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Analysis Of Students Satisfaction With Distance Learning And The Advantages And Disadvantages Of Laboratory Works With Computer Simulation Of Electronic Analog Circuits

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***Abstract*— The analysis of students satisfaction with distance learning during COVID-19 pandemic by surveying responders was done. The survey contains questions on the advantages and disadvantages, the problems and recommendations for improving distance learning. At the result it became clear that most students like to study in a blended learning format. This research shows the attitude of students to online learning, communication skills, technical and social aspects of distance learning. Also the differences between the laboratories based on computer simulation of electric circuit and the bench laboratory were analyzed and the advantages and disadvantages of the computer simulation laboratory were established. There were two focus groups of students for analyzing the level of students after their work with the bench and computer simulation laboratories. The testing shows that if a student additionally works with computer simulation program, his level of education increases. Computer simulation work can be important and the level of knowledge of students has increased.**

Keywords—distance learning, computer simulation laboratory, online learning

I. INTRODUCTION

The COVID-19 pandemic has had a major impact on the education system around the world [1,2]. Many lecturers and students communicated by means of technology during the pandemic, but online education was hampered by poor infrastructure, including network problems, inaccessibility and unavailability, as well as poor digital literacy [3]. Researchers says that education should be sustainable and interconnected, as well as work within the framework of global cooperation, adapted to current global needs and conditions. And online learning platforms in education are more flexible, multiple, open and accessible to everyone and everywhere, not limited to problems of access to certain economic, geographical or social strata [4].

What concerns Kazakhstan, mass online learning launced in March 2020. Now we decide to analyze the students satisfaction with distance learning during these period and try to understand how to organize effectively laboratory works for enheeniring educational programs.

II. SURVEYING THE STUDENTS ON DISTANCE EDUCATION AND TESTING ON COMPUTER SIMULATION LABORATORY

A. Searching Instrument

We have developed a questionnaire to identify the perception of online learning by students. The questionnaire contains 21 questions about the attitude of students to online learning, about the advantages and disadvantages, about the problems encountered and recommendations for improving distance learning in the future. The questionnaire questions are presented with answer options, since it is easier for students to choose a ready-made answer than to think about their own answer options for a certain amount of time. But for a more effective collection of information, after each question with answer options, a question followed with a request to explain the previous choice.

Also, the differences between the laboratories based on computer simulation of electric circuits and the bench laboratory were analyzed, and the advantages and disadvantages of the computer simulation laboratory were established. The research was based on the development and implementation of laboratory works through approbation. Two groups of students - control group and focus group - were used to analyze the students' level after their work with the bench and computer simulation laboratories. Both groups of students underwent tests to diagnose their knowledge before and after working on their respective laboratory tasks. The first set of test questions was presented before and after the students worked on the bench. After a few days, the second

group (focus) was given a computer simulation laboratory task on the topic. A week later, both groups were presented with a final test#2.

B. Methodology

The survey was formed online. In general, 207 students took part in this research as an responders. By this survey examines: the attitude of students to online learning, communication skills, technical and social aspects, as well as the situation of the abrupt transition of the educational system to distance learning within the COVID-19 pandemic.

For the second part of research, three computer simulation laboratory works were developed. In detail the laboratory works description was presented in our previous work [5]. Two groups of students were used to analyze the students' leel after their work with the bench and computer simulation laboratories. Both groups work with physical laboratory stand on fundamentals of electrical circuits and electronics (figure 1). However, only one focus group, in addition to this stand, also use computer simulation laboratory at home.

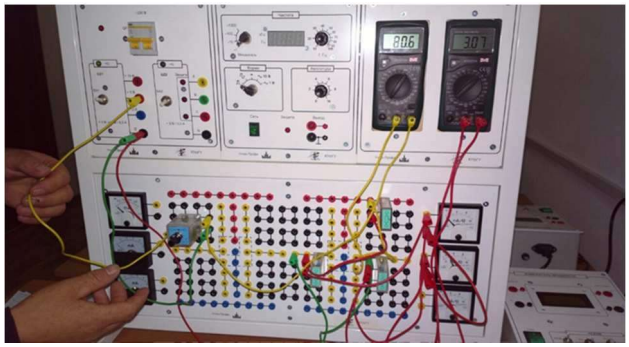

Fig. 1. Laboratory stand on fundamentals of electrical circuits and electronics

III. Results

A. Survey results

According to the results of the survey, to the question "Which format of education at university is most convenient for you?", 47% of students chose a mixed learning format, 31.8% consider a completely offline learning format comfortable, and the remaining 21.2% of students prefer a completely online learning format.

The next question of the questionnaire was "How, in your opinion, has the academic load at university changed during online (distance) learning?". 41.1% of students considered that the academic load decreased, for 31.4% the academic load did not change, and 27.5% noted

an increase in the load during online learning.

Many explained their opinion about reducing the workload by the fact that there were a lot of tasks, but they were easy to perform, because it is quite easy to write off in an online format. Students find ready-made information on the Internet, copy it and send it to teachers.

Motivation to learn plays an important role in the educational process, so we have included this question in the questionnaire. In 37.7% of students, the motivation to study with the online learning format decreased, in 36.2%, the motivation to study with the online learning format increased on the contrary. And 26.1% believe that the motivation for learning has not changed (Figure 3). According to the students, the decrease in motivation is due to the lack of strict control and live contact with teachers and other students, inability to concentrate at home, as well as technical problems. Many students with the transition to online learning motivation has not changed, they explain this by the fact that the purpose of learning was the same, and it did not make much difference to them whether to study remotely or traditionally. The reasons for increasing motivation were familiarity with new educational platforms and gaining new experience.

The advantage of online learning, according to 68.1%, is "the ability to combine study with other things", 13% chose the option "flexibility of the educational process".

While it turned out that with the online learning format, 43% of students had a problem in the form of a poor Internet connection, 15.5% of respondents did not have access to the Internet, 30% noted that there were no problems with online learning. The rest of the students noted such moments as: lack of technology, difficulty communicating with teachers, insufficient knowledge of information technology, difficulty assimilating educational material, a large amount of tasks, inability to concentrate, lack of social interaction and the adverse impact of electronic technology on human health.

The next question was "How do you think your academic performance has changed during online university studies?" (Figure 4). 33.8% felt that their academic performance has not changed. 32.9% noted an increase in academic performance during online learning, and 22.2% of students noticed a decrease in academic performance. There were also such answers as "academic performance increased, but knowledge and concentration decreased", "lack of motivation led to non-fulfillment of tasks".

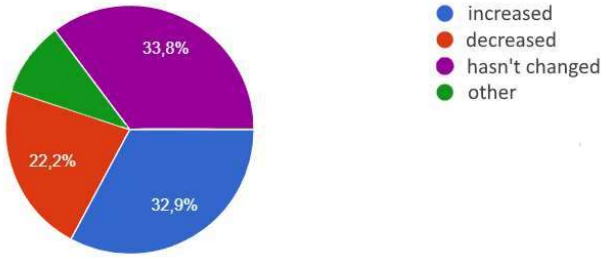

Fig. 2. Statistics of student responses to the question "How has your academic performance changed during online learning?"

In conclusion, we asked the students to give recommendations for improving online learning, and write what changes in the online learning format they would introduce if they were the Minister of Education. The most interesting answers are presented below:

1. I would try to find (create) a more convenient platform for students /schoolchildren, and suitable for the Internet even in villages.
2. I would introduce new technologies so that people could study independently.
3. Create an improved program for conducting classes.
4. I would make a mixed training format (offline and online).
5. Easy accessibility of technology and unlimited access to the training program.

6. Sufficient equipment of students in the use of information and communication knowledge.

7. Free internet for studying.

8. A more convenient website for training.

9. Transition of non-core subjects to online mode (for senior classes).

10. Lessons would be shortened. It's better to have more of them, but one lesson lasts 25-30 minutes. Sitting 45 minutes in a row behind the screen is very difficult and vision and concentration deteriorate.

11. The ability for students to skip school if they are ill, oblige teachers to record material.

B. Testing of students knowledge results

The first laboratory work was "Diode, Zener Diode and thyristor". The results indicats that in average the first control group before the operation has 44% of total score just after theoretical study without practical lessons. The rate after the work with stand is increases till 68%. And before the second focus group is working, the indicator was 65%. The result of the same group after work with stand became 72%. The results of the test obtained after the second group performed the work of the virtual laboratory shows that the knowledge of the first (control) group decreased even more than the initial one and reaced 45%. The second (focus) group has 56% (figure 3).

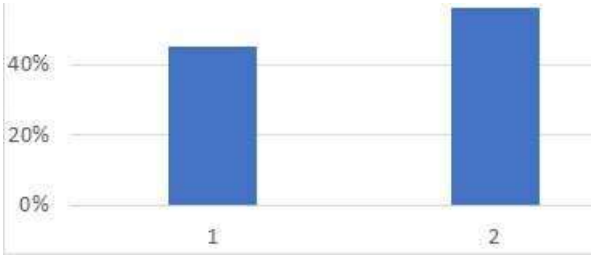

Fig. 3. Final test#2 results after first laboratory work realisation

For the second laboratory work on “Bipolar and field-effect transistor” the first control group before the operation has 95% and second focus group has 87% of total score just after theoretical study without practical lessons. After work with stand the knowledge indicator rises till 97% for the first group and till 93% for the second group. The result of Test # 2 indicats that over time, the the first group has the score 62% that is lower than the second group’s 82% (figure 4).

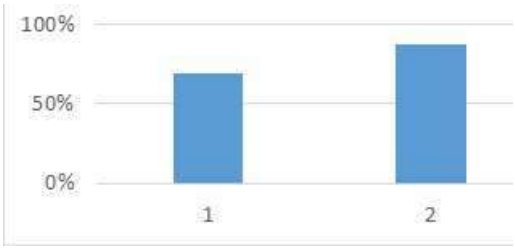

Fig. 4. Final test#2 results after second laboratory work realisation

The third laboratory work is "Analog comparators". In relation to this, the result of Test No. 3 is shows that the first focus group before the operation has 43%. After work with stand the same group has the rate 64%. Before the work of the second focus groups rate was 78%. The result after work is 91%. As for the test results over time, the knowledge of the first group decreased from the initial one to 44%. The second group’s average rate - 82%.

The results shows that students working additionally with computer simulation laboratory work have higher indicators after two week of having last laboratory practice.

IV. DISCUTION

Despite the fact that schoolchildren find the online format convenient, they still prefer to study in the traditional format. When choosing a convenient learning format, school students were more focused on comfort in communication than on the benefits of online learning. It can be said that school students need live contact with teachers and peers to learn. But students, on the contrary, prefer to study in a mixed format.. This tells us that, unlike schoolchildren, students are already more independent. When choosing the most convenient training format, they took into account the possibilities and advantages of the proposed training format. That is, it is more convenient for them to conduct lectures online, because they can save time. And it is better to conduct seminars in a traditional format, since physical tasks are easier to understand and solve with live contact with teachers.

If we consider the question of the academic load, from the collected answers, students can be divided into 3 types:

- Type 1, they understand and use all the possibilities of online learning; therefore they are more engaged in self-study.
- Type 2, it is difficult for them to study remotely, they do not understand how and what to do, so online learning brings them discomfort.
- Type 3, the online format is convenient for them, because they do not want to study, and the lack of control by teachers plays to their advantage.

In fact, the educational load during the pandemic was supposed to increase, but statistics show the opposite, which can be considered an incorrect organization of online learning.

Students' academic performance in online learning is directly related to the academic load and motivation to learn. And from the statistics presented above, we know that a large percentage indicates a decrease in the workload and a decrease in motivation to learn. But at the same time, the academic performance of most students has increased. It follows from this that the incorrect organization of online learning and the lack of a comfortable platform for all students led to the fact that during distance learning, students did not receive the full amount of knowledge and skills planned in the programs.

What about the second part of research, we saw the importance of laboratory work. Moreover the work with the stand can be added by computer simulation laboratory to increase the efficiency.

V. CONCLUSION

Based on the results of the survey, the following problems were identified:

1) Low motivation of students for online learning: The purpose of online learning should be to increase motivation, and not vice versa. And this means that this goal was not achieved.

2) Wrong organization of the study load: Online learning is actually more about self-learning. After all, with online learning, students have to study most of the educational material on their own The lack of control on the part of teachers affected the quality of assignments.

3) Lack of a convenient platform for conducting online classes: The convenience of the platform affects both the workload and the motivation for learning and the speed of data transfer. for effective distance learning, you need to regularly improve the digital literacy of teachers and students. And also to choose the most comfortable platform for online learning, which would be quite convenient and easy to use for students of the educational process. In addition, it is necessary to create additional distance courses to consolidate the material covered.

According to the results of the three tests, it is evident that students who worked with the computer simulation program achieved significantly higher scores. The completion of the three laboratory works by both groups of students helped improve their knowledge levels, indicating the importance of hands-on laboratory experiences.

The results obtained after a few days demonstrated an increase in the knowledge level of the group that engaged in the additional computer simulation laboratory work alongside the physical laboratory stand. It was observed that working with the stand in a software environment can provide a more comprehensive and clear understanding of the subject matter. Based on these findings, we recommend incorporating laboratory work in an additional software environment alongside the physical laboratory stand.

REFERENCES

[1] P. Engzell, A. Frey, M.D. Verhagen. Learning loss due to school closures during the COVID-19 pandemic // PHAS. - Vol. 118 | No. 17, 2021.- https://doi.org/10.1073/pnas.2022376118

[2] M. M. Abdelsalam, K. E. Ebitisam, S. Aljawarneh, H. Rashaideh, H. Alharbi. The COVID-19 pandemic and E-learning: challenges and opportunities from the perspective of students and instructors // J Comput High Educ; 34(1):21-38, 2022. - DOI: 10.1007/s12528-021-09274-2.

[3] M.O. Edeh, Ch.E. Nwafor, A.O. Faith, S. Shuvro, G.A. Fyneface, Sh. Aabha, O.A. Alhuseen. Impact of Coronavirus Pandemic on Education. Journal of Education and Practice. Vol.11, No.13, 2020. DOI: 10.7176/JEP/11-13-12.

[4] M.Subandowo., Suryaman., Mindset Changes in Governance High School Post Covid-19 Pandemic. Journal of Education and Practice, Vol.13, No.24, 2022. DOI: 10.7176/JEP/13-24-01.

[5] Nurgaliyeva K.E., Gavare Z., Igenbayeva A.S., Kanatova A.N. Researching of the advantages and disadvantages of laboratory works on simulation of electronic analog circuits in Multisim by testing. Recent Contributions to Physics. No2(69). 2019, p.136-145 (in Kazakh)