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Professional paper

THE BENEFITS OF HOMEWORK IN THE SUBJECT OF MATHEMATICS

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Abstract

Homework is just as important as classroom work, so it must be well thought out and applicable, because only in that way will it help the student to independently summarize their conclusions. Through homework in the subject of mathematics, teachers gain insight into the level of mastery of the material by the students, which enables them to properly guide the students and provide appropriate feedback. Homework is also a great opportunity for families to learn more about their children's school life and allows parents to witness their children's journey toward independence. This study aims to explore the planning and structuring of mathematics homework, through which the previously intended objectives are achieved. The research was conducted between January and March 2025. The instrument used was an online questionnaire. This questionnaire was completed by 96 primary school teachers in the Republic of North Macedonia. After data collection and organization, the information was processed using SPSS. The questionnaire used has a reliability coefficient of 0.847 (Cronbach's alpha). The results showed that if homework is interesting, it stimulates students' imagination and creativity (Pearson coefficient ρ =0.550, p=0,000). When homework encourages creativity and imagination, it also promotes classroom discussions (Pearson coefficient 0.524, p=0,000). Additionally, the planning of homework during the preparation of learning content does not depend on the teacher's experience or the school's location ($\chi^2 = 20.041 < 26.296$ df = 16, $5.341 < 9.488$ df = 4).

Keywords: mathematics, homework planning, types of homework

Introduction

Homework plays an important role in the teaching process, especially when it comes to teaching mathematics in primary education. It not only serves to repeat the content covered in class, but is a means through which students develop independence, responsibility, perseverance, and learning habits. In addition, homework can encourage critical thinking, which is an important component of the process of independent learning from an early age.

Contemporary research suggests that consistently assigned and carefully structured homework can positively influence students' motivation, creativity, and problem-solving skills. Accordingly, homework should not be perceived merely as a routine obligation, but rather as a pedagogical instrument that fosters deeper comprehension of the instructional content and promotes a personalized approach to learning.

The modern pedagogical approach places increasing emphasis on the quality, not just the quantity of homework. This means that it should be carefully planned, adapted to the age, individual abilities and interests of students, as well as related to the objectives of the lesson. It is particularly important that homework represents a logical continuation of the activities of the previous lesson and provides space for self-checking, application of knowledge in new situations, as well as the opportunity for research.

This research aims to investigate teachers' perspectives on homework, including the objectives intended to be achieved through it, the preferred methods for completing assignments, and the approach to planning mathematics homework with respect to duration, frequency, and students' individual abilities.

Literature Review

Mastering the teaching content in mathematics involves systematic work both in class and at home. Achieving certain curriculum objectives necessitates not only class work but also additional engagement outside of the school environment. Consequently, homework becomes an essential element of the educational process.

The purpose of homework in mathematics is to encourage the development of independence and responsibility among students. For students in lower grades in primary education, homework is an opportunity to apply newly acquired knowledge. To this end, these tasks should not contain new concepts or terms that were not covered in class. For this reason, homework should be appropriately adapted to the abilities of students so that they can complete it independently, with minimal support from adults.

The teacher has an obligation to provide clear and precise instructions on what is expected of students when performing homework. He should find appropriate ways to connect the interests of students with the content that is practiced through homework. Sometimes it is advisable to include the students themselves in the process of creating tasks, that is, to suggest methods that are interesting to them for practicing certain mathematical knowledge and skills.

This approach is a simple but effective way to encourage the active participation of students in determining homework tasks, which leads to greater motivation and effort invested in their learning.

Appropriately set homework in mathematics enriches teaching, encourages students to have a creative and critical attitude towards reality, and contributes to establishing a balance between the knowledge acquired in classes and independent learning. They facilitate the incorporation of the student's personal experiences and insights with the knowledge acquired during the educational process.

The basic problem of today's education is its excessive reproducibility. Namely, knowledge is understood as accumulation, knowledge of facts, and repetition of data. Hence, the need to overcome this approach. This is also indicated by Jovan Đorđević, who believes that: "The characteristics of the new quality of education represent a transition from reproductive to productive education." (Đordević, 1987). By preparing homework, students learn and get used to working independently and on time, as well as to performing their duties as precisely and orderly as possible (Hong, Mason, & Peng, 2015).

When doing homework, students develop a sense of responsibility for their tasks. At the same time, an emotional attitude towards school obligations is created, expressed through the tasks that need to be performed, which manifests initiative and interest in completing the work. Consistency in checking work assignments is developed, and in parallel with this, independence and systematicity. It is precisely on these features that modern teaching today insists more than on the adoption of a quantum of knowledge transmitted by the teacher (Ratnesar, 1999).

The reasons for the ineffectiveness of homework assignments applied in teaching practice arise from the formal approach to their assignment, inadequate compliance with the psychophysical abilities of students, as well as from the informal habits of teachers who insufficiently systematically instruct students in the methods and techniques of independent work (Rosário et al., 2015). Through systematic observation of teaching practice, it has been determined that the procedures for assigning homework in teaching elementary mathematics are not in accordance with didactic requirements. Research on mathematics teaching shows homework is usually a continuation of classwork, mainly tied to textbooks, and seldom considers the specific needs of the class (Vatterott, 2017).

Disrespect for individual differences among students when assigning homework leads to a series of difficulties, which are reflected in superficial performance of obligations, loss of positive attitude towards school, and avoidance of obligations. Therefore, it is necessary to

strive to differentiate homework in accordance with students' abilities (Trautwein, Köller, Schmitz & Baumert, 2002).
Homework is not only an obligation to develop student independence, but is an indispensable condition for student independence and the realization of the basic characteristics of modern teaching. (Hong, Mason, & Peng, 2015).

Research methodology and results

Homework is a very important part of the teaching process in each subject, especially in the subject of mathematics. Homework extends classwork, fostering student independence and individual effort. In order to achieve all the goals of assigning homework, it must meet several criteria, which are included in the questionnaire used in this research. The questionnaire was compiled for the subject of mathematics based on the homework guide that was compiled by the Bureau for Educational Development in 2013. The online questionnaire was distributed by distributing the link to many primary schools with which we had contact, or by visiting the schools, and there we shared the link to the questionnaire with the person representing the school, who then distributed it to the lower cycle teachers. Through the questionnaire of this research, we managed to collect information about the attitude of teachers towards homework, the goals that teachers want to achieve through homework, and which homework-solving techniques they prefer. Also, through this questionnaire, we collected data, through which we want to show how didactic principles are respected when assigning homework in the subject of mathematics. Homework is often a topic of discussion among researchers, teachers, and parents. Therefore, this study also collected data on their planning by teachers regarding the duration of solving the assigned tasks, their variety, and the amount of homework according to their age and abilities. The questionnaire used in this study is reliable. We prove this by the Cronbach Alpha reliability coefficient, which has a value of 0.847. A total of 96 teachers of the lower cycle of primary education completed this questionnaire, of which 83 are female. This study was conducted during January - March 2025. According to the experience of the teachers participating in this study, 21.9% of them have experience up to 5 years, 16.7% up to 10 years, and 9.4% have work experience up to 15 years. 15.6% of the teachers have work experience of over 20 years, while 36.5% of the teachers participating in this research have work experience of over 20 years. The distribution of teachers according to the class where they teach is given in Table 1, presented below:

Table 1. Teachers, by the class they teach

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	First class	14	14,6	14,6	14,6
	Second class	20	20,8	20,8	35,4
	Third class	17	17,7	17,7	53,1
	Fourth class	22	22,9	22,9	76,0
	Fifth class	23	24,0	24,0	100,0
	Total	96	100,0	100,0	

The table shows that most teachers work in the fifth (24%) and fourth (22.9%) grades. Additionally, 40.6% of teachers are in urban schools, while the rest are in rural areas. This distinction is important due to the differing conditions and student backgrounds between these locations. The following questions pertain to mathematics homework engagement, with

answers rated on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). Table 2 highlights teacher involvement in assigning mathematics homework.

Table 2. Students' engagement with Math homework

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	5	5,2	5,2	5,2
	Rarely	12	12,5	12,5	17,7
	Sometimes	32	33,3	33,3	51,0
	Often	23	24,0	24,0	75,0
	Always	24	25,0	25,0	100,0
	Total	96	100,0	100,0	

The table shows that 25% of teachers always engage students with homework in mathematics, while 24% of teachers often engage students with homework. Only 5.2% of teachers do not engage their students with homework at all. These responses from teachers prompted us to see how students' engagement with homework varies according to the grade they attend and whether there is any dependence. We have concluded that there is no dependence between students' engagement with homework and the grade they attend because the coefficient $\chi^2 = 22,233 < 26,296, p = 0,136$ We also concluded that there is no relationship between school location and students' engagement with math homework $\chi^2 = 5,329 < 9,488, p = 0,255$.

When engaging students with homework, it is important for the teacher to take into account the age of the students, namely their abilities, since each student is an individual in his or her own right. We have presented this element in Table 3, as teachers take this into account when assigning homework in the subject of mathematics.

Table 3. Assigning Math homework according to students' age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	2,1	2,1	2,1
	Rarely	2	2,1	2,1	4,2
	Sometimes	10	10,4	10,4	14,6
	Often	15	15,6	15,6	30,2
	Always	67	69,8	69,8	100,0
	Total	96	100,0	100,0	

The table above shows that most teachers assign homework to students in mathematics, taking into account their age, or rather their abilities. This way of working does not depend on the teachers' work experience, as we have also statistically proven this $\chi^2 = 10,9 < 26,296, p = 0,816$.

On the other hand, after processing the data obtained, they show that students' engagement with homework by age depends on the grade they are in. $\chi^2 = 31,154 > 26,296, p = 0,013$ which further confirms the fact that we must be very careful when engaging students with homework in the subject of mathematics.

Mathematics is often burdened by the stereotype that it is inherently difficult, exclusive, and only accessible to those with a natural talent. To break this misconception, teachers can present math lessons engagingly and appealingly, inspiring students to continue exploring the subject through stimulating activities at home. In the questionnaire used in this study, we asked about

the level of interest in homework for the subject of mathematics. 73% of teachers stated that the tasks are always or often interesting. Only 2% of them stated that they are very rarely interested. We have statistically proven that giving interesting tasks to do at home does not depend on the class where the teachers teach because $\chi^2 = 11,966 < 21,026,\ p = 0,448$. This also does not depend on the experience of the teachers. $\chi^2 = 15,705 < 21,026,\ p = 0,205$. But, if homework is interesting, then it stimulates students' creativity and imagination (Pearson's coefficient $\rho = 0,550,\ p = 0,000$). Creativity is an essential skill for 21st-century citizens. To accomplish this, every field and subject must contribute in its own way. In our study, participating teachers expressed that planning homework in the subject of mathematics affects the development of students' creativity and imagination. Such tasks that stimulate the creativity and imagination of students also encourage discussions in the classroom, as evidenced by the Pearson correlation coefficient $\rho = 0,524,\ p = 0,000$. It is very important to plan the time for solving homework, because in this way we will have an overview of whether we have overloaded students with homework or, conversely, perhaps the students are not very engaged in their individual work at home. According to the homework planning guide, it is preferable for students to engage in solving homework according to the class they attend, namely, the period. In the first period (grades 1-3), 10-30 minutes per day are foreseen, while in the second period (4-6), 30-90 minutes per day. Table 4 presents an overview of the planning of the time for solving homework in the subject of mathematics.

Table 4. The overview of the planning for solving homework in the subject of mathematics per day

		10-30 min	30-90 min	
	I class	12	2	14
	II-class	17	3	20
	III-class	15	2	17
	IV-class	20	2	22
	V-class	15	8	23
Total		79	17	96

The table above shows that the engagement of students in the first period is according to the proposals of the guide, while the engagement of students in the second period through homework is lower than the proposal given by the guide. We do not know the reasons why teachers are determined to engage students with less homework. It is a practice that homework, whether from the subject of mathematics or from other subjects, is given according to the teaching content. This has also been the practice of nearly 88% of teachers who completed the questionnaire. The amount of homework that students engage with is part of the guide for planning homework, but also, from the data collected and processed, it is seen that nearly 85% of teachers plan the amount of homework. However, the amount of homework itself carries the time for solving homework, as well as its complexity. Sometimes we notice that even though the number of homework assignments is not large, the time planned for solving them is not enough due to their complexity.

The homework assignments that students are engaged with are selected tasks according to the learning content, which are from different mathematical fields. Each discipline, along with the integration of various areas of mathematics, demands dedicated effort. As a result, students become actively involved in homework that aligns with the specific content.

Planning homework according to the learning content is in correlation with planning the number of homework assignments $\rho = 0,616,\ p = 0,000$, which means that homework from different contents requires different student engagement, which affects the number of homework assignments. It is very important to note that when assigning homework, teachers should take

into account students' individual abilities. From the data collected and processed, this paper shows us that approximately 85% of teachers take into account students' individual abilities. If the opposite happens, then it may happen that students become demotivated both because of very easy assignments and because of very difficult assignments. The 21st century provides opportunities for quick access to various resources, which can also be used as resources for homework in the subject of mathematics, but in these cases, resources with instructions that the students can use to solve homework assignments should also be provided. 95% of the participating teachers take this into account and provide instructions for solving homework assignments.

Conclusion and recommendation

Homework is important because students develop basic skills that will serve them throughout their schooling and working lives. Improved grades, discipline, time management, resource utilization, and improved communication are vital life skills that will open doors to new opportunities and help children achieve career success (Bogin & Nguyen-Hoang, 2014).
Student work at home, i.e., the completion of various homework assignments, creates conditions for the student to independently consolidate the knowledge acquired in class and, based on this, to be able to apply it in new situations and when solving new tasks. From this perspective, homework is an integral part of the teaching, with which it is connected and complemented in terms of content (Kouzma & Kennedy, 2002).
As a result of our research on the benefits of homework in mathematics, we came to the following conclusions:

- Homework is a continuation of the student's work on the material developed at school in the subject of mathematics if it is planned properly.
- Homework affects the development of the student's independent work in the subject of mathematics.
- Homework is always planned according to the age of students in the subject of mathematics. However, the time for solving homework, as can be seen from the data obtained in the second period of education, is less than that given by the guide. We do not have data on the reasons for this decision of the teachers, perhaps this remains to be clarified in the future.
- If the tasks are planned in advance and are interesting, then they develop imagination, creativity, and stimulate discussions in the classroom.
- Planning homework during the preparation of teaching material does not depend on the teacher's experience or the location of the school.
- Homework is just as important as classwork, so it should be well thought out and planned, because that way it will help the student make decisions independently.

Based on these conclusions, we believe it is important to avoid the practice of assigning homework hastily—whether at the end or even in the middle of a lesson—without providing the necessary guidance that helps students understand how to approach the task. When homework is assigned regularly, it is crucial for teachers to show genuine interest in the circumstances under which students complete their assignments at home. Additionally, teachers should align homework tasks with learning objectives, students' abilities, and the classroom environment. Homework that students choose to complete willingly, rather than out of obligation, tends to have the greatest educational impact. Teaching and learning mathematics should be grounded in students' real-life experiences and connected to meaningful, practical situations. This approach helps students recognize the relevance and broad applicability of mathematics in everyday life.

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