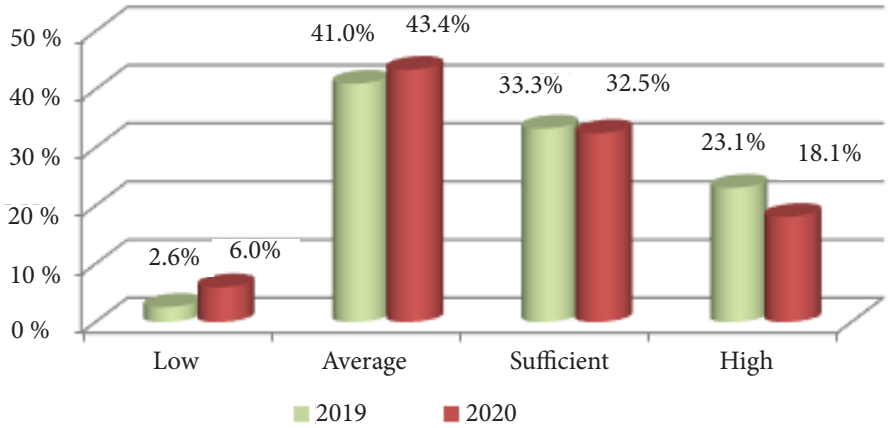

Figure 7. Distribution of computer science student grades per semester in 2019 and 2020

There is an opinion in society that distance learning has low efficiency and that its conditions lower the grades. However, the results obtained in the study negate negative trends. Therewith, it is not yet possible to draw conclusions about the effectiveness of certain forms, since the survey and assessment of students were not organised using the double-blind experiment method. Thus, the prospect of further research is to organise an experiment of the appropriate level and accumulate more results.

CONCLUSIONS

The study discovered the attitude of future primary school teachers to the use of various tools in distance learning. It was established that the vast majority of students positively views the use of blogs, electronic journals, platforms for online learning and testing. Therewith, students rate the effectiveness of video conferences for organising the distance learning process rather low and suggest using the appropriate tools only for consulting and explaining certain complex topics. In general, students are quite conservative and preferred the means by which the organisation of distance learning began. The survey allowed compiling a list of problems that prevent students from studying in quarantine. Among the most important of them: access to computer tools and the Internet, overloading due to an increase in the number of tasks. Based on the comparison of the results of groups that studied in 2019 in the conventional form and in 2020 in the distance form, there are no noticeable statistical differences between the grades at the beginning of the quarantine and for the semester.

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