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USE OF MOBILE APPLICATIONS AND STATISTICAL ANALYSIS IN IMPROVING THE EFFECTIVENESS OF THE EDUCATIONAL SYSTEM

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ABSTRACT

In this scientific article, the main goal is to experiment and test the methodology of teaching and practical use of web programming on the basis of a platform created using interactive methods and software based on the principles of pedagogical technology in the use of interactive mobile educational resources in higher educational institutions, and to make teaching using mobile applications in the educational system more effective. On the basis of the developed interactive mobile education platform, pilot work for training will be carried out in higher education institutions in three regions of the Republic.

The pilot work will be carried out in 3 stages over the period 2020-2023, namely in the stages of diagnosis and prediction, organizational-preparatory, practical and generalizing. It is attended by students of educational areas of Professional Education in the field of software engineering and Information and communication technologies from Tashkent University of Information Technologies, Karshi branch, Samarkand branch and Urgench branches. They are assigned to experimental and control groups, and experimental test work is carried out on the basis of the ideas advanced by the researcher in the experimental group.

On the basis of the experimental and test work carried out during our research, the development of methodology for teaching subjects in higher educational institutions on the basis of mobile technologies, the peculiarities of educational resources, various manifestations of their implementation, the development of recommendations for teaching students using interactive mobile educational resources and a mathematical-statistical analysis of the results obtained are shown.

Keywords: Pedagogy, education, technology, interactive, web, mobile learning, development, methods.

INTRODUCTION

In order to determine how web programming is reflected in the indicators of student assimilation when organizing classes using developed methodological support in higher educational institutions, pilot work was carried out among students. The main experience was carried out on the basis of teaching web programming in the areas of Professional Education in the field of software engineering and Information Communication Technologies of higher

education with the participation of a researcher. The purpose of this is to study the results of experimental research and to validate them in practical terms [1]. In pilot groups, training was conducted using the developed methodological support of web programming science, and in control groups with the traditional methodology [2].

Statement of the Problem

Distribution of groups in determining the formation of the use of methodology for teaching subjects on the basis of mobile technologies in higher educational institutions (table I).

TABLE I. Total Group and Students

№	Institutions of Higher Education	Total students	Experimental group	Control group
1	Urganch branch of TUIT	106	53	53
2	Karshi branch of TUIT	102	51	51
3	Samarkand branch of TUIT	116	57	59
	Total	324	161	163

The number of groups and students involved in the pilot process in higher education institutions.

163 students in 161 control groups took part in experimental test work. The number of these in the higher education cross section is given in the table above.

In the research work carried out, the assessment criteria provided for in the assessment system were used in order to determine the indicators of mastering in experimental and control groups [3], [4]:

- higher education is able to use interactive mobile educational resources in institutions and master the given topics, apply the knowledge gained in solving examples and issues, can interpret and think creatively on the topic — Grade 5 (excellent);
- in the resources of interactive mobile education in higher educational institutions, the student independently observes, is able to apply the knowledge gained in practice, understand the essence of the topics of interactive mobile educational resources, be able to perform and apply knowledge on the given topic to new processes when found-4 (good) grades;
- in higher education institutions in interactive mobile educational resources can put into practice the knowledge gained by their students in mastering the topics of interactive mobile educational resources, understand the essence of the topic — when identified as having an idea on the topic - 3 (satisfactory) grades;
- in higher education institutions, interactive mobile educational resources of their students in interactive mobile educational resources are assessed with an assessment of -2 (unsatisfactory) when they do not master the topics, do not understand the essence of the topic and are found to be unimaginable on the topic.

In higher education institutions using this assessment system, lesson processes are organized using methodological materials, innovative developments and various interactive mobile educational technologies offered by the researcher to the students of the experimental group,

and the methodology for using interactive mobile educational resources is determined levels of formation. Control groups, on the other hand, use traditional teaching techniques [5].

In order to determine the degree of formation of the use of interactive mobile educational resources in higher educational institutions in experimental test work, it was clarified at the following stages and in the types of control of lesson classes [6]:

1. Determination and analysis of the initial state of the formation of the use of interactive mobile educational resources in higher educational institutions.
2. Organization of intermediate tests and their statistical analysis in experimental testing of the developed methodology for the formation of the use of interactive mobile educational resources in higher educational institutions.
3. Conducting final experimental test work and statistical analysis of the results of classes organized on the basis of improved methodology and innovative technologies for the development of the use of interactive mobile educational resources in higher educational institutions in order to determine the appropriation by students.

METHOD FOR SOLVING THE PROBLEM

One of the main indicators of the research work is to show a statistical analysis of the results put forward by the idea of the study. Therefore, there was a main stage of experimental and test work-in the clarifying experiment, development work is carried out on the basis of the idea of research in its later stages, determining what the initial knowledge of students is in selected groups [6]. At the next stage, the following tasks were solved in the formative experimental test work aimed at the development of existing levels of knowledge [7]:

1) respondent-to identify the needs and interests of students and professors on the formation of the use of interactive mobile educational resources, the organization of questions and answers, the acquisition of knowledge related to the development of the creation of interactive mobile educational resources;

2) application to the preparation and practice of lesson and control work of educational activities aimed at developing the formation of the use of interactive educational resources in higher educational institutions;

3) development of the creation of interactive mobile educational resources based on the study of feedback from professors involved in experimental test work with the introduction of innovative technologies in the development of training activities and control work carried out in practice.

At this stage, special attention was paid to the creative solution of the above tasks, and developments were created and put into practice on the basis of innovative technologies of training, control work, and the results were studied as control tasks [8, 9].

An analysis was carried out using elements of Mathematical Statistics in order to confirm the validity of the above-mentioned results of the table, that is, the conclusion about the effectiveness of experimental and test work in accordance with the results obtained in experimental and control groups [10]. In conducting this analysis, the "T criterion of the procedure" and confidence interval methods were used. The results obtained were statistically analyzed based on the following formula:

1. Average acquisition rates in experimental and control groups $\overline{X} = \frac{1}{n}\sum_{i=1}^{n=4} n_i x_i$ and $\overline{Y} = \frac{1}{n}\sum_{i=1}^{n=4} n_i y_i$ where the number of respondents in N-groups is, n_i – assessment types types which take 5th excellent, 4th good, 3rd satisfactory, 2nd unsatisfactory values, xi, yi are the number of students according to the assessment criterion in the experience and control groups, respectively.

2. As an indicator of the effectiveness of mastering in experimental and control groups, the ratio of the experimental group to the average mastering values in the control group was taken, namely $\eta = \frac{\bar{X}}{\bar{Y}}$

3. As a statistical criterion that reassures the reliability of efficiency, the T criterion of the styling was obtained. Where the hypothesis $H_0 : a_T = a_H$ of equality of mean values is, the opposite (alternative) $H_1 : a_T \neq a_H$ hypothesis to it was absorbed earlier. Hypotheses have been investigated by the statistic of the stylus in relation to the hypothesis.

$$T = \frac{|\bar{X} - \bar{Y}|}{\sqrt{\frac{S_T^2}{N_T} + \frac{S_H^2}{N_H}}}$$

Here, the T-emperic value of the stylus is compared with the critical value, if $T > T_{0,95}(k)$ then H_1 (research work carried out in experimental groups is effective) is taken, otherwise H_0 (there is no difference between the levels of mastery and knowledge in experimental and control groups) is taken. The k-criterion in the formula is the degree of freedom. It was calculated by formula $k = \frac{\left(\frac{S_T^2}{N_T} + \frac{S_H^2}{N_H}\right)^2}{\frac{\left(\frac{S_T^2}{N_T}\right)^2}{N_t - 1} + \frac{\left(\frac{S_H^2}{N_H}\right)^2}{N_H - 1}}$. values of average $C_S^T = \frac{S_T^2}{N_T \cdot \bar{X}} \cdot 100\%$ $C_S^H = \frac{S_H^2}{N_H \cdot \bar{Y}} \cdot 100\%$ as detection indicators, here, through N_T and N_H, the number of students in both groups is $S_T = \sqrt{S_T^2}$ and through $S_H = \sqrt{S_H^2}$ compatible standard errors. $S_T{}^2 = \frac{1}{N_T} \cdot \sum_i n_i (x_i - \bar{X})^2$ $S_H{}^2 = \frac{1}{N_H} \cdot \sum_i n_i (y_i - \bar{Y})^2$ sample dispersion calculation formulas were used.

4. Confidence intervals for unknown mean values a_T and a_H

$$a_T \in \left[\overline{x_T} - \frac{t}{\sqrt{N_T}} S_T ; \overline{x_T} + \frac{t}{\sqrt{N_T}} S_T \right]$$

$$a_H \in \left[\overline{x_H} - \frac{t}{\sqrt{N_H}} S_H ; \overline{x_H} + \frac{t}{\sqrt{N_H}} S_H \right]$$

The probability of t – normalized deviation confidence here is determined based on p.

Based on these formulas, we will cite the statistical calculation work of the results obtained in the study. In terms of preliminary results, we will cite statistical calculations for the results of the test conducted in general (total) educational institutions [11]. In this case, we take the following table for the statistical series, with experimental groups as sample 1, control groups as sample 2 (Table II).

TABLE II. TOTAL RESULTS

Group	Student population	5 excel.	4 good	3 Satisfactory	2 Unsatisfactory	Average grade	
	At the beginning of the experiment						
Experiment (sample 1)	161	11	49	76	25	3,28	1,00
Control (sample 2)	163	11	51	76	25	3,29	
Total:	324	22	100	152	50		

Pedagogical experience-general results obtained from students who took part in the test work.

We determine the average of these samples. $\overline{X} = \frac{1}{n}\sum_{i=1}^{n=4} n_i x_i = \frac{1}{161}(11 \cdot 5 + 49 \cdot 4 + 76 \cdot 3 + 25 \cdot 2) = 3{,}28$

$\overline{Y} = \frac{1}{n}\sum_{i=1}^{n=4} n_i y_i = \frac{1}{163}(11 \cdot 5 + 51 \cdot 4 + 76 \cdot 3 + 25 \cdot 2) = 3{,}29$ experience and control group respectively.

Indicator $\eta = \frac{\bar{X}}{\bar{Y}} = \frac{3{,}28}{3{,}29} = 1{,}00$ determines the effectiveness of mastering in experimental and control groups.

Hence, in all of the results obtained in the closing step, the H1 hypothesis was accepted. The fact that the appropriation indicators in selected groups differ from each other, and the level of knowledge efficiency indicators are higher than in control groups proves the validity of experimental test work.

Let's cite the diagram viewers of the resulting initial results (Fig. 1, Fig. 2, Fig. 3 and Fig. 4).

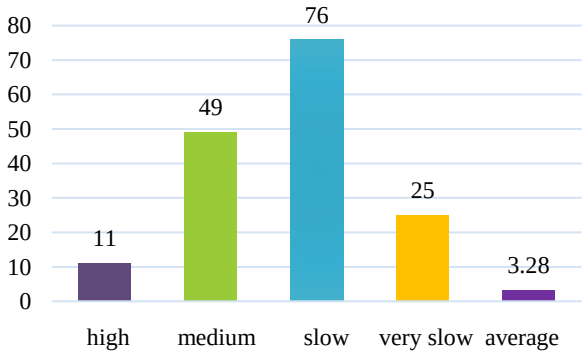

Fig. 1. Initial experimental group.

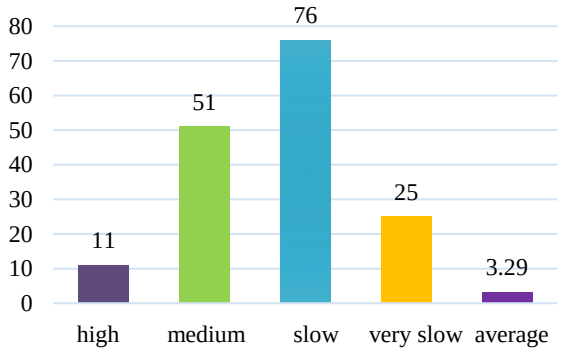

Fig. 2. Initial control group

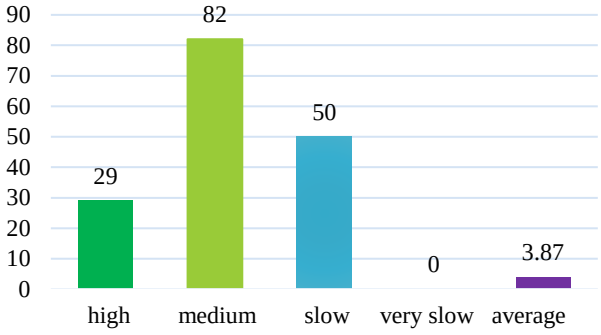

Fig. 3. Final experimental group

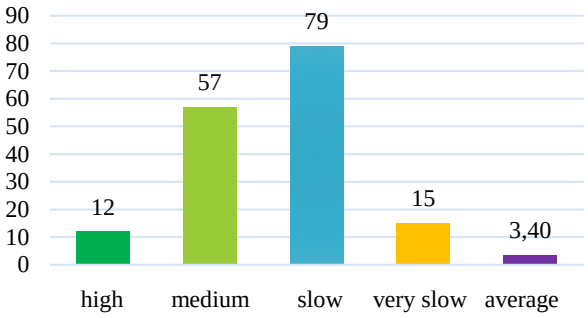

Fig. 4. Final control group

From the diagram and the results of the table above, it can be seen that in the closing stage, the mastering performance of the respondent-students increased by 1.14 times, that is, by 14 %.

Thus, the organization of test work on the basis of a specific program made it possible to achieve the expected results.

CONCLUSION

In this research work, the methods of use of interactive mobile educational technologies in the development of the methodology for the use of interactive mobile educational resources in students of the field of Professional Education in the field of software engineering and Information Communication Technologies were experimentally tested, the methodology for organizing and conducting pedagogical experimental test work was determined.

In order to carry out pedagogical pilot work, regulatory documents such as a training plan, curriculum, science program were collected in the relevant specialties, educational resources were prepared.

Interactive mobile education in higher education institutions of the Republic was carried out an experiment aimed at the use of resources and the training of web programming, the following were carried out:

- a pilot program was developed;
- the purpose and content of the training given in the curriculum, textbooks and teaching aids were integrated into the interactive educational resource and applied to practice on an experimental basis;
- got acquainted with the content of scientific and methodological literature on the problem of research, the current state was analyzed, experimental and test areas were identified;
- Interactive mobile education in higher education institutions studied the use of resources and, on their basis, the state of teaching the subject of access to web programming;
- In higher education institutions, the use of interactive educational resources was organized, and the results obtained were summarized.

A methodological system has been developed that allows students of a higher educational institution to form the use of interactive mobile educational resources in an e-learning environment. In this system, a combination of the content, methods, tools and forms of training was achieved.

We came to the conclusion that the level of knowledge, skills and qualifications of students in the specialty can be increased at a high level when organized on the basis of an interactive mobile educational resource based on the pedagogical and methodological side of a lecture on web programming, practical and independent educational activities, on the basis of observations, analyzes, results of control work.

The results obtained at the final stage of the experimental test work were proven to be effective, and the general ideas of the research work obtained at the second stage of the experimental test were presented in this scientific article.

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