"Current Approaches to Organizing Distance Learning in The Field of Electrical Engineering"

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ABSTRACT

The indispensability of incorporating distance learning technologies in organizing the educational process in the field of electrical engineering is emphasized in the article. Nowadays, to meet the demands of the labor market and to enhance the quality of training engineering professionals, it is crucial to integrate digital technologies into the educational process. The recommended technology proposed is in the form of mobile applications, which can be utilized by students studying in both traditional and online formats in all undergraduate education directions related to the technical field, as well as by staff members of all sectors of production and service provision, and by both professional and higher education professors and instructors. Additionally, effective solutions for teaching the subject "Electrical Engineering and Electronics" to students at Tashkent State Technical University have been recommended based on the results of trials conducted, which have proven to be highly efficient. Furthermore, the results of pedagogical experimentation conducted during scientific research are announced.

Keywords: *Higher education, distance learning, educational effectiveness, electrical engineering subjects, mobile application, self-improvement level, pedagogical experimentation*

Entry: Following the Decree of the President of the Republic of Uzbekistan dated October 5, 2020, No. PF-6079 "Digital Uzbekistan - 2030" Strategy Approval and Measures for its Effective Implementation, the following measures have been identified to enhance digital literacy at all levels of the population in Uzbekistan:

Promoting information technologies among youth, as well as developing digital technology usage skills among all segments of the population;

In the field of education, first and foremost, attention is focused on developing and implementing educational technologies, particularly distance and electronic learning. The digitization of higher education and the implementation of distance learning technologies are identified in conjunction with the evolving computer technologies and the changing information environment. In this process, not only the goals, content, forms, and methods of education are important, but also the learners themselves. Nowadays, most students have good knowledge of IT technologies and sufficient experience with computers and digital technologies, and they

cannot imagine their daily lives, communicate with peers, or access information without the internet and digital technologies. The effectiveness of the higher education system is certainly explained by the professional knowledge, skills, and competencies acquired by future specialists, along with their achievements and experiences in IT technologies.

Methods. To create convenience for students in mastering electrical engineering subjects, a project was developed to create a mobile application specifically designed for independent learning of electrical engineering and electronics. Theoretical information related to electrical engineering and electronics was compiled through this mobile application project and presented to students (see Figure 1). The following sequence is used to utilize the mobile application for independent learning of electrical engineering and electronics:

- The application is installed on a smartphone, Android device, or tablet.
- Upon opening the application, a menu shows 15 lectures related to the subject.
- After selecting a lecture, the content is displayed, and at the end of the lecture, a link to test questions related to the topic is provided to assess the level of understanding.
- Upon completion of the test, if successful (with a score above 60%), the student proceeds to the next lecture; otherwise, they are advised to review the material and retake the test.
- This process continues until the fifteenth lecture is completed. Subsequently, a midterm test based on the information from all lectures is opened. If the student passes the midterm test successfully, they proceed to the eighth lecture; otherwise, they are recommended to review the course material with attention.
- Successful completion of the final exam ensures the student's success in passing the course [6].

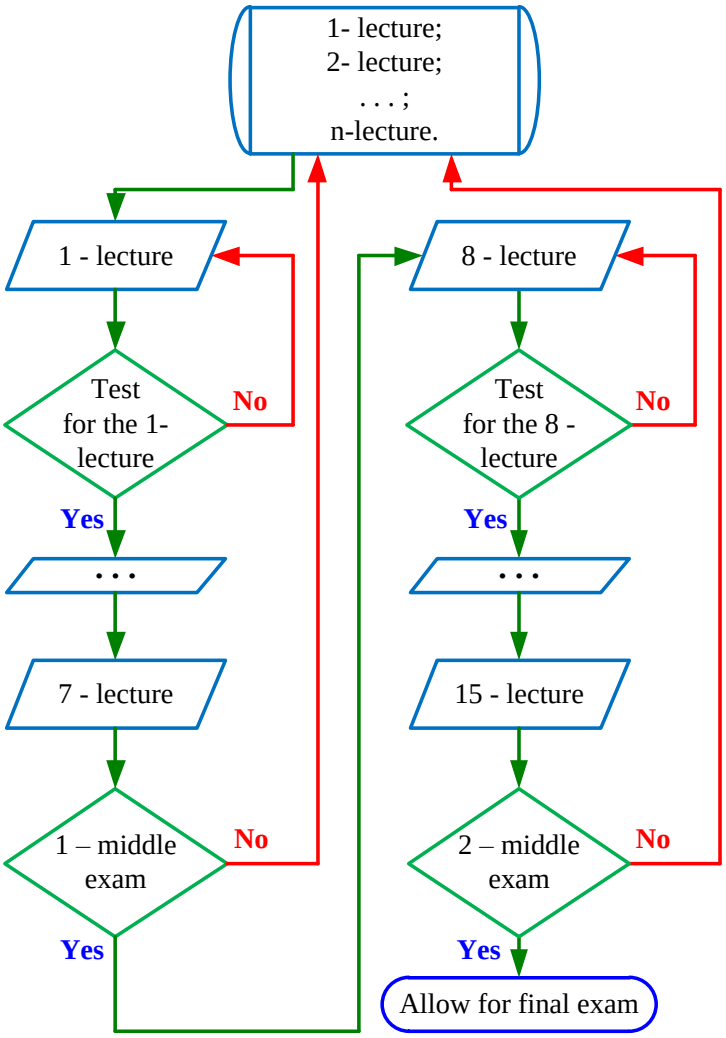

Diagram 1. Algorithm of the mobile application for independent learning of electrical engineering and electronics.

Results. In the autumn semester of the 2023-2024 academic year, pedagogical experimentation was conducted at the Tashkent University of Technology named after Islam Karimov, Faculty of "Geology-exploration and ore-metallurgy," in the bachelor's program "Labor Protection and Technical Safety (by sectors)" in the direction of external education, in groups 5Sa-22 MMTX (Uzbek) and 5S-22 MMTX (Uzbek). In the pedagogical experimentation, 46 students from group 5Sa-22 MMTX (Uzbek) were selected as the experimental group, and 46 students from group 5S-22 MMTX (Uzbek) were selected as the control group.

The level of development of knowledge after the Electrical Engineering and Electronics experiment by the students who participated in the pedagogical experimentation is presented in the table below (Table 1).

Table 1

№	Number of groups and experiment participants	Degrees and number of eligible students			
		Excellent (5)	Good (4)	Satisfactory (3)	Not satisfied (2)
1	Experimental group (x) 5Sa-22, 46 students	**5**	**25**	**16**	**0**
up (y) tudents		**0**	**20**	**24**	**2**

The average coefficient of development of knowledge in the field of Electrical Engineering and Electronics by participating students was calculated as follows and entered into Table 2, where the corresponding diagram is depicted in Diagram 2 (Figure 2).

For the experimental groups:

For group 5Sa-22, the average value is calculated as: $x = \frac{5\cdot5+4\cdot25+3\cdot16}{46} = 3{,}76$

The average square value is:

$$x^2 = 3{,}76^2 = 14{,}14$$

The quantity is:

$$m = \frac{14{,}14}{46} = 0{,}31$$

For the control groups:

For group 5S-22, the average value is calculated as: $y = \frac{4\cdot20+3\cdot24-2\cdot2}{46} = 3{,}22$

The average square value is:

$$y^2 = 3{,}22^2 = 10{,}37$$

The quantity is:

$$m' = \frac{10{,}37}{46} = 0{,}22$$

Therefore, the average improvement of the experimental group exceeds that of the control group: $X = 3{,}76 > Y = 3{,}22$.

The effectiveness coefficient

$$\eta = \frac{3{,}76}{3{,}22} = 1{,}2$$

Table 2

№	Number of groups and experiment participants	Degrees and number of eligible students				Coefficient	Efficiency coefficient
		Excellent (5)	Good (4)	Satisfactory (3)	Not satisfied (2)		
1	Experimental group (x) 5Sa-22, 46 students	**5**	**25**	**16**	**0**	**3,76**	**1,2**
2	Control group (y) 5S-22, 46 students	**0**	**20**	**24**	**2**	**3,22**	

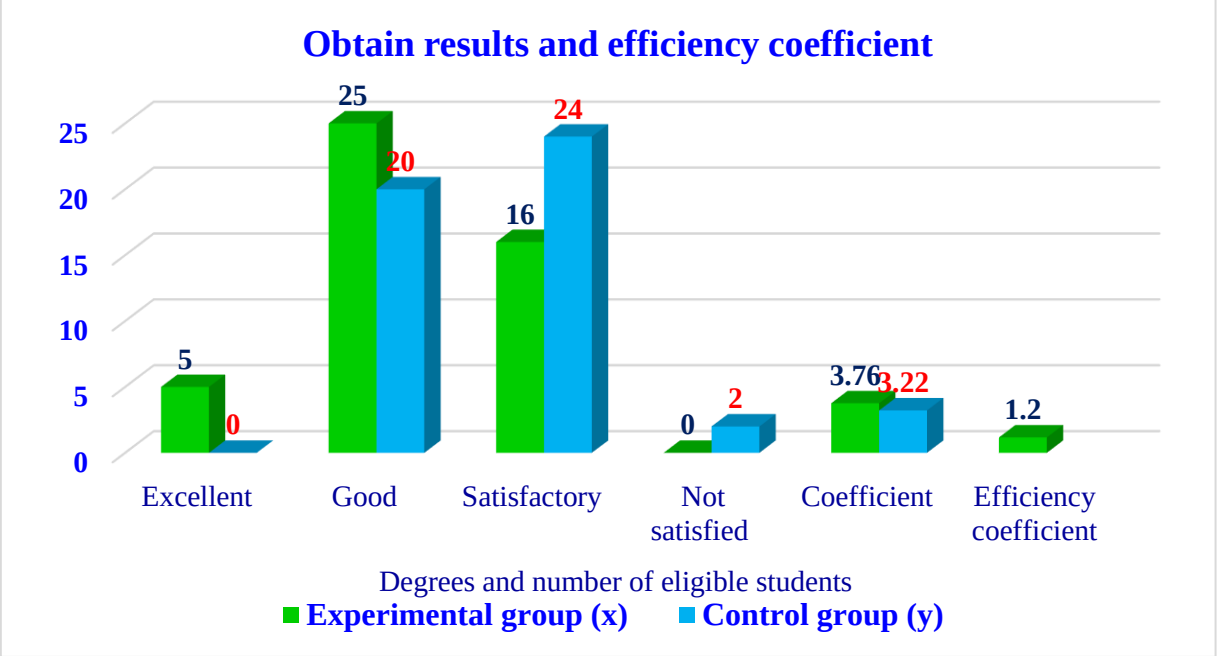

Diagram 1. Improvement Results and Effectiveness Coefficient of Experimental and Control Group Students

Discussions. Students' engagement in independent learning through mobile devices and the use of internet networks during non-class hours is proving to have a positive impact on improving their knowledge and enhancing their research skills.

Mobile learning applications contribute to the individualization of education by providing opportunities for self-study. As a result, students develop their ability to work independently and improve their self-improvement indicators. The inclusion of monitoring tasks in mobile applications contributes to monitoring the self-improvement process of the student [8].

Mobile learning does not replace traditional education but can be used as an additional and complementary part of the learning process. Unlike traditional methods, mobile technologies offer students additional convenience and adaptability, allowing them to learn their chosen subjects wherever they are. Mobile technologies, in situations where traditional methods may not be applicable, are evaluated from a different perspective [9].

Developers of mobile learning should create simple applications that meet the needs of students. In addition, they should propose applications that differ from previous learning methods and tools, and students should understand the advantages of mobile learning in general educational activities [6].

Developers of mobile learning should create simple applications that meet the needs of students. In addition, they should propose applications that differ from previous learning methods and tools, and students should understand the advantages of mobile learning in general educational activities [6]. Mobile learning is not just a theoretical possibility but a real presence. Participants and educators from various countries can benefit from a wide range of educational resources through mobile devices, discuss information, share information with other students, colleagues, and teachers, and establish effective communication pathways [11].

In today's modern society, the demand for the internet and its tools is increasing, and the importance of mobile applications in enriching and expanding the content of the educational process itself is growing. Because mobile applications allow for iterative changes to the learning system, leading to its advancement. Moreover, this adaptation applies not only to public education, higher education, and other educational institutions but also to specialized training. Learning with mobile applications is highly effective [12].

Mobile applications allow learning anytime, anywhere, providing unlimited learning opportunities and the ability to learn in the same conditions as any other demand on the surface;

Conclusions. To carry out pedagogical experimental work, students of the 5S-22 MMTX (Uzbek) and 5Sa-22 MMTX (Uzbek) groups of the Bachelor's degree program in Labor Protection and Technical Safety (in the fields of branches) at the Tashkent University of Technology named after Islam Karimov were selected. In the pedagogical experimental work, 46 students from the 5S-22 MMTX (Uzbek) group participated as a control group, while 46 students from the 5Sa-22 MMTX (Uzbek) group participated as an experimental group. Before the start of the semester, the experimental group students were provided with a mobile application designed for independent study of the Electrical Engineering and Electronics subject, and they began to study the subject independently using the mobile application. The control group students did not receive a mobile application. Throughout the semester, lectures, practicals, and laboratory activities were conducted for both groups. At the end of the semester, all students from both groups took final exams.

According to the final results of the pedagogical experimental work, it was found that the development level of knowledge in the field of "Electrical Engineering and Electronics" for students of the 5Sa-22 MMTX (Uzbek) group, who participated as an experimental group in the pedagogical experimental work, compared to the students of the 5S-22 MMTX (Uzbek) group, who participated as a control group, increased by a factor of 1.2, i.e., by 12%.

In summary, it can be stated that the recommended mobile application not only serves as a means of distance education but also plays a significant role in enhancing the knowledge of students in the field of "Electrical Engineering and Electronics" and improving the effectiveness of teaching in both daytime, evening, and external education directions.

References

1. O‘zbekiston Respublikasi Prezidentining Farmoni. “Raqamli O‘zbekiston — 2030” strategiyasini tasdiqlash va uni samarali amalga oshirish chora-tadbirlari to‘g‘risida // 05.10.2020 yil. PF-6079-son.
2. Xalmanov D.X. Pedagogik texnologiyalar asosida elektrotexnika fanlaridan ma’ruza mashg‘ulotlarni samarali tashkil etish uslubiyati // Ta’lim innovatsiyasi va integratsiyasi *Xalqaro ilmiy elektron jurnal* 11-son 9-to‘plam 2023 y. 100-106 b.
3. Khalmanov D.Kh. Effective use of mobile applications in improving the teaching of electrical sciences // Science and innovation international scientific journal volume 2 issue 11 november 2023 uif-2022: 8.2 | issn: 2181-3337|scientists.uz.418-423p. https://doi.org/10.5281/zenodo.10206277;
4. Xalmanov D.X. Elektrotexnika fanlaridan laboratoriya mashg‘ulotlarini samarali tashkil etishda raqamli texnologiyalarni qo‘llash uslubiyati // “Ta'limning zamonaviy transformatsiyasi” mavzusida o‘tkazilgan respublika onlayn ilmiy amaliy konferensiyasi to‘plami №2 2023. www.tadqiqotlar.uz 544-548 b.
5. Xalmanov D.X. Elektrotexnika fanlaridan amaliy mashg‘ulotlarni tashkil etishda raqamli va kompyuter texnologiyalarni qo‘llash. Academic Research in Educational Sciences Volume 4 | Issue 4 | 30 aprel 2023 yil. 417-428 b. https://ares.uz/uz/maqola-sahifasi/elektrotexnika-fanlaridan-amaliy-mashgulotlarni-tashkil-etishda-raqamli-va-kompyuter-texnologiyalarni-qollash
6. Xalmanov D.X., Xushvaktov D. Sh., Ashurov D.X. Elektrotexnika va elektronika fanini mustaqil o‘rganish uchun mobil ilova. № DGU 28804. O‘zbekiston Respublikasining Dasturiy mahsulotlar davlat reyestrida 03.11.2023 y. ro‘yxatdan o‘tkazilgan.
7. Xalmanov D.X. Elektrotexnika fanlaridan ma’ruza mashg‘ulotlarini samarali

tashkil etishda pedagogik texnologiyalarni qo‘llash O‘zMU xabarlari. Mirzo Ulug‘bek nomidagi O‘zbekiston milliy Universiteti ilmiy jurnali. Tashkent, 2023. - № 1/8/1. 253-257 b.

8. Zakir Shakirovich Tulaganov “Masofaviy ta'limda qo'llaniladigan mobil qurilmalar” // Academic Research in Educational Sciences Volume 4 | Issue 6 | June 2023 yil https://cyberleninka.ru/article/n/masofaviy-ta-limda-qo-llaniladigan-mobil-qurilmalar
9. Djumayev S.N., Shodmonov D.A., Ortiqova N.E. “Ta’limda mobil ilovalardan foydalanish imkoniyatlari” // Raqamli texnologiyalarning nazariy va amaliy masalalari xalqaro jurnali ISSN 2181-3086 2023 № 2(4).
10. S Chitturi and G.C. Farrell, “Adverse effects of hormones and hormone antagnists on the liver” Drug-Induced Liver Dis.Secpnd Ed. Vol. 19, no. 1, pp. 707-722, 2007.
11. Madina A'zamovna Farmonova, “Ta‘lim unumdorligini oshirishda mobil ilovalarning o‘rni” // Academic Research in Educational Sciences / Volume 2/Issue 3/2021/ ISSN: 2181-1385
12. Iskandarov Bobur Muhammadjonovich “O‘quv jarayonini tashkil qilishda mobil ilovalar yaratadigan imkoniyatlar” / “PEDAGOGS” international research journal ISSN: 2181-4027_SJIF: 4.995/ Volume-9, Issue-2, May – 2022/ www.pedagoglar.uz