

## Parental Influence on Students' Achievement: Findings from TIMSS 2003 in Serbia

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### *Abstract*

There are conclusions of many authors who studied parental influence on student achievement and educational aspiration that there is significant influence in the domain. These conclusions and essential characteristics of parental influence on students' achievement in mathematics and science obtained from the TIMSS 2003 in Serbia are the main topics of the study. The objectives of this study are to determine correlations between: (1) parental level of education and achievement of Serbian eighth grade students in mathematics and science; (2) parental support to teaching and learning mathematics and science and students' achievement in mathematics and science; and (3) students' educational aspiration and their achievement in mathematics and science. The hypotheses established accordingly to these objectives are confirmed in the research. General conclusion, based on the findings, is that there is significant correlation between parental influence and students' achievement in mathematics and science, in all areas of the research. Moreover, it also can be concluded that this kind of influence is very complex, with many specific characteristics that cannot be easily separated and explored, independently from its complexity.

**Keywords:** TIMSS 2003, contextual factor, parental influence, student achievement, mathematics, science.

### 1. Introduction

Parental influence on their children educational achievement and educational aspirations represents one of very important factors in children growth and development. The influence of parents on their children from early years in childhood, intentionally conceptualized and/or spontaneous, should form a base for all later institutional educational activities, in pre-school and school period. When characteristics of parental influence are a topic of discussing and exploring, some important questions have to be asked, such as following: What are the essentials of parental influence on students' achievement? What are the main ways of influencing? How to separate methodologically parental influence on students' achievement from other factors of influence, which family life consist of? How to determine and evaluate appropriately elements of parental influence on students' achievement?

There are many factors of influence on students' achievement in different school subjects that come from the family. Generally, students' achievement is mostly determined by these factors. Some of them have more direct influence on students' achievement and the others have mostly non-direct, secondary influence. For instance, we may suppose that having of separate

space for learning at home, computer and Internet access, can directly improve students' achievement. The factors may be defined as technical support for students' learning at home. On the other hand, parents' annual income may be mostly considered as a non-direct factor of influence. Despite of its generality, this is also a factor of influence on students' achievement. It is difficult to separate some of these factors from others and explore their influence independently from the general context of family life and its system of factors influencing students' achievement in any field of teaching and learning.

Different factors in the domain of parental influence on students' achievement are the topics of the research interests in many studies, and the importance of parental influence on students' achievement is confirmed. For instance, there are several studies of single-parent and two-parent families' influence which are a proper evidence for the relationship between the family structure and students' achievement. Cherian and Malehase (2004) confirmed that children from single-parent families showed lower achievement and displayed more discipline problems than did their peers from two-parent families.

In the study on influences and motivations of students' career choices (Kniveton, 2004), there was a question formulated as: "Who was most influential in helping you select the job/follow the career path you are aiming for?" Rank order of students' responses to the question shows that mother (calculated index 2.24) and father (2.21) are the most influential. On the bottom of the rank are, as the least influential, brother (0.39) and sister (0.33). These ranks of influence immediately shows that parents' influence is the most significant for students' career choices. Moreover, it has to be emphasized that there are some differences between students' and their parents' views and attitudes towards the nature and features of this influence.

An intermediary factor in parents-child relationship is a child values' system developed under crucial influence of his/her parents. From the early childhood, there are different influences, coming from social agents, such as peer influence, mass-media, and adults in general. However, parental influence is and should be crucial one. The child system of values consists of different beliefs and attitudes, created and formatted through different kinds of interaction between child and external world, prior to all, through interaction with parents, family members and peers. Process of development of this value system stretches from early childhood to adolescence, to the period in which parental influence is less than in childhood. Although students' beliefs and attitudes are largely formed and shaped in the period of adolescence, the period before is still under the great influence of parents. The extent and quality of parental influence mostly depend on *how much time* they spend with their children and *how* they spend it. This is the particular domain of researchers' common interests and in this study as well.

The value system, which is transferred from parents to children, is linked with the concept which some authors considered as "parenting style" (Baumrind, 1991, 2005; Smetana, 1995). The construct of parenting style is used to define the variations of parents' attempts to control and socialize their children. There are three parenting configurations (styles) that are proposed from Baumrind previous pilot study (2005): *authoritative*, *authoritarian* and *permissive*. The author claims that parental influence on children occurs in accordance to these parenting configurations (styles). Following the definition of parenting style, it may be considered that the parenting style is founded on the parents' value system.

The role of parents is of primary importance and it is unchangeable, in the process of the child value system formation. Parents initialize the system of values in their children and give primary orientations in its development, transferring their own standpoints, as some kind of self-projection. The child system of values "should be" developed on such a way how parents imagine and conceptualized it. In many cases, parental influence is not enough structured and stable, without strong aims and intentions, and, in fact, it is rather spontaneous influence. Parents are very different in their parenting styles and in other family characteristics, which influence their

children. Also, parents are very different in giving answer how to grow and to educate their children. Many of parents don't possess adequate knowledge and skills in this area, and they rely on their personal (often based on experience) attitudes and beliefs about family educational influence.

Students' attitudes towards school activities, teaching and learning, as well as towards overall importance of education, are based on and are a constituent part of their system of values. The attitudes come from parents' forming of children attitudes towards teaching and learning, as well as towards educational aspirations, and some authors conceptualized it as "attitudinal influence" (Bartram, 2006). Parents influence their children education, including their educational aspirations, through general influence on children system of values. Gouvias and Vitsilakis-Soroniatis (2005) determined in their study of the degree to which *students' aspirations* (educational and occupational) are linked or affected by their family characteristics (for example, *parental occupation*). This cross-sectional study included students of primary and secondary education (ages 7–18), from the Dodecanese region. On the base of study results, they concluded that differences in students' intentions to reach a higher education degree, to pursue courses for high-income jobs and high status professions, and/or display aspirations for occupying such professions after completion of tertiary education, can be, in large extent, explained by parental characteristics, such as education and occupation, family socio-economic characteristics (income, place of residence, minority status) and rearing practices.

Another key question about parental influence on students' achievement may be addressed to the way how parental influence functions in some separate segments. This question is formulated, for example, by Collins (2006). Presenting several studies of parental influence on students' psychosocial behavior, the author emphasized the fact that findings he reported in his study not only enhance the evidence that parental influence is significant, but strengthen the basis for extending such studies to the relatively neglected questions of *how* and *under what conditions* influences occur. The author's argument from these findings clarifies that components of parenting vary in their contributions to the likelihood of particular outcomes. It opens the door to specific tests of hypotheses about the nature of parental control. A broad specter of parental influencing factors quests for finding appropriate answers conducting various researches in the field.

## 2. Research objectives

Based on the considered theoretical standpoints and previous studies on parental influence on students' achievement, the objectives and hypotheses of this research<sup>1</sup> are conceptualized, in order to make the study more accurate and bring some stronger conclusions in the area. This research refers to the following objectives and tests the following hypotheses:

(1) *Exploring connection between parents' level of education and students' achievement in mathematics and science.* It is supposed that parents' level of education is significantly correlated with students' achievement in mathematics and science. This is a general assumption, based on the previous research evidences on direct or non-direct elements of influence, and based on the fact that students' achievement in mathematics and science depends on broader parents' influence on the process of forming system of values and beliefs in their children. Parents' level of education is connected with students' educational aspiration, supposing that higher level of parents' education implies higher level of students' educational aspirations. That fact is likely highly connected with parents' expectations on their children educational aspirations. In some cases, parent level of education is a direct aim of student educational/academic aspiration, the aim that he/she usually wants to achieve through

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<sup>1</sup> Generally, this research is based on data collected from the TIMSS 2003 in Serbia.

institutionalized process of education. More specific and indirect influence of that higher level of parent education goes with higher level of students' achievement in mathematics and science.

*The hypothesis is that students' achievement in mathematics and science is highly connected with parents' level of education and there is a significant correlation between these variables.*

(2) *Exploring connection between parents' support for teaching and learning mathematics and science, and students' achievement in mathematics and science.* Parents' support for teaching and learning mathematics and science may be connected with their general attitudes towards common and specific values of education and academic aspiration expected to be formed and developed in their children. It is supposed that if there is stronger parents' support for teaching and learning mathematics and science, then better students' achievement may be expected in the fields. It is also a part of appropriate climate in family, as general context for learning mathematics and science, what should produce more successful results and more qualitative educational outcomes.

*The hypothesis is that students' achievement in mathematics and science is highly connected with parents' support for teaching and learning mathematics and science and there is a significant correlation between these variables.*

(3) *Exploring connection between students' educational/academic aspirations and their achievement in mathematics and science.* Students' educational aspirations are connected with their parents' educational expectations and are often directly formed on the base of parents' influence. The questions in the domain are the following: How strong is the influence of parents' level of education on their children educational aspirations? And, is this the main factor of influence in the domain? Answers at these questions enable to understand properly the base of students' educational/academic aspirations. Parents make great influence on their children's attitudes' formation and on the development of their entire system of values. In the sense, these values are of great importance for influencing the area of students' level of educational aspirations, regarding the level of schooling which students expect and intend to reach. As a consequence of these different factors of influences, students often view their parents as a desirable model (role model), especially in the domain of educational aspiration. In other words, it could be supposed that students want to finish at least the same level of school, which is done by their parents. It may also be supposed that students with higher educational aspirations achieve better results in mathematics and science than students with lower educational aspirations.

*The hypothesis is that students' achievement in mathematics and science is highly connected with their educational aspirations and, consequently, with parents' level of education, and thus there is a significant correlation between the variables of students' achievement and students' educational aspirations.*

These three areas of the research reflect a part of parental influence on students' achievement. Each of the defined study objectives and explored areas belong to the TIMSS 2003 contextual areas of "classroom activities and characteristics" and "students", the areas which are conceptualized within the TIMSS 2003 assessment frameworks (Mullis *et al.*, 2003).

### 3. Methodology

The multistage cluster sample model for the TIMSS 2003 in Serbia included 149 primary schools, proportionally selected by cluster model of sampling from each of the stratified region. The schools near the Kosovo region, special education schools and very small schools are excluded from target population of schools. An explicit stratification was not made but there was implicit stratification by the region (Central Serbia, Belgrade and Vojvodina) and by urban-rural

criterion. Based on these criteria, there were a total of six implicit strata. After all kinds of the applied exclusions, the Serbian sample was represented by 4296 eighth grade students, 2206 boys, or 51.35%, and 2090 girls, or 48.65%. The mean age of tested eighth grade students in Serbia was 14.9 years. The sample of school directors consisted of 149 persons. There are also samples of mathematics teachers (177), biology teachers (175), physics teachers (176), chemistry teachers (175), and geography teachers (176).

In our study some statistical procedures were applied and measures were obtained, in the purpose of exploring some characteristics of the quantitative and qualitative dependences between chosen variables analyzed in the research. We had connected variables from BCG file (school questionnaire, for directors), BSG file (eighth grade students' questionnaire), BTM file (mathematics teachers' questionnaire), BTS file (science teachers' questionnaire) and BSA file (eighth grade students' achievement data). Merging of files were done using student-teacher linkage files (BST). The statistical procedures and measures were also applied in order to make proper statistical descriptions and characteristics of the groups of school directors and eighth grade students. Consequently, it means that we have included TIMSS mean scale scores and per cent measure. All estimations of students' achievement in the mathematics and science are made by calculating with the "1<sup>st</sup> mathematics plausible value" and "1<sup>st</sup> science plausible value", which exist for each student in student achievement file, as well as in the files merged using student-teacher linkage files. DPC IDB Analyzer software was used in carrying out each of defined analysis in the research. Using of this software is associated with the SPSS software, and both accompanied enabled appropriate approach to the TIMSS International Data Base.

### 3.1 The TIMSS 2003 results in Serbia<sup>2</sup>

Serbian eighth graders attained results in mathematics, which are somewhat above the average international scale score achievement (Antonijević & Janjetović, 2005). Compared with the international scale, we can see that the Serbian average scale score is 477 points (24<sup>th</sup> rank on the international scale), the same average international score is 467 points, and the best scores belong to Singapore (605 points, SE 3.6), Republic of Korea (589 points, SE 2.2), Hong Kong (Special Administrative Region – SAR) (586 points, SE 3.3), etc (Mullis *et al.*, 2004). Serbian students attained results in the science areas which are somewhat below the average international achievement. Compared with the international scale, we can see that the Serbian average scale score is 468 points (SE 2.5, 28<sup>th</sup> rank on the international scale). The same average international score is 474 points (SE 0.6), and the best scores belong to Singapore (578, SE 4.3), Chinese Taipei (571, SE 3.5), Republic of Korea (558, SE 1.6), and Hong Kong (Special Administrative Region – SAR) (556, SE 3.0), etc (Martin *et al.*, 2004).

Students' achievement at each level of schooling depends of common and specific conditions for teaching and learning mathematics and science. For better understanding of students' educational achievement it is needed to explore the main characteristics of context in which achievement has occurred. It is considered in the TIMSS 2003 in the following way: "For fuller appreciation of what the TIMSS achievement results mean and how they may be used to

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<sup>2</sup> The TIMSS 2003 (Trends in International Mathematics and Science Study) is the third circle in continuing of an international assessment of fourth and eighth grade students in the fields of mathematics and science teaching, as well as their achievement dependence of the mathematics and science curricula contents, school context for teaching and learning and home context for learning. This paper is based on the secondary analyses of collected data, obtained from TIMSS 2003 assessment of the Serbian eighth grade students' sample. Basic and essential results from secondary analyses were previously presented in the book TIMSS 2003 u Srbiji (TIMSS 2003 in Serbia), published by the Institute for Educational Research (Antonijević i Janjetović, 2005).

improve students learning in mathematics and science, it is important to understand the contexts in which students learn” (Mullis *et al.*, 2003).

The TIMSS 2003 assessment frameworks define structure and content of contextual areas, in which students' achievement has occurred. The achievement context is separated in the following areas: *curriculum, schools, teachers and their preparation, classroom activities and characteristics*, and *students* (Mullis *et al.*, 2003). In this research we deal with some variables set in last two contextual areas: “classroom activities and characteristics” and “students”.

#### 4. Parents' level of education and students' achievement

Discussing different factors influencing students' achievement, the question about essence of parental level of education and its influence on students' achievement is emerging. This kind of parental influence may be recognized as indirect one. Influences from mother and father in family are much more complex and it is difficult to explore them separately. Parents' highest level of education is viewed in the TIMSS 2003 assessment framework as one of important general factors, which affects students' overall mathematics and science achievement to a great extent, and it is confirmed that students' achievement depends on this kind of influence (Mullis *et al.*, 2004; Martin *et al.*, 2004). This correlation is appeared in the Serbian eighth grade students' sample as well.

Table 1. Mothers' level of education and students' achievement

ISCED levels	Per cent of students	Math	Science
Did not finish ISCED1 or did not go to school	0.31	384.56	392.27
ISCED1	1.78	431.80	426.19
ISCED2	13.76	433.34	426.36
ISCED3	6.22	484.39	474.46
ISCED4	45.54	483.08	472.06
ISCED5B	14.23	495.60	484.50
ISCED5A first degree	10.55	532.35	513.90
Beyond ISCED5A first degree	1.91	556.11	541.27
I do not know	5.69	428.57	428.78
TOTAL	100	480.37	469.90

Note: ISCED1 – fourth grade of primary school, ISCED2 – eighth grade of primary school, ISCED3 – secondary vocational school, ISCED4 - gymnasium, ISCED5B – higher school, ISCED5A first degree – faculty.

The data on percentages across categories of student parents' schooling levels, mothers and fathers respectively, and their children's achievement in mathematics and science, are given in the tables 1 and 2. Students' achievement results are given in the format of the TIMSS mean scale score points, the format of average achievement which enables several types of students' achievement comparisons, nationally and internationally.

Table 2. Fathers' level of education and students' achievement

ISCED levels	Per cent of students	Math	Science
Did not finish ISCED1 or did not go to school	0.35	376.95	349.91
ISCED1	1.59	420.35	423.69
ISCED2	9.88	435.87	423.85
ISCED3	3.98	500.42	486.36
ISCED4	47.71	477.33	468.33
ISCED5B	13.50	488.72	474.09
ISCED5A first degree	13.20	532.48	514.88
Beyond ISCED5A first degree	2.54	531.20	517.19
I do not know	7.26	437.84	442.80
TOTAL	100	480.23	469.86

Note: ISCED1 – fourth grade of primary school, ISCED2 – eighth grade of primary school, ISCED3 – secondary vocational school, ISCED4 - gymnasium, ISCED5B – higher school, ISCED5A first degree – faculty.

It can be seen from the tables that the highest percentages belong to the categories of “gymnasia”, “high school” and “faculty”, total sum is 70.32% for mothers and 74.41% for fathers. It can also be seen that we have regular increase of students' achievement in the Serbian sample, both in mathematics and science, across defined categories of educational levels. This is especially significant for students' mathematics achievement, both for mothers' “faculty” category (532.35) and fathers' “faculty” category (532.48). The facts implies conclusion that mother and father educational level represent important general factor influencing students' achievement in mathematics and science and there is strong connection between these two variables. This general conclusion, drawn from analysis of the TIMSS 2003 data, doesn't allow deeper exploration of the nature and main characteristics of the parents' influence and further specific conclusions in the domain.

##### 5. Parental support for student achievement

The role of parental support for students' achievement is very important and also has some very complex structure and particular features. Parents make different influences towards formation of children's system of values and their educational aspiration and motivation for learning. Parents also direct their children's actions and their senses, towards achieving children's educational goals.

In the School Questionnaire the item 7 is formulated in a way which enables to explore some of the phenomena present in school environment. It is formulated by the question: “How would you characterize each of the following within your school?” One of the variables is devoted to explore school directors' opinion about “parental support for student achievement”. This variable is oriented to gather generally oriented data about the issue and to make global picture about level of parental support for students' achievement. The formulation of the variable is not completely clear, because of the fact that parental support is not specified enough and defined clearly, and those who answered on it maybe won't completely understand what “parental support” should really mean.



Table 3. Parental support for student achievement

Levels of support	Per cent of school directors	Mathematics	Science
Very high	0.75	551.18	508.04
High	14.69	498.16	484.66
Medium	58.82	476.80	468.89
Low	24.64	469.53	456.61
Very low	1.11	450.01	443.13
TOTAL	100	478.40	468.18

As it can be seen from the Table 3, it is obvious that students' achievement in mathematics and science is higher when there is reported higher presence of parental support for students' achievement. Despite the fact that the notion "parental support" was not precisely defined, there is a regular increase of students' achievement in mathematics and science across the categories of parental support levels. Moreover, it is supposed that variable of parental support is highly correlated with parents' educational level. Unfortunately, it is not possible to calculate it in the TIMSS 2003 data system. Based on the fact that increasing of students' achievement is very regular, the variable of parental support may have good achievement predictability.

#### 6. Students' level of educational aspiration and their achievement

In the students' questionnaire there is the question devoted to explore students' level of educational aspiration, formulated as following: "How far in school do you expect to go?" Results of students' answers on this question are given in the Table 4, also including students' achievement across categories of schooling level they expect to finish. This variable is included in the study based on the fact that students' level of educational aspiration is also may be connected, directly or indirectly, with the degree of parental education, with regard to the parental influence in child education. This relationship is also analyzed within the Serbian TIMSS 2003 sample.

Table 4. Students' level of educational aspiration and their achievement

ISCED levels	N	Math	Science
Finish ISCED 3	2.80	489.97	480.23
Finish ISCED 4	28.45	428.24	430.66
Finish ISCED 5B	16.61	464.33	448.68
Finish ISCED 5A first degree	31.93	528.71	507.34
Beyond ISCED 5A first degree	9.98	547.66	529.53
I do not know	10.22	424.92	429.67
TOTAL	100	479.63	469.30

Note: ISCED3 – secondary vocational school, ISCED4 - gymnasium, ISCED5B – higher school, ISCED5A first degree – faculty.

It can be seen from previous table that small per cent of students (2.8%) choose secondary vocational school (3-year secondary school in Serbian educational system), and almost 32% of students choose faculty, as their targeted educational levels. These are significant indexes of eighth grade students' educational aspirations in Serbia. Excluding the first chosen category of secondary vocational school, due to the fact of low per cent of students in this category, we can see



regular increase of students' achievement in mathematics and science, across other chosen categories of educational levels, as the consequence of students' educational aspirations' increase. These results show significant correlation between these two variables. The variable of students' educational aspirations has good degree of achievement predictability.

## 7. Conclusion

Complex context in which students' achievement occurs is very important for deeper understanding of the nature and main characteristics of student cognitive abilities and skills development, and structure and depth of his/her attained knowledge. For improving teaching and learning in school it is important to understand complex structure of influence of some contextual factors. Parental influence appears to be very important one, between other contextual influences, and that fact is emphasized in many studies in the domain.

General conclusion is that there is stable connection between parental influence and students' achievement in mathematics and science, in all three areas of the research: parental education, parental support and students' educational aspirations. All hypotheses formulated in the study are confirmed. As the data obtained from the TIMSS 2003 Serbian eighth grade students' sample show, parental level of education really affects students' achievement in mathematics and science. A significant correlation is confirmed between these two variables. Furthermore, the results show that the role of parental support to children's achievement is very important and students' achievement is higher if parental support is emphasized. And finally, there is a significant correlation between students' educational aspirations and their achievement in mathematics and science, due to the fact that higher level of educational aspiration leads to higher students' achievement in mathematics and science.

At the end, it also can be concluded that this kind of influence on students' achievement is very complex, followed by many specific characteristics that cannot be easily separated and explored independently from their complexity.

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