IRSTI:14.15.21
DOI: https://doi.org/10.47344/v2fdcp38

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DIFFERENTIATION OF HOMEWORK IN PHYSICS TO IMPROVE THE ACHIVEMENTS OF 9TH GRADE STUDENTS IN SECONDARY SCHOOLS IN KAZAKHSTAN

Abstract. This study examines the impact of differentiated homework assignments on the academic achievements of 9th-grade students in physics within secondary schools in Kazakhstan. The research employs a mixed-methods approach, incorporating both qualitative and quantitative data collection techniques, including pre- and post-assessment tests. The study aims to determine whether tailored homework assignments, based on students' proficiency levels and learning styles, enhance their understanding and performance in physics. Findings indicate that differentiation in homework positively affects student engagement, comprehension, and overall academic success. The research highlights the necessity of personalized learning approaches in physics education. This study contributes to the broader discourse on effective teaching methodologies and underscores the role of homework customization in fostering student achievement.

Keywords: differentiated homework, physics education, student achievement, personalized learning, secondary school, academic success, Kazakhstan, mixed-methods research.

Introduction

Improving students' academic performance in physics is a complex and significant challenge in education (Salar & Turgut, 2021, p. 11). Key questions arise: How can homework be used as a tool to enhance students' interest and engagement in learning physics (Keane & Heinz, 2019, p.15)? Can differentiated homework positively influence students' completion rates? In my teaching practice, I have observed that physics homework is primarily completed by students with above-average academic performance, whereas students with lower achievement often neglect these assignments. This trend suggests that academic ability may influence homework completion, which, in turn, can affect classroom participation and overall academic success (Kontur & Terry, 2015, p.7).

Notably, students who regularly complete homework tend to participate more actively in class discussions, grasp new concepts more quickly, and achieve better academic results (Delfino, 2019, p.9). Conversely, a lack of completed homework is typically correlated with lower grades, indicating a negative cycle of disengagement (Crocker, R. K., & Kleitsch, M., 2023, p. 11). When asked about their reasons for neglecting homework, some students remain silent, while others cite a lack of interest, insufficient time, or difficulty understanding the material (Smith, J., et al., 2019, p.36). Additionally, some students prioritize other activities over homework, perceiving assignments as less valuable. For others, intrinsic motivation to complete homework depends on whether the tasks are engaging and meaningful to their learning process (Patall, E. A., et al., 2010, p.10).

This raises the question: Is it possible to design homework that supports student learning without imposing an excessive workload (Jamal & Rizvi, 2021, p.276)? How can assignments be adapted to meet the diverse needs of students in a physics classroom? Moreover, can homework be tailored to students' personal interests, potentially fostering greater motivation and sustained academic engagement? Given that collaborative learning enhances students' understanding of classroom material, it may also offer potential benefits if integrated into homework design (Epstein, J. L., & Van Voorhis, F. L. 2001, p.183).

The purpose of this study is to examine the impact of differentiated homework on students' academic performance and engagement in physics lessons. The study will assess whether

personalizing assignments based on students' abilities and interests can positively influence their motivation and completion rates, thereby contributing to their overall success in physics.

General Information About the Study

This study aims to improve education and the teaching of physics in 9th-grade general education schools in Kazakhstan. In my view, one possible way to enhance learning is through the differentiation of physics homework. This approach should take into account students' individual interests. These interests may include achieving good grades, feeling comfortable while completing assignments and seeing results, having a genuine interest in physical phenomena and their study, enthusiasm for sports, a sense of superiority, focusing on a future profession, gaining recognition from parents and classmates, and other motivating factors.

To analyze the impact of differentiated homework on students' academic performance, two classes were selected: one following a traditional teaching methodology and the other serving as an experimental group. In the experimental class, homework assignments will be differentiated. Student learning outcomes will be measured, and the effect of differentiated homework on physics performance will be evaluated. The results will be assessed by comparing the academic progress of the traditional class and the experimental class. To enhance progress in the experimental class, differentiation will be implemented in several areas.

Relevance of the Study

Today, general education schools in Kazakhstan often have classes consisting of 24 to 32 students. Research suggests that large class sizes can hinder the effectiveness of teaching and learning, as individual attention is limited **(**Wyss, V. L., et al., 2007, p.49). In fact, studies indicate an inverse relationship between class size and academic performance, especially in subjects like physics, which require focused engagement and hands-on practice (Borland, M. V., et al., 2005, p.77). However, in my teaching experience, I have consistently observed that some students maintain high efficiency and dedication to their studies, completing homework on time, actively participating in discussions, and demonstrating unwavering focus even in overcrowded classrooms. Their motivation appears to stem not only from the desire to earn good grades but also from a deeply rooted drive to explore new and intriguing concepts (Ryan, R. M., & Deci, E. L. 2000, p.60).

Motivation is recognized as a key factor in student achievement, particularly in subjects perceived as challenging, such as physics (Schunk, D. H., & Zimmerman, B. J. 1998, p.14). Students who engage with physics through hands-on activities develop a deeper understanding and retain knowledge more effectively, as active participation fosters a strong learning momentum (Ellwood, R., & Abrams, E. 2018, p.1130). Differentiated physics homework provides an opportunity to cater to students' diverse interests and learning styles, making the subject more relevant and engaging for each individual. Such assignments not only promote a healthy interest in physics but also encourage students to strive for higher academic achievements (Rosário, et al., 2015, p.386).

Given the varying levels of intrinsic motivation among students, differentiated homework can serve as a tool to stimulate curiosity and willingness to explore beyond the classroom, even in large classes. This approach aligns with educational research showing that when assignments are tailored to students' abilities and interests, they are more likely to engage actively and achieve higher outcomes (Tomlinson, C. A. 2014, p.174). Thus, by personalizing physics homework, we can potentially enhance student engagement and overall academic performance, making the subject more accessible and enjoyable to study.

Research Objective

The objective of this study is to establish the relationship between differentiated physics homework and the improvement of students' academic performance through the results of formative and summative assessments in physics. The study aims to determine whether differentiated homework assignments influence students' achievement in physics lessons.

Research Tasks

- Determine whether differentiated homework has a positive impact on student engagement during lessons.
- Assess whether differentiated homework positively affects students' performance in the summative assessment for a specific unit.
- Examine whether differentiated homework positively influences students' overall summative performance for the academic term.

Research Hypothesis

Students' academic performance in physics can be improved through differentiated assignments. Academic achievement depends on students' level of interest in studying physics. Differentiated assignments should spark interest in unmotivated students and enhance the motivation of those with low engagement in learning physics.

Methodology Section

To achieve the research goal, observation methods were implemented. This included monitoring student activity in class and tracking academic performance through formative assessment. The study also involved monitoring homework completion, comparing the formative assessment results of the control and experimental classes, and graphically representing the final assessment results to visually demonstrate the effectiveness of the applied methods.

Materials Used in the Study

To collect initial data, the study utilizes student motivation surveys to determine their interest in studying physics, as well as academic performance testing for both the control and experimental classes. The results serve as the foundation for tracking further academic progress throughout the study.

In the experimental class, various types of homework assignments will be implemented, while in the control class, traditional assignments will remain unchanged. Throughout the learning process, observations of student engagement during physics lessons will be conducted, along with formative assessment during lessons and regular monitoring of homework completion. Additionally, students will complete final assessments for each unit, and the results of these assessments will be analyzed for both the control and experimental classes. Quarterly final assessments will also be administered, and their results will be compared between the two groups.

To visualize the findings, a progress chart will be created, clearly illustrating the academic development of both the control and experimental classes. Graphical representations of the research results will be used to compare the dynamics of student achievement across both groups.

Participants and Research Location

The study will involve two ninth-grade classes, with the results from the selected classes expected not to differ significantly. One class will be the control group, and the other will be the experimental group. The control group will serve as a baseline for comparison with the experimental group's results, and no changes will be made to their homework assignments.

The experimental class, which will have a similar level of knowledge as the control group, will receive differentiated homework assignments. To examine the impact, the class with a lower academic performance level will be chosen as the experimental group, allowing us to observe contrasts in the research results. Both classes will have the same number of students, and the lessons will be conducted on the same days.

The study will take place in a secondary school setting.

Research Algorithm

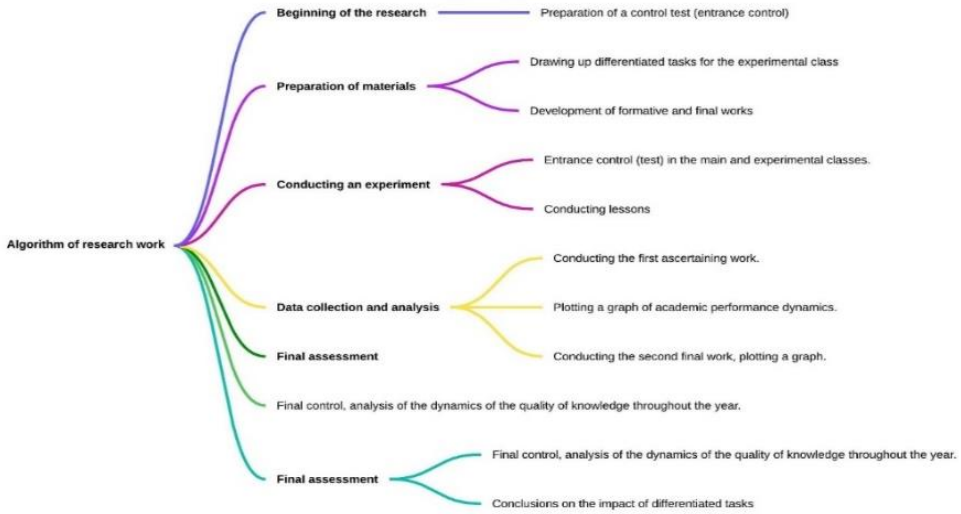

Figure 1- Research Algorithm

The study will begin with the selection of tasks for a control test, which will be used for both formative and summative assessments in the control and experimental groups. Differentiated assignments will be created for the experimental group, taking into account the theme of the lesson, practical focus, group work, student interests, and allowing for varying levels of difficulty.

The next step involves selecting tasks for formative assessments in the classroom and preparing the final tests for each topic. Additionally, final tests for the academic quarter will be prepared.

After preparing the materials, the data collection phase will begin. The first step will be conducting an initial control test in both the control and experimental classes. Lessons in both classes will follow the same structure. However, the homework assignments will differ: in the control class, the homework will follow the standard curriculum, while in the experimental class, the assignments will be differentiated based on the lesson content and students' ability to choose their level of difficulty.

At the end of the section on physics, summative assessments will be conducted in both the control and experimental classes. The summative assignments for both classes should be identical, and reliable, valid, and credible tasks should be used. After completing the summative assessments, the results of both classes will be graphically displayed. The data from the initial test and the first summative assessment will form the basis for analyzing the dynamics of academic performance in both the control and experimental classes.

Once the next section has been completed in both classes, a second summative assessment will be conducted. The results from the second final test will be graphically displayed for both classes. The data from the first two final tests will reveal the first dynamics of student performance, allowing for preliminary conclusions about the work and whether differentiated homework affects students' academic performance. Specifically, the impact of differentiated homework on student performance—whether positive or negative—will be analyzed.

At the end of the quarter, a final assessment will be conducted for both classes. The results will help determine the quality of knowledge in both the control and experimental groups, and a graph will be created to compare the knowledge quality in both classes. The graph should highlight the dynamics between the classes.

At the end of the research, a final test will be conducted in both classes. The results will be compared to the initial test results. By comparing the results of the initial and final tests, the dynamics of academic performance in both the control and experimental groups will be determined.

The results will allow for a conclusion on the effectiveness of the selected types of differentiated homework in improving the knowledge quality of students in the experimental class. By comparing and analyzing the dynamics of the obtained results, it will be possible to identify which types of

differentiated homework had the most significant impact on the knowledge quality of students in the experimental group.

Practical part

In order to determine the current level of knowledge, entrance testing was conducted in the main and experimental classes. The testing results are included in Table 1.

Table 1. Pre-test Results and Comparative Analysis

Entrance test results			
Control group		Experimental group	
Student No.	Maximum score - 30	Student No.	Maximum score - 30
1	20	1	9
2	15	2	10
3	15	3	13
4	19	4	20
5	18	5	15
6	11	6	15
7	21	7	13
8	15	8	19
9	21	9	13
10	13	10	15
11	12	11	13
12	12	12	18
13	14	13	15
14	15	14	18
15	16	15	14
16	20	16	12
17	12	17	13
18	11	18	20
19	16	19	14
20	14	20	23
21	15	21	18
22	13	22	12
23	14	23	16
24	11	24	10

In the control and experimental groups, there is a strong scatter of results: in the control group, the minimum score is 11, the maximum score is 21, in the experimental group, the minimum score is 9, the maximum score is 23. The results of the preliminary analysis are included in Table 2.

Table 2. Results of the Preliminary Analysis

	Control group	Experimental group
Minimum score	11	9
Maximum score	21	23
Average score	15,13	14,9
Range of values	10	14
Quantity estimate «5» (Great)	0	0
Quantity estimate «4» (Fine)	5	5
Quantity estimate «3» (satisfactorily)	18	16

Quantity estimate «2» (not satisfactory)	1	3

Analysis of the entrance testing shows that the difference in results is insignificant; overall, the picture of academic performance in both classes is similar.

Statistical Analysis of Pre-test Group Results

To ensure the initial equivalence between the control and experimental groups, a Welch's one-way analysis of variance (ANOVA) was conducted on the pre-test scores. This statistical test was chosen due to its robustness against violations of homogeneity of variances. The results indicated no statistically significant difference between the groups:

$F(1, 45.6) = 0.0462$, $p = 0.831$.

These findings suggest that the groups were comparable at the outset of the study, providing a valid foundation for subsequent comparisons in the post-test phase.

Table 3. Descriptive Statistics for Pre-Test Scores

	Groups	Number of students	Average	Standard deviation	Standard error (of the mean)
Pre-Test	Control	24	15.1	3.19	0.652
	Experimental	24	14.9	3.51	0.717

Table 3 presents the descriptive statistics for the pre-test scores in both the control and experimental groups. The control group (N = 24) had a mean score of 15.1 (SD = 3.19), with a standard error (SE) of 0.652. The experimental group (N = 24) had a mean score of 14.9 (SD = 3.51), with a standard error (SE) of 0.717.

These results suggest that both groups have similar average scores prior to the intervention, with only a slight difference in the means (0.2), which is not statistically significant based on the previous ANOVA results. The standard deviations (SD) for both groups are relatively similar, indicating that the spread of scores within each group is comparable.

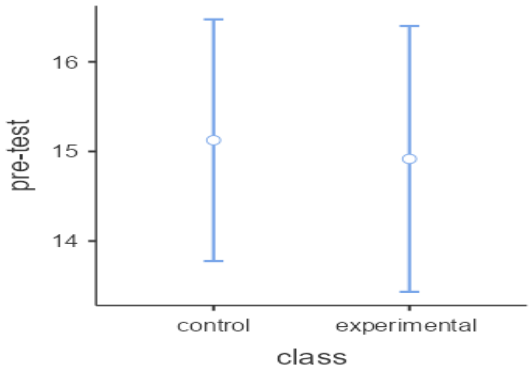

Figure 2- The mean values and confidence intervals for the pre-test

As shown in the graph (Figure 2), the mean values and confidence intervals for the pre-test are nearly identical, confirming the absence of significant differences between the groups at the initial stage.

Final academic performance of students before the start of the study.

To ensure initial comparability between the control and experimental groups, the final academic performance of students was analyzed prior to the pedagogical intervention (Table 4). This analysis serves as a baseline indicator of students' achievement levels in physics before the start of the study.

Establishing a comparable starting point is essential for an objective assessment of the impact of the implemented instructional approach.

The final grades reflect the cumulative results of students in physics prior to the use of differentiated homework. A one-way Welch's ANOVA was conducted to determine whether there were any statistically significant differences between the groups at the outset. The results of this analysis are presented below.

Table 4. Results of summative assessment of groups before the start of the study.

Results of summative assessment of groups before the start of the study			
Control group		Experimental group	
Student No.	Maximum value – 100%	Student No.	Maximum value – 100%
1	77	1	63
2	60	2	52
3	67	3	50
4	78	4	59
5	70	5	70
6	53	6	63
7	83	7	65
8	65	8	49
9	74	9	61
10	61	10	73
11	70	11	59
12	64	12	57
13	65	13	62
14	74	14	51
15	62	15	64
16	86	16	69
17	57	17	66
18	55	18	67
19	74	19	84
20	69	20	86
21	71	21	79
22	68	22	54
23	68	23	83
24	58	24	49

Table 5. One-way analysis of variance (Welch) of the results of the summative assessment of groups before the start of the study.

One-way analysis of variance (Welch)				
Condition	F-statistic (test value)	Degrees of freedom between groups	Degrees of freedom within groups	p-value (significance level)
	1.90	1	43.2	0.175

Table 6. Descriptive statistics of the group: Final academic performance of students before the start of the study

Descriptive statistics of the group

	Groups	Number of students	Average	Standard deviation	Standard error (of the mean)
Before the study begins	control	24	67.9	8.48	1.73
	experimental	24	64.0	11.03	2.25

To ensure baseline equivalence between the groups, a one-way Welch's ANOVA was conducted on students' final academic performance prior to the start of the study(Table 5 and Table 6). The analysis revealed no statistically significant difference between the control and experimental groups, $F(1, 43.2) = 1.90$, $p = .175$. This indicates that both groups had similar academic achievement levels at the outset, supporting the validity of subsequent comparisons. (Figure 3)

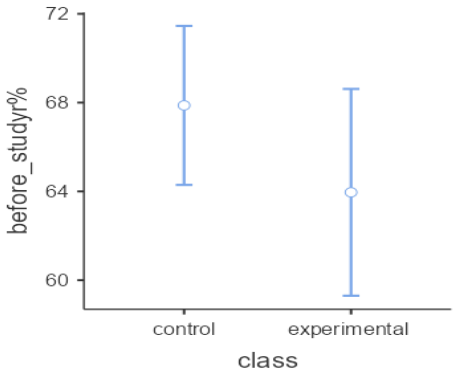

Figure 3- Basic equivalence between certificates

Description of the Phase Between the Pre-Test and Post-Test

Following the administration of the pre-test, which served to determine the students' initial level of understanding, the core phase of the study was initiated. This phase spanned the period between the pre-test and the post-test and involved the implementation of distinct instructional approaches in the experimental and control groups, particularly in relation to homework assignments.

In the experimental group, a system of differentiated homework tasks was introduced. These tasks were tailored to the individual learning needs, abilities, and interests of the students. The assignments varied in terms of complexity (basic, intermediate, and advanced), and included practical problem-solving tasks, research-based mini-projects, and activities designed to foster critical thinking and independent learning. The teacher played an active role in monitoring students' progress, providing ongoing feedback, and adjusting the level and type of tasks as necessary to maintain engagement and ensure accessibility.

In contrast, the control group continued learning through the traditional method, in which all students received identical homework assignments, regardless of their individual performance levels or learning preferences. The tasks were predominantly reproductive in nature, focusing on the repetition and reinforcement of classroom content without significant variation.

Throughout this phase, data collection was conducted systematically, including observations of students' engagement levels, task completion quality, and overall participation. Difficulties encountered by students in both groups were also recorded to allow for a more comprehensive analysis of the instructional strategies employed.

This phase concluded with the post-test, which was designed to assess the development of students' academic performance over the course of the intervention. The post-test was aligned with the same content areas as the pre-test, enabling a direct comparison of learning outcomes and providing insights into the effectiveness of differentiated homework assignments as a pedagogical intervention.

Post-Test Results and Comparative Analysis

To assess the effectiveness of the applied instructional strategies, a post-test was conducted in both the experimental and control groups. This section presents the outcomes of the post-test, highlighting key trends, differences, and patterns in students' performance that emerged as a result of the intervention.

The results of the post-test are entered into table 7.

Table 7. Post-Test results

Post-Test results			
Control group		Experimental group	
Student No.	Maximum score - 30	Student No.	Maximum score - 30
1	21	1	15
2	16	2	14
3	14	3	17
4	20	4	23
5	18	5	20
6	14	6	19
7	22	7	17
8	16	8	24
9	23	9	16
10	13	10	19
11	14	11	16
12	14	12	24
13	13	13	16
14	16	14	21
15	17	15	18
16	21	16	15
17	14	17	16
18	12	18	26
19	18	19	15
20	15	20	26
21	16	21	22
22	15	22	14
23	15	23	23
24	10	24	15

In both groups, the control and the experimental, there is a spread of post-test results: in the control group, the minimum score is 10, the maximum score is 23, in the experimental group, the minimum score is 14, the maximum score is 26. The results of the preliminary analysis are presented in Table 8.

Table 8. Descriptive Statistics of Student Performance Based on Grading Scale

Descriptive Statistics of Student Performance Based on Grading Scale								
Indicator	Minimum score	Maximum score	Average score	Score range	Number of "5" (Excellent)	Number of "4" (Good)	Number of "3" (Satisfactory)	Number of "2" (Unsatisfactory)
Control group	10	23	16.13	13	0	5	18	1

Experimental group	14	26	18.79	12	2	7	15	0

To evaluate the effectiveness of differentiated homework tasks, a one-way analysis of variance (Welch's ANOVA) was conducted, accounting for potential heterogeneity of variances between the groups. (Table 9 and Table 10).

Table 9. Results of One-Way Analysis of Variance (Welch) of the Post-Test results.

Results of One-Way Analysis of Variance (Welch)				
Condition	F-statistic (test value)	Degrees of freedom between groups	Degrees of freedom within groups (adjusted)	p-value (significance level)
Post-Test	6.49	1	44.8	0.014

Table 10. Descriptive statistics of the group of the Post-Test results.

Descriptive statistics of the group					
	Groups	Number of students	Average	Standard deviation	Standard error (of the mean)
Post-Test	Control	24	16.1	3.31	0.677
	Experimental	24	18.8	3.91	0.799

The analysis yielded the following result: $F(1, 44.8) = 6.49$, $p = 0.014$. Since the p-value is less than 0.05, the result indicates a statistically significant difference in post-test scores between the experimental and control groups. This finding suggests that differentiated homework had a positive impact on students' academic performance.

Therefore, it can be concluded that assigning homework tailored to students' individual readiness levels and learning needs contributed to improved learning outcomes. (Figure 4)

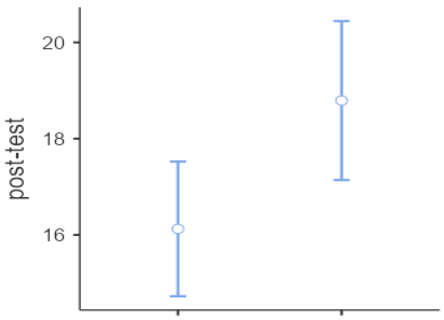

Figure 4- Mean post-test scores with confidence intervals in the control and experimental groups

Statistical Analysis of Summative Assessment Results Conducted After the Pedagogical Intervention

Upon completion of the study, a summative assessment was administered to both the experimental and control groups. The results of this assessment were used as a tool to track changes in students' academic performance compared to the data obtained during the pre-test phase. The statistical analysis presented in this section aims to identify differences in results between the groups and evaluate the potential impact of the implemented intervention on students' learning outcomes.

Results of the Final Assessment of the Groups After the Research Intervention

To evaluate the impact of the implemented instructional intervention, a comparative analysis of the final academic performance and test results was conducted between the experimental and control groups. The assessment aimed to determine whether the differentiated approach to homework assignments contributed to significant improvements in students' learning outcomes. The results were analyzed using descriptive statistics and one-way Welch's ANOVA to account for potential differences in variance between the groups. The findings are presented below. (Table 11).

Table 11. Final Assessment Results: Control vs Experimental Group

Control group		Experimental group	
Student No.	Maximum value – 100%	Student No.	Maximum value – 100%
1	78	1	66
2	59	2	53
3	66	3	52
4	76	4	62
5	75	5	72
6	56	6	66
7	83	7	68
8	66	8	51
9	73	9	66
10	63	10	76
11	70	11	63
12	65	12	66
13	66	13	66
14	73	14	52
15	65	15	66
16	89	16	70
17	60	17	66
18	61	18	69
19	76	19	87
20	69	20	89
21	69	21	81
22	67	22	57
23	67	23	86
24	60	24	51

The results of the one-way analysis of variance using Welch's test revealed statistically significant differences between the control and experimental groups on both measures.

For summary academic performance, the F-value was 10.22 with 1 degree of freedom between groups and 44.1 degrees of freedom within groups. The associated p-value of 0.003 indicates a statistically significant difference in overall performance, favoring the experimental group.

Similarly, for test results, the F-value was 6.31, with 1 and 46.0 degrees of freedom respectively. The p-value of 0.016 confirms a statistically significant difference between the groups in terms of test outcomes. (Table 12, Table 13, Figure 5)

Table 12. Results of One-Way Analysis of Variance (Welch) of the Final Assessment of the Groups After the Research Intervention

Results of One-Way Analysis of Variance (Welch)				
Comparison	F-value	Degrees of Freedom	Degrees of Freedom (Within Groups)	p-value

		(Between Groups)		
Difference in summary academic performance	10.22	1	44.1	0.003
Difference in test results	6.31	1	46.0	0.016

Table 13. Descriptive Statistics of the Groups of the Final Assessment After the Research Intervention

Descriptive Statistics of the Groups					
Comparison	Group	Sample Size (N)	Mean	Standard Deviation (SD)	Standard Error (SE)
Difference in summary academic performance	Control	24	0.958	2.14	0.436
Difference in summary academic performance	Experimental	24	2.750	1.73	0.352
Difference in test results	Control	24	2.208	1.64	0.335
Difference in test results	Experimental	24	3.417	1.69	0.345

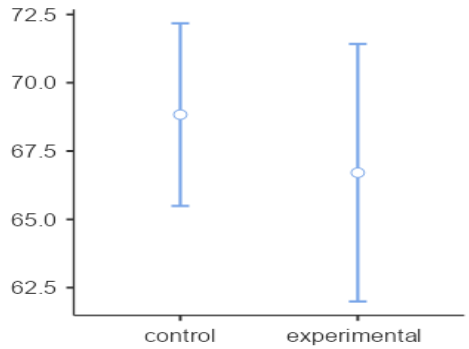

Figure 5- Comparison of average test performance between control and experimental groups, showing a significant difference.

These findings suggest that the intervention had a meaningful and positive effect on both the general academic achievement and specific test performance of students in the experimental group.

One-way Welch's ANOVA was conducted to analyze the dynamics of students' results in summative assessment before and after the intervention, as well as the changes in Pre-test and Post-Test performance in both the experimental and control groups.

The results of Welch's one-way ANOVA, table 14 and table 15, revealed statistically significant differences between the experimental and control groups in both the dynamics of summative assessment performance ($F(1, 44.1) = 10.22$, $p = .003$) and in Pre-test to Post-test performance ($F(1, 46.0) = 6.31$, $p = .016$).

Table 14. Welch's ANOVA Results for the Dynamics of Summative Assessment Performance Between Groups

Results of One-Way Analysis of Variance (Welch)				
Comparison	F-value	Degrees of Freedom (Between Groups)	Degrees of Freedom (Within Groups)	p-value
Difference in summary academic performance	10.22	1	44.1	0.003
Difference in test results	6.31	1	46.0	0.016

Table 15. Welch's ANOVA Results for Pre-test to Post-test Performance Between Experimental and Control Groups

Descriptive Statistics of the Groups					
Comparison	Group	Sample Size (N)	Mean	Standard Deviation (SD)	Standard Error (SE)
Difference in summary academic performance	Control	24	0.958	2.14	0.436
Difference in summary academic performance	Experimental	24	2.750	1.73	0.352
Difference in test results	Control	24	2.208	1.64	0.335
Difference in test results	Experimental	24	3.417	1.69	0.345

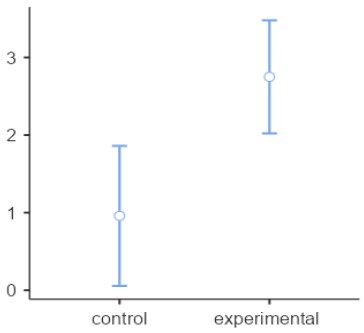

Figure 6- Difference in summary academic performance

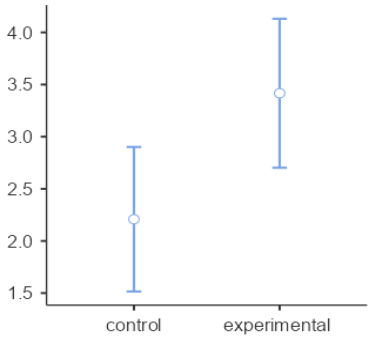

Figure 7-Difference in test results

These findings indicate the effectiveness of the intervention and confirm the positive impact of differentiated assignments on students' academic achievement (Figure 6, Figure 7).

Conclusion

In the present study, the hypothesis regarding the existence of statistically significant differences between the participants of the experimental and control groups was tested in terms of task performance indicators (i.e., the dynamics of students' results in summative assessments before and after the intervention) and academic performance levels (i.e., the dynamics of students' results in pre-test and post-test assessments). Welch's one-way analysis of variance (ANOVA) was used to analyze the data, as preliminary testing using Levene's test revealed a violation of the homogeneity of variances assumption (where a p-value < .05 indicates statistically significant differences in variances between groups, meaning that the variability within the groups is unequal, thus violating the assumption of homogeneity of variances required for classical ANOVA).

The results of the analysis showed statistically significant differences between the groups for both variables under investigation. For the variable measuring the dynamics of students' results in summative assessments before and after the intervention, a significant difference was observed: $F(1, 44.1) = 10.22$, $p = .003$. This indicates a substantial impact of differentiated homework assignments on academic achievement. Additionally, for the variable reflecting the dynamics of students' results in pre-test and post-test assessments, a statistically significant difference was found: $F(1, 46.0) = 6.31$, $p = .016$, suggesting that the intervention had a positive influence on final test outcomes.

Thus, the results support the proposed hypothesis: the implementation of the suggested methodology has a positive impact on students' academic performance. The most pronounced effect was observed in the dynamics of students' summative assessment results before and after the intervention, which may indicate increased engagement and improved quality in task completion within the experimental group. These findings highlight the importance of integrating pedagogical strategies aimed at individualizing instruction to enhance students' academic success.

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ҚАЗАҚСТАННЫҢ ОРТА МЕКТЕПТЕРІНДЕГІ 9-СЫНЫП ОҚУШЫЛАРЫНЫҢ ЖЕТІСТІКТЕРІН АРТТЫРУ МАҚСАТЫНДА ФИЗИКА ПӘНІНЕН ҮЙ ТАПСЫРМАСЫН САРАЛАУ

Аңдатпа. Бұл зерттеуде Қазақстандағы орта мектептердің 9-сынып оқушыларының физика пәні бойынша академиялық жетістіктеріне дифференциалданған үй тапсырмаларының әсері қарастырылады. Зерттеуде аралас әдіс қолданылып, сапалық және сандық деректерді жинау әдістері, соның ішінде бастапқы және қорытынды бағалау тесттері қамтылған. Зерттеудің мақсаты – оқушылардың дайындық деңгейі мен оқу стиліне негізделген бейімделген үй тапсырмалары олардың физиканы түсінуі мен үлгерімін жақсартуға ықпал ететінін анықтау. Алынған нәтижелер үй тапсырмаларын саралаудың оқушылардың белсенділігін, материалды меңгеруін және жалпы академиялық жетістіктерін арттыруға оң әсер ететінін көрсетеді. Зерттеу физика пәнін оқытуда жекелендірілген тәсілдердің қажеттілігін атап көрсетеді. Бұл жұмыс тиімді оқыту әдістері туралы кеңірек пікірталасқа үлес қосып, үй тапсырмаларын бейімдеудің оқушылардың үлгерімін арттырудағы рөлін айқындайды.

Түйін сөздер: Дифференциалданған үй тапсырмалары, физиканы оқыту, академиялық жетістік, жекелендірілген оқыту, орта мектеп, оқу жетістігі, Қазақстан, аралас зерттеу әдістері.

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ДИФФЕРЕНЦИАЦИЯ ДОМАШНЕЙ РАБОТЫ ПО ФИЗИКЕ ДЛЯ ПОВЫШЕНИЯ УСПЕВАЕМОСТИ УЧАЩИХСЯ 9-Х КЛАССОВ СРЕДНИХ ШКОЛ КАЗАХСТАНА

Аннотация: В данном исследовании рассматривается влияние дифференцированных домашних заданий на академические достижения учеников 9-х классов по физике в средних школах Казахстана. В работе используется смешанный метод исследования, включающий как качественные, так и количественные методы сбора данных, включая предварительное и итоговое тестирование. Цель исследования – определить, способствуют ли адаптированные домашние задания, основанные на уровне подготовки и стилях обучения учащихся, улучшению их понимания и успеваемости по физике. Полученные результаты показывают, что дифференциация домашних заданий положительно влияет на вовлеченность учащихся, их понимание материала и общий академический успех. В исследовании подчеркивается необходимость персонализированных подходов в обучении физике. Работа вносит вклад в более широкий дискурс об эффективных методах преподавания и подчеркивает роль индивидуализации домашних заданий в повышении успеваемости учащихся.

Ключевые слова: Дифференцированные домашние задания, обучение физике, академическая успеваемость, персонализированное обучение, средняя школа, учебный успех, Казахстан, смешанные методы исследования.

Received 15 May 2025