

CZU: 37.02:811.1112.2+004

DOI: 10.36120/2587-3636.v30i4.67-77

IMPLEMENTATION OF NEW INFORMATION TECHNOLOGIES IN THE TEACHING AND LEARNING PROCESS IN DAF CLASSES FOR BEGINNERS

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Abstract. The article describes the main stages of the pedagogical experiment within the research *Implementation of new information technologies in the educational process in German language classes*. The experimental results are analysed and statistically processed.

Keywords: teaching and learning process, German language classes, DAF, information and communication technologies.

IMPLEMENTAREA NOILOR TEHNOLOGII INFORMAȚIONALE ÎN PROCESUL DE PREDARE ȘI ÎNVĂȚARE LA ORELE DAF PENTRU ÎNCEPĂTORI

Rezumat. Articolul descrie principalele etape ale experimentului pedagogic în cadrul cercetării *Implementarea noilor tehnologii informaționale în procesul instructiv educativ în cadrul orelor de limbă germană*. Sunt analizate și prelucrate statistic rezultatele experimentale obținute.

Cuvinte cheie: proces de predare și învățare, lecții de limba germană, DAF, tehnologii informaționale și comunicaționale.

Introduction

The current key changes had a major impact on all social domains including the economy, politics, and education. All these developments led to acquiring new competencies, which are essential in the 21st century, such as digital skills. By virtue of the rise of Information and Communication Technologies (ICT) the teaching and learning processes have more attractive and accessible. At the same time, there has been an increase in the variety of modern digital media, which refers to educational tools and has the potential of being implemented in all teaching stages.

The effects of Information and Communication Technologies (ICT) on education were and still are a relevant topic for lots of researchers. As a consequence, a substantial number of studies have proven the hypothesis that modern education tools make the assessment process more attractive, meaning the performance of school courses becomes more accessible and appealing [1].

Nowadays, digital instruments in the education system have become unthinkable with the sharp rise of the digitalization of all social areas. According to the report by TALIS, 2018, 53% of teachers have already implemented Information and Communication

Technologies in assessment activities. On the other hand, the same study has also proven that Information and Communication Technologies are not the most attractive and used, for they demand further resources such as time, knowledge, software, and hardware instruments from teachers and pupils [2, p. 14].

A deeper analyzing the specialized literature, national, and international projects led to the conclusion that innovative digital information technologies and modern digital medias used in DaF courses are of paramount importance. This statement reflects the **research problem** regarding the theoretical and methodical consolidation of the processes, including the use of Information and Communication Technologies and digital media in DaF courses for beginners.

The aim of this research is to elaborate a methodology for the application of modern digital media which enables the development of common teaching methods in interactive teaching approaches in the teaching and learning processes.

The research tasks:

- ✓ The elucidation of new information technologies and modern digital media which can be implemented in the teaching and learning process in DaF classes for beginners.
- ✓ The comprehensive description of modern digital media that can be used in the teaching and learning process in DaF classes for beginners.
- ✓ The elaboration of a methodology concerning the implementation of modern digital media, which can be incorporated in the teaching and learning process in the DaF lessons for beginners.
- ✓ The validation of the presented methodology by pedagogical experiment, which was carried out within the framework of the school subject German, in the 6th grade, level A1.2.
- ✓ Evaluation of the research results.

The solution to the research problem and the fulfillment of the set tasks are aimed to reinforce the major impact of information technologies on pedagogical teaching processes. The first task was achieved by studying the literature of Moldovan and foreign researchers. The next two tasks were attained by developing a pedagogical model using modern digital tools. The fourth task could be fulfilled as a consequence of developing a pedagogical model using integrative tools presented in [3]. For the fifth task, an experiment had to be conducted in which two phases were distinguished: the observation experiment and the training experiment.

According to A. Cosmovici [4], the experiment is the most important method of investigation, as it provides precise and objective data [5, p. 98]. In the following study of this paper, 133 students from the sixth grade participated, out of which 67 students belonged to the experimental group, and 66 students belonged to the control group.

It is also worth mentioning that the textbook Beste Freunde A1.2 (Kurs- und Arbeitsbuch) [6-8], Hueber Verlag, was used when conducting this experiment.

Description of the observation experiment

Firstly, the pupils had to take a basic knowledge test to determine their initial level of knowledge. Table 1 reflects the composition of the samples.

Table 1. The composition of the samples

School year	Experimental sample		Control sample	
	Grade	Number of pupils	Grade	Number of pupils
2022-2023	VI-A	36	VI-B	34
	VI-C	31	VI-D	32
In total per sample	67		66	
In total	133			

For the statistical processing of these data, the app SPSS (Statistical Package for the Social Sciences) was used, for it is the most widely recognized statistical software for data analysis in the social sciences, and MS Excel. When conducting the basic knowledge test, it was considered that both samples had similar levels of knowledge.

By taking into consideration that the experimental and control groups had the same level of education at the beginning of the study, the following research hypotheses was formulated:

H_0 : $m_1 = m_2$ - no significant difference between the mean of the experimental sample and the mean of the control sample;

H_1 : $m_1 \neq m_2$ - there are significant differences between the mean of the experimental sample and the mean of the control sample.

The results of the basic knowledge test for each sample and each class are illustrated in Table 2.

Table 2. The distribution of scores by sample (basic knowledge test)

Sample	10	9	8	7	6	5	Average score	In total
	Experimental group							
Grade VI-A	1	4	8	6	5	12	6.72	36
Grade VI-C	2	3	10	6	7	3	7.29	31
In total the experimental group	3	7	18	12	12	15	6.985	67

Deskriptive Statistiken					
	N	Minimum	Maximum	Mittelwert	Std.-Abweichung
Grundwissenstests	67	5,00	10,00	6,9851	1,48214
Gültige Werte (listenweise)	67				

Control group								
Grade VI-B	1	3	9	12	4	5	7.13	34
Grade VI-D	2	1	10	12	2	5	7.19	32
In total the control group	3	4	19	26	6	8	7,152	66

Deskriptive Statistiken					
	N	Minimum	Maximum	Mittelwert	Std.-Abweichung
Grundwissenstests	66	5,00	10,00	7,1515	1,27993
Gültige Werte (listenweise)	66				

In total	133							
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Figure 1 shows the distribution curves of the basic knowledge test results by sample.

Marks	10	9	8	7	6	5
Experimental group	3	7	18	12	12	15
Control group	3	4	19	24	6	10

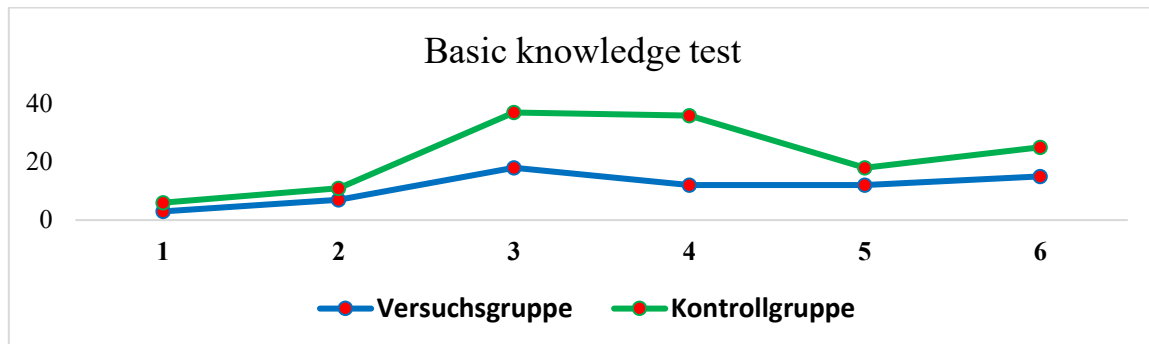


Figure 1. The distribution of the marks of the basic knowledge test

The difference between the scores obtained by the control sample and the experimental sample is highlighted by the average score of the tests and the graph of the distribution of the scores.

To reinforce the obtained results, the experimental data was also analyzed using SPSS. The test t was performed independently in two samples to demonstrate this evidence. The current test allows verifying the presence of significant differences between two compared groups, in reference to the average values of the dependent variable to be checked (in our case, the dependent variable represents the score obtained in the basic knowledge test, and the independent variable refers to the samples).

Table 3. Group statistics (basic knowledge test)

Gruppenstatistiken					
	Stichprobe	N	Mittelwert	Std.-Abweichung	Standardfehler des Mittelwertes
Grundwissenstests	Kontrollgruppe	66	7,1515	1,27993	,15755
	Versuchsgruppe	67	6,9851	1,48214	,18107

Table 3 indicates the number of subjects (N), the mean, the standard deviation, and the standard error of the mean for the experimental sample (2.00) and the control sample (1.00), whose mean is larger (7.15) as opposed to 6.98).

In the following Table 4 Levene test of variance homogeneity (basic knowledge test), the results of the Levene test are given, in which $F(131) = 3.702$, $p = 0.057$. Since the value of F is insignificant (≥ 0.05), the homogeneity of variances is satisfied. Consequently, the results of the test t are taken from the first line, where equal variances are predicted. The calculations $t(131) = 0.693$ and $p = 0.490 \geq 0.05$ indicate that there are no major differences between the media. Another indicator of whether or not there are discrepancies between the experimental group and the control one is the confidence interval limits (Lower value/Upper value). When $0 \in (-0.3089; 0.64178)$, it is proved that the difference between the mean of the experimental sample and that of the control one is not significant. Moreover, this table reveals that the difference in media is 0.24028, and this difference is encompassed by a 95% confidence interval.

Table 4. Levene test of variance equality (basic knowledge test).

Test bei unabhängigen Stichproben											
		Levene-Test der Varianzgleichheit		t-Test für die Mittelwertgleichheit							
		F	Sig.	T	df	Signifikanz		Mittlere Differenz	Differenz für Standardfehler	95% Konfidenzintervall der Differenz	
						Einseitiges p	Zweiseitiges p			Unterer Wert	Oberer Wert
Grundwissenstests	Varianzen sind gleich	3,702	0,057	0,693	131	0,245	0,490	0,16644	0,24028	-0,30890	0,64178
	Varianzen sind nicht gleich			0,693	128,802	0,245	0,489	0,16644	0,24002	-0,30845	0,64133

Therefore, it can be concluded that the null hypothesis H_0 holds, meaning that there are no significant differences between the means of the experimental and control samples.

The description of the training experiment

The training experiment was performed from September to November. The textbook "Best Friends", level A 1.2, module "Nico", which includes three lessons of four hours each, were being used. The basis for the experiment was modern digital media, which was applied in the experimental groups in all phases of teaching and the teaching and learning process.

When presenting the theoretical content the Google Site app and the Canva learning platform were utilized. Furthermore, online apps and other digital tools were used for the creation of graphical content.

Tools such as Learningsapps, word cloud creation apps, StudyStack, Quizlet, ClassroomScreen, Lino, Padlet, Quizizz, Kahoot, etc were proved to be useful for consolidating, repeating, and learning new vocabulary.

The evaluation in the experimental groups was conducted in the apps Testmoz and Google Forms. The first test was carried out in Google Forms (lessons 10 and 11), while the second was organized in Testmoz (lesson 12).

The analysis of the results for the first summative evaluation

The results of the first summative evaluation for each sample and class are reported in Table 5.

Table 5. The distribution of scores by sample (First Evaluation)

Sample							Average score	In total
	10	9	8	7	6	5		
Experimental group								
Grade VI-A	4	6	4	8	9	5	7.25	36
Grade VI-C	2	7	5	8	4	5	7.35	31
In total for experimental group	6	13	9	16	13	10	7.298	67
Deskriptive Statistiken								
	N	Minimum	Maximum	Mittelwert	Std.-Abweichung			
Erste_summ_Ev_I	67	5,00	10,00	7,2985	1,56684			
Gültige Werte (listenweise)	67							
Control group								
Grade VI-B	3	5	4	8	4	10	6.97	34
Grade VI-D	2	1	8	4	5	12	6.75	32
In total for control group	5	6	12	10	6	22	6.783	66
Deskriptive Statistiken								
	N	Minimum	Maximum	Mittelwert	Std.-Abweichung			
Erste_summ_Ev_I	66	5,00	10,00	6,7879	1,64097			
Gültige Werte (listenweise)	66							
In total	133							

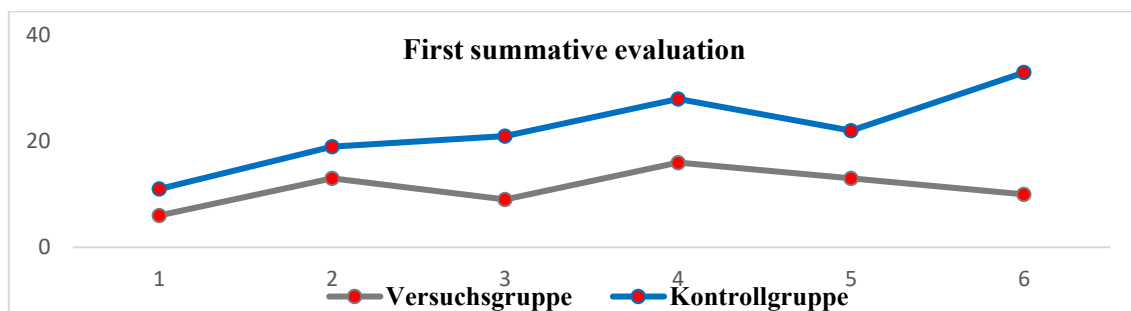


Figure 2. The distribution of the scores of the first summative evaluation

Figure 2 represents the distribution curves of the results of the first summative evaluation separated by sample.

Grade	10	9	8	7	6	5
Experimental group	6	13	9	16	13	10
Control group	5	6	12	12	9	23

The average score of the tests and the graph of the distribution of the scores underline the substantial difference between the scores obtained by the control sample and the experimental sample in favor of the experimental sample.

Table 6. Group statistics (First Evaluation)

Gruppenstatistiken					
	Stichprobe	N	Mittelwert	Std.- Abweichung	Standardfehler des Mittelwertes
Erste_summ_Ev_I	Kontrollgruppe	66	6,7879	1,64097	,20199
	Versuchsgruppe	67	7,2985	1,56684	,19142

Table 6 illustrates the number of subjects (N), the mean, the standard deviation, and the standard error of the mean for the experimental sample (2.00) and the control sample (1.00), whose mean is smaller (6.78 as opposed to 7.29).

The following Table 7 Levene test of variance equality (First Evaluation) points out the obtained results of the Levene test, in which $F(131) = 0.274$, $p = 0.601$.

Table 7. Levene's test of equality of variance (First Evaluation)

Test bei unabhängigen Stichproben											
		Levene- Test der Varianzgleich- heit		t-Test für die Mittelwertgleichheit							
		F	Sig.	T	df	Signifikanz		Mittlere Differenz	Differenz für Standard fehler	95% Konfidenzintervall der Differenz	
						Einsei- tiges p	Zweisei- tiges p			Unterer Wert	Oberer Wert
Erste Summ Ev I	Varianzen sind gleich	0,274	0,601	-1,836	131	0,034	0,069	-0,51063	0,27819	-1,06095	0,03969
	Varianzen sind nicht gleich			-1,835	131	0,034	0,069	-0,51063	0,27828	-1,06116	0,03990

The value of F is insignificant (≥ 0.05), so the homogeneity of variances is satisfied. For this reason, the results of the test t are taken from the first line, where equal variances are assumed. The calculations $t(131) = -1.836$ and $p = 0.069 \geq 0.05$ indicate that there are still no significant differences between the media of the taught groups during the experiment. That is, the null hypothesis H_0 still holds, so after the first summative evaluation, the null hypothesis H_0 cannot be rejected. In addition, this table indicates that the difference in the media is 0.27819 and that this difference is encompassed by a 95% confidence interval.

The analysis of the results for the second summative evaluation

The results of the second summative evaluation for each sample and class are reported in Table 8.

Table 8. The distribution of scores by sample (Second Evaluation)

Sample	10	9	8	7	6	5	Average score	In total
	Experimental group							
Grade VI-A	5	5	6	8	8	4	7.41	36
Grade VI-C	4	6	9	5	5	2	7.77	31
In total for experimental group	9	11	15	13	13	6	7.582	67
Deskriptive Statistiken								
	N	Minimum	Maximum	Mittelwert	Std.-Abweichung			
Zweite_summ_Ev_II	67	5,00	10,00	7,5821	1,52900			
Gültige Werte (listenweise)	67							
Control group								
Grade VI-B	3	5	5	7	6	8	7.05	34
Grade VI-D	2	1	10	2	8	9	6.75	32
In total for control group	5	6	15	9	14	18	6.909	66
Deskriptive Statistiken								
	N	Minimum	Maximum	Mittelwert	Std.-Abweichung			
Zweite_summ_Ev_II	66	5,00	10,00	6,9091	1,59545			
Gültige Werte (listenweise)	66							
In total	133							

Figure 3 represents the distribution curves of the results of the second summative evaluation separated by sample.

Score	10	9	8	7	6	5
Experimental group	9	11	15	13	13	6
Control group	5	6	15	9	14	17

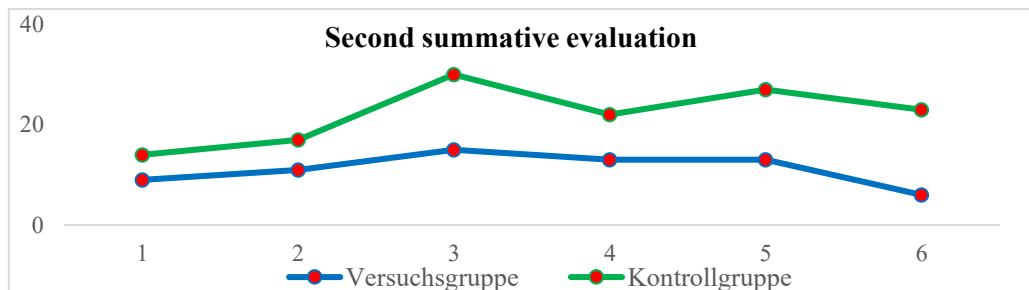


Figure 3. The distribution of the scores of the second summative evaluation

The average score of the tests and the graph of the distribution of the scores underline the substantial difference between the scores obtained by the control sample and the experimental sample in favor of the experimental sample.

Table 9. Group statistics (First Evaluation)

Gruppenstatistiken					
	Stichprobe	N	Mittelwert	Std.- Abweichung	Standardfehler des Mittelwertes
Zweite_summ_Ev_II	Kontrollgruppe	66	6,9091	1,59545	,19639
	Versuchsgruppe	67	7,5821	1,52900	,18680

Table 9 illustrates the number of subjects (N), the mean, the standard deviation, and the standard error of the mean for the experimental sample (2.00) and the control sample (1.00), whose mean is smaller (6.9 as opposed to 7.58).

The following Table 10 Levene test of variance equality (Second Evaluation) points out the obtained results of the Levene test, in which $F(131) = 0,236$, $p = 0,628$. The value of F is insignificant (≥ 0.05), so the homogeneity of variances is satisfied. For this reason, the results of the test t are taken from the first line, where equal variances are assumed. The calculations $t(131) = t(131) = -2,484$ und $p = 0,014 \leq 0,05$ indicate that there are significant differences between the media of the taught groups during the experiment. Since $0 \notin (-1.209; -0.137)$, it is proven that the difference between the mean of the experimental sample and the mean of the control sample is outstanding. It follows that hypothesis H1 is confirmed and the null hypothesis H₀ can be rejected. Furthermore, this table shows that the difference of the media is 0.27095 and that this difference is encompassed by a 95% confidence interval.

Table 10. Levene's test of equality of variance (Second Evaluation)

Test bei unabhängigen Stichproben											
		Levene-Test der Varianzgleichheit		t-Test für die Mittelwertgleichheit							
		F	Sig.	T	df	Signifikanz		Mittlere Differenz	Differenz für Standardfehler	95% Konfidenzintervall der Differenz	
						Einseitiges p	Zweiseitiges p			Unterer Wert	Oberer Wert
Zweite Summ Ev II	Varianzen sind gleich	0,236	0,628	-2,484	131	0,007	0,014	-0,67300	0,27095	-1,20900	-0,13700
	Varianzen sind nicht gleich			-2,484	131	0,007	0,014	-0,67300	0,27095	-1,20900	-0,13700

As a result of the implementation of modern digital media and the methodology presented, several sets of data were acquired, namely: the results (scores) of pupils in three assessment tests: a basic knowledge test and two control papers. In table 11 the average scores which were achieved in the three assessment tests are illustrated, while in figure 4 the comparative analysis of these scores is provided.

Table 11. The average scores achieved in the three assessment tests.

	Experimental group	Control group
Basic knowledge test	7,006	7,152
First summative Evaluation	7,298	6,863
Second summative Evaluation	7,580	6,909

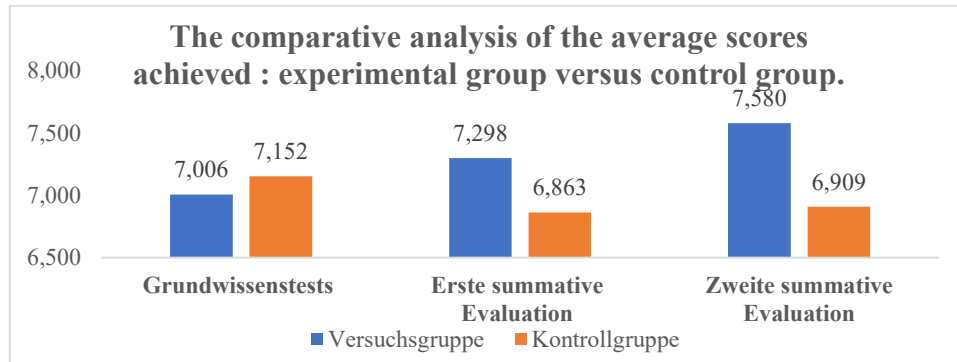


Figure 4. Comparative analysis of the average scores achieved

When analyzing the results, a considerable increase in the average score of the experimental group is noted in each assessment test, while the average score of the control group remains stable or decreases. This evidence underlines the positive effect of information technologies in the pedagogical teaching process. The graph from figure 5 emphasizes the trend of increasing the average scores from one test to another. Thus, the hypothesis of academic success from one test to the next has been proven.

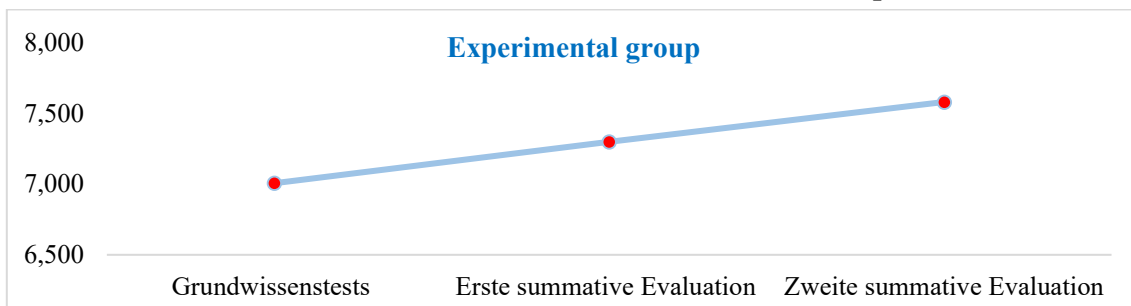


Figure 5. Graphical representation of the results of the experimental group, 2022-2023

Below, Figure 6 illustrates the graph of results that disprove the hypothesis of academic success from one test to the next.

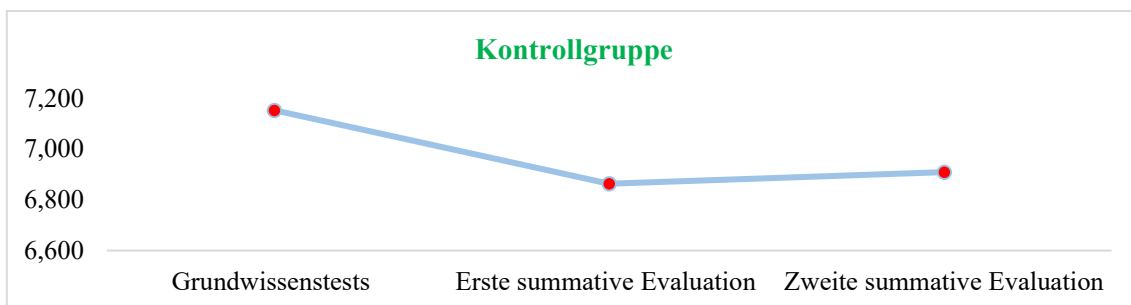


Figure 6. Graphical representation of the results of the control group, 2022-2023

Conclusions

To verify the viability of the implementation of new information technologies in the teaching and learning process, the training experiment was conducted in the period September-November. The statistical evaluation of the results supported the efficiency of the implementation of new information technologies in the teaching and learning process. The statistical tests carried out during the analysis of the data collected during the formative experiment have highlighted the considerable differences in favor of the experimental sample. It further affirmed the effectiveness of the modern learning strategies that produced steady academic success in the experimental sample and the lack of it in the control sample. Hence, through the obtained results, the research hypothesis was fully confirmed.

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