

EVIDENCE ON HOMEWORK EFFICIENCY IN TIMSS MATHEMATICS ACHIEVEMENT

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Abstract: *The attitude regarding the time spent doing homework is varied in Europe. In some countries, the students finish quickly their recommended tasks, meanwhile in other countries, the process taking a longer time. The information taken from international databases show that supplementing the time for homework doesn't always bring better performance. The international comparison was made taking into consideration five assortments of students as follows: students without homework, students with a homework taking maximum fifteen minutes, students with homework taking between fifteen and thirty minutes, students with homework taking between half an hour and an hour, and students with homework taking longer than an hour. This comparison offered the occasion to analyse the Romanian student's performance in an European context in order to identify the important factors in making strategies oriented on improving results in mathematics, in primary school.*

Key words: *homework, primary school, TIMSS*

Introduction

This subject always had an important impact on extremely varied audiences, mobilizing an impressive collection of actors. Students, teachers, parents, grandparents, elder brothers and sisters, nannies, tutors and even institutions more or less sophisticated are advancing specific mentalities and attitudes using analysis patterns shaped by specific philosophies.

Internalising this reality lived so diversely by each category listed above is directed by the personalised importance given to each one of the immense quantity of variables taken into consideration. Of these, the most discussed is the time factor. Not only the concept of time has importance in this context, but the efficient use of this resource, time management.

Homework frequency

One of the important variables associated with this subject is homework frequency. (Dettmers, Trautwein & Ludtke, 2009; Farrow, Tymms & Henderson, 1999; Murillo & Martinez-Garrido, 2014; Rønning, 2010; Valle et al, 2015; Valle et al, 2016). There are authors that do not agree with the catchphrase: „More is better!” (Farrow, Tymms& Henderson, 1999) recommending high vigilance, especially regarding primary school. Moreover, they suggest important associations between low school grades and frequent homework.

In order to give an explanation to this connection we could introduce motivational variables into discussion. Some authors describe different motivational styles that influence differently the learning process (Valle et al, 2015). There are students with strong goals, oriented to multiple areas. Other students are focused single-mindedly on learning. The last category of students, has an attraction and is motivated to divergent areas just like the first category but with a lower intensity. Even if these three styles don't interact with the frequency of homework, the results in school and the time management is different in direct relation with the motivational styles.

In the study published the next year (Valle et al, 2016) are added significant details to this context. School grades are positively associated with the quantity of homework resolved; quantity of homework being related to time management regarding homework; time management is related to the type of approach regarding homework; the type of approach and all the other variables, excepting the time spent during doing homework, are related to student's motivation.

Rønning (2010) relates homework frequency with family's socio-economic level and with learning motivation. The more children come from disadvantaged backgrounds, the less they tend to spend time doing homework. They are less motivated to learn because their environment is not proper for learning. On the other head, a quantity too large of homework strongly diminishes the motivation, and directly affects grades in school. A lower quantity of homework would be more suitable for the children that are financially disadvantaged. These students learn much better during classes rather than at home. A long time spent doing homework could be a high frustration indicator on one hand but on the other hand, an expression of high goals for another category of students.

The effect caused by the economic variable is seen by Dettmers, Trautwein and Ludtke (2009) also. They report a positive association between the results in mathematics at the PISA evaluation and the quantity of time spent in doing homework. But when the socio-economic variable is taken into consideration, the effect decreases significantly.

Besides the fact that they keep the socio-economic variable, Murill and Martinez-Garrid (2014) refine the discussion regarding homework frequency

by introducing a new variable – valorising student’s homework. They focus on the fact that the quality or quantity check count less. What effects the most studying results is valorising homework. Based on research, these authors claim that homework must be incorporated in lesson dynamics, and the knowledge and abilities accumulated doing homework must be used during teaching the next lesson. An increase in homework frequency is recommended when the teacher uses homework to teach new concepts. In Latin America it is considered that homework duration must not be over half an hour a day during primary school.

Parents and homework

Another coordinate of homework focuses on parent's contribution in the homework solving process. (Cooper, Lindsay & Nye, 2000; Gonida, Cortina, 2014; Falch & Rønning, 2011; Farrell & Danby, 2012; Margolis, 2005; Rudman, 2014). From the beginning it was considered that parents can be strong allies for teachers in doing homework. It is suggested that parents should be taught how to help their children and that they must be won for collaboration (Margolis, 2015).

Cooper, Lindsay and Nye (2000) describe more dimensions of parent's implication regarding homework: autonomous support, direct implication and disturbance factor elimination. Research shows that two thirds of parents practice totally inappropriate methods of implication regarding homework. In these conditions, the question is raised if parent’s style and family characteristics could affect the efficiency of the help given to the students by their parents. Generally, the more parents help their children to acquire a higher autonomy level, the more they obtain higher scores in standardised tests. This high autonomy level is reached generally in higher grades, being obtained harder by the student coming from disadvantage families. The same research shows that student's attitude regarding homework is not related with parent's style and that students have a lower level of eliminating distractions when adults are not home, especially in case of lower grade children.

Other authors take types of involvement of parents in homework (Gonida & Cortina 2014): autonomous support, control, interference, cognitive engagement. The discussion is moved here to a subjective coordinate by introducing variables like: children's expectations, ideals orientation, opinion regarding children efficiency. Parent's types of involvement in homework are associated with different results at school. Parents that offer autonomous support have the capacity of leading students to having superior results.

Rudman (2014) accentuates the need for schools to research more this subject, and to insist on understanding student's motivation and parent's role with the purpose of conceiving proper strategies, in order to answer parent's

and children's expectations. It is believed that the absence of dialogue leads to absence of clarity regarding the creation of a unitary vision on the purpose of homework for children of the same age. Like other authors (Farrell & Danby, 2012), Rudman insists over the fact that this subject is not researched sufficiently. There is a diversity of opinions at international level, fueled by the fact that there are researchers who state that homework's effect varies according to the country the research is done in (Falch & Rønning, 2011).

Homework has a significant contribution in acquiring knowledge, skills and values. Literature describes four types of themes: practice themes, preparation themes, extension themes and creative themes (Heitzmann, 2007). They are true educational instruments, but to make the most out of these, a plan is mandatory. Homework organization plays an essential role in this vision, knowing the people involved and the role they will have being mandatory. The most important element, according to Hampshire, Butera and Hourcade (2014) is establishing routines. They must include: going through every homework before leaving school, gathering the material needed for students to do the homework before leaving school, organizing the space for homework, checking the personal agenda with the homework schedule for the day, checking the strategic plan, following homework routine, display the homework at school.

Examined studies have also particular aspects regarding homework. It is examined the alternative of help for doing homework through a phone call (Reich & Cooper, 2004) and also online homework (Dodson, 2014). There is evidence that shows an increase of performance when the student uses paper for homework. This explains why teachers still use this method. However, online homework maintains the performance of students in class.

Both internationally and nationally are trends of shifting to projects. It may be boring for children to do their daily homework (Stefan, 2015), but it becomes really interesting when they have to work at a project. It is underlined more and more the need of flexibility. For example it can be allowed doing homework in multiple stages.

The biggest need at the moment is enriching traditional methods of doing homework by introducing new modern variants that are capable to arouse contemporary children's interest, to involve creativity and to develop a critical thinking.

Time given to homework and the results obtained at TIMSS

In the year 2011, approximately 30 countries participated at TIMSS international evaluation (Trends in International Mathematics and Science Study). After participating at this evaluation, an international database has been created that includes detailed information regarding all fourth grade students (TIMSS evaluates eight grade students also, but this research was

limited to fourth grade students), that are approximately ten years old. This information contain scores obtained at the evaluation, data about school, family and country of origin. Data was gathered from 185475 students, 171098 parents, 6469 principals (Foy 2013).

In homework context, researching the link between time spent doing homework and performance at mathematics was considered important, at European level, using this database.

Figure 1 divides students with no homework, students who stated that finished their homework in maximum fifteen minutes, student that spend between sixteen and thirty minutes doing homework, students that spend between half an hour and an hour and students that spend more than an hour daily doing homework.

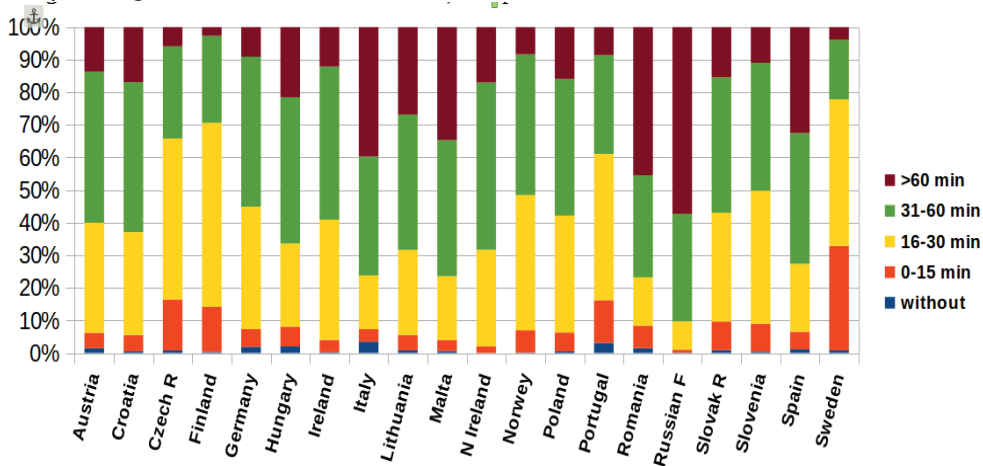


Figure1. Average scores at mathematics and time allocated to homework
Source: Personal presentation of the data from the TIMSS International Database 2011.

At a global analysis, it can be concluded that there is a small number of European students that report a lack of homework. Swedish students have the smallest amount of homework. Approximately a third of them spend less than fifteen minutes for doing it. Finnish students have a similar situation, having the smallest percent of students spending more than an hour doing homework (less than 3%) and the biggest percent of students that do their homework in maximum half an hour (56.5%).

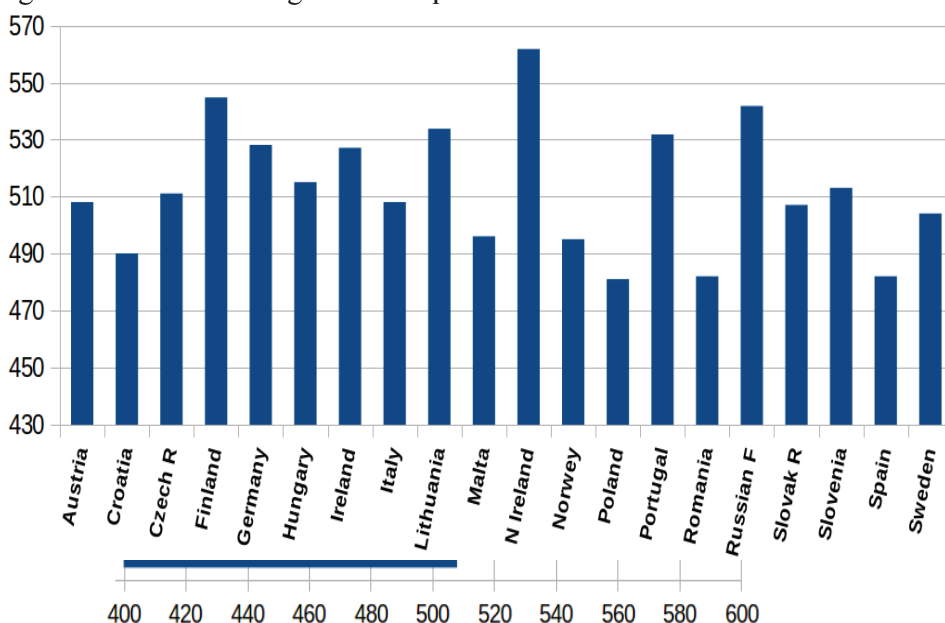
At the opposite pole are situated Russia, Romania and Italy, true champions of homework. In these countries, approximately half of their students spend more than half an hour doing homework. Russia's case being the most eloquent. Just one students out of one thousand declares that have no homework, nine of one thousand declare that they do their homework in

maximum fifteen minutes, 87 students out of one thousand spend half an hour doing homework, 33% one hour and more than half of students spend more than an hour doing homework. It is observed that the states from Eastern and Southern Europe prefer a longer homework, meanwhile Central, Western and Northern European countries are more relaxed regarding homework.

The most important question of this research is if the time spent doing homework influences directly TIMSS results. Through moderate case analysis on the data presented in Figure 2, in the context of Figure 1, we will find an answer to this question. The analysis will be presented in decreasing order of the TIMSS results, being selected a few representative states for each level. Romanian student's results will be then compared with the results of the students from the first three countries in European hierarchy.

As you can see, the highest scores were obtained by Northern Ireland. Out of the 3571 of students in this research, none of them stated that they don't have homework, a unique situation in the selected countries for this research. Just 2% finish their homework in less than fifteen minutes. The vast majority doing their homework between half an hour and an hour and just 17% declare that they need more than an hour for homework.

Figure 2. TIMSS averages in European States



Source: Personal presentation of the data obtained from the TIMSS International database, 2011

With an average score of 562, it is considered that they have a high score. The maximum score was reached by students that do their homework in maximum half an hour, 582.2, in the meantime students that do their homework in more than an hour, obtained lower scores 567.8. The conclusion would be that in Northern Ireland, the learning process is uniform during classes, students wouldn't need more than half an hour to consolidate and deepen their understanding. The ones that surpass this time, are the students with problems in learning, because they obtain lower scores even if they spend a longer time doing homework.

Figure 3. Comparing the averages obtained regarding the time spent doing homework

Source: Personal presentation of the data obtained from the TIMSS International database, 2011

The second country in this classification is Finland. Finnish educational system is well known as being one of the most efficient in the world. The average of this country is 545. To be noticed that less than 3% of the Finnish students spend more than an hour doing homework and only a quarter of the 4638 evaluated students need more than an hour for homework. The majority of students finish their homework in maximum half an hour. This category of students obtain the highest average of the country: 549.1. Like Northern Ireland, evidence show that Finnish students learn during class and don't need more than held an hour for doing homework.

Third in class, Russia, obtained 542 points, being the country where students work the most for their homework. More than 57% of the 4467 Russian students evaluated spend more than an hour doing homework. However the highest scores (546.7) were obtained by students that work at home between 30 to 60 minutes. Russian students need double the time for preparing at home to be be at the same level with their Finnish colleagues or students from Northern Ireland. It is possible that the teaching methods used by Russian teachers do not favour learning during classes, excepting a small amount of students. This could be the reason why students in Russia have to work double at home.

Romania is placed according to Figure 2, in the backward lot, along Poland and Spain. With a score average of 482, it is far away from the first in class, approximately 60 points. A definitive note of Romania students is the big difference between the results of the five analysed categories.

Out of the 4673 Romania students evaluated, approximately half of them need more than an hour for homework. This is the category that has the highest scores. The half of students that finish their homework in more than an hour obtain 504.9 and a third of Romanian students that finish their

homework in maximum an hour, have an average of 445.1, almost 7% of students that finish in approximately fifteen minutes have an average of 411.9 points (Figure 3). As a result Romanian students that do homework for more than an hour a day have approximately the same results as the Finnish or Russian students that do no homework at all! For Romania students. The saying "the more, the better!" seems to be true, because the longer the time to do homework is the better are the results at the international test, but this doesn't help them have the same results as their European colleagues.

Implications and conclusions

The data given by the International database with the results from the TIMSS (2011) evaluation regarding homework efficiency in Romania are alarming. Even if they put more effort than other European students, their scores aren't better, quite the opposite, they are far lower than students from other countries that spend far less time.

A possible cause could be the lack of unity between teaching and evaluation. The more the splitting is grater, the more the time necessary for consolidating information and for forming the necessary skills for continuation of the learning process is longer. Most of the schools still use the traditional method of learning where teaching has the biggest place during classes and learning is isolated during homework. In this case the time for doing homework is longer. A change in vision and trying to make it easier to learn during classes could help making the homework doing process more efficient.

The reluctance regarding the active participative methods in the teaching learning and evaluating process could be another important factor for the low scores obtained by the Romanian students, despite their supplementary efforts. The higher usage of the exposition methods that don't encourage students to involvement and don't have the gift of making the students active, increases the distance between teaching and learning, keeping the teacher in the centre of the activity, not the student, how it is accustomed in the modern teaching process. Student motivation in class, gaining his attention and his activation could encourage learning during class. In this way, homework would not concentrate on learning but applying the knowledge and the skills already acquired during class, developing creativity and critical thinking.

Overcrowded classrooms force teachers to apply more the traditional methods. He doesn't have the necessary time and space to offer each student an active role in the teaching process. Thus a big part of the activities that should take place during class must be done at home. AT this point, teachers depend on solutions that can be found at the system level.

Teachers don't have didactic materials varied enough in order to create significant teaching situations that could impress so strongly student's minds in order to motivate, ease and accelerate learning. Even if these resources would exist, teachers in Romania are too little stimulated and motivated to use them because this needs personal development and they are not professionally stimulated to continuously develop.

One of the biggest need at the moment is investment in the didactic personal. Increasing the preparation quality would call for increasing the teaching experience quality in school. It is important that the time doing homework not be spent learning, a process that should have taken place during class. The time given to homework should have as an objective developing creativity and critical thinking, encouraging developing free initiative through varied projects and interdisciplinary activities.

The Romanian student is perfectly capable of evolving as well as all his European colleagues. It is important that homework time not to be busy with boring tedious tasks, but with challenges that could develop his entire personality, that could satisfy his innate curiosity and motivate him. Only this kind of homework would be efficient despite the short working time and would bring the long expected results.

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