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School participation, Family support, Performance in Mathematics: The case of Mexico in PISA (2012)

Participación escolar, apoyo familiar y desempeño en Matemáticas: El caso de México en PISA (2012)

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Abstract

The purpose of the work is to understand 1) the multidimensional structure and the validity of two convergent and divergent constructs: parental participation in school, and parental support for learning in the home and 2) the relationship between these two constructs to the performance of students in mathematics. The study was conducted with Mexican PISA databases (2012); specifically, with the answers of 33,806 parents to 18 questions in familial questionnaires, as well as with their children´s scores in mathematics. To achieve this objective two types of analysis were conducted: exploratory and confirmatory factor analysis of the responses of the parents 2) Confirmatory Factorial Analysis of Trajectories with the answers of the parents as independent variable and the mathematics scores of their children as the dependent variable. The results show that the first construct is composed of three dimensions and that the second of two constructs, together they have a load factor that explains the 10% of variance in student mathematics performance.

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Familial support; Parental participation; Mathematics; PISA; Mexico.

Resumen

Este trabajo tuvo el propósito de conocer: 1) la estructura multidimensional y la validez convergente y divergente de dos constructos: Participación de los padres en la escuela, y Apoyo de los padres para el aprendizaje en el hogar y 2) la relación que tienen estos dos constructos con el desempeño de los estudiantes en matemáticas. El estudio se realizó con las bases de datos mexicana de PISA (2012); específicamente, con las respuestas de 33,806 padres de familia a 18 preguntas de los cuestionarios de familia, así como con las puntuaciones de matemáticas de sus hijos. Para lograr este objetivo se realizaron dos tipos de análisis: 1) Análisis factoriales exploratorios y confirmatorios de las respuestas de las padres de familia y 2) Análisis Factoriales Confirmatorios de Trayectorias con las respuestas de los padres, como variables independientes y los resultados en matemáticas de sus hijos como variable dependiente. Los resultados muestran que el primer constructo se compone de tres dimensiones y que el segundo de dos, los que en conjunto tienen una carga una carga factorial que explica el 10% de la varianza en el rendimiento de matemáticas de los estudiantes.

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Large scale educational attainment studies have a dual purpose. On one hand, to know what are the levels and types of learning that students have to reach when they conclude different grades or reach a certain age, and to know how learning is distributed between different school populations in a country or region. On the other hand, the aforementioned

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studies also aim at explaining the reasons or causes for differences observed in educational attainment and thence be able to make recommendations to improve those conditions that can impact students' learning.

Hence, national and international studies on educational attainment use two types of evaluation tools. Some to measure cognitive abilities, such as school competence, and the others to investigate and assess aspects of the students' context that positively or negatively relate with educational attainment. Usually, learning tests aim to measure few cognitive constructs, are built with a great quantity of assessment items, and are developed with rigorous procedures to secure the validity of the results. In contrast, context questionnaires aim to measure a large number and diversity of constructs, have a smaller number of items (for every construct), and are developed with less methodological rigour; these conditions make it necessary to investigate the validity and relevance of context variables that are used to explain their relation with educational attainment.

González-Pienda (2003) pointed out that context factors related to learning may be organized in two large groups: 1) personal factors or variables (such as cognitive strategies, motivation to study, intellectual capacity) and 2) contextual factors (such as family, social and institutional conditions). Furthermore, Brunner and Elacqua (2004) distinguish between factors of family context and factors of school context; additionally, they suggest that school factors have a greater weight in developing countries, while family factors have greater influence on learning in industrial countries.

For Cornejo and Redondo (2007) context factors outside the school are divided into two groups: those of the home and family environment, and those related to the community where the student lives; in turn, the former are grouped in structural and non-structural factors. Structural factors are, among others: the family's socioeconomic level, the level of education of the parents, diet and health conditions, educational resources at home and parents' reading habits. Additionally, the following may be considered among non-structural family factors: education and job expectations of the family with regard to their children; emotional atmosphere at home, parents' social and education practices, family involvement in school activities, and parents' support at home with children's homework and studies.

Because of the significance that non-structural factors in the family environment have in students' learning, and because they may be modified, by enlarge context questionnaires in most studies about learning include groups of items that seek measuring these factors. Such is the case of PLANEA's national assessments (National Plan for the Evaluation of Learning), used by INEE (National Institute for the Evaluation of Education), and PISA's international study (Programme for International Student Assessment), coordinated by the OECD (Organization for Economic Cooperation and Development).

The study of non-structural family factors and their relation with academic achievement has been the object of several investigations in Mexico (reference: Bazán, Sánchez y Castañeda, 2007; Backhoff, 2011; Backhoff, Bouzas, Hernández y García, 2007; Blanco, 2008; Carvallo, 2005; Contreras, Rodríguez, Caso, Díaz, & Urias, 2012; Murillo, 2010; Rodríguez, Contreras, Díaz, & Contreras, 2012; Salazar-Elena, 2013; Sánchez & Andrade, 2013). However, there is little consistency in these studies, both in the way they name variables in the family environment and in their construction. Also, it is common for these factors to be "accepted as right" and no valid studies are conducted prior to relating them with learning results (De la Orden & Jornet, 2012; González & Backhoff, 2010; Jornet, González-Such, & Perales, 2012).

Similarly, family support, defined as actions to accompany, supervise and reinforce children's learning, has different effects on attainment indicators, for example, when

stundets' perception is taken into account, generally negative relationships are found, relationships that are significant in different assessment systems and in several countries, and the same occurs when professors and principals are investigated with respect to parental support and the family learning environment, or when parents' self-assessment is required regarding the support they provide to their children for learning at home (Bazán & Castellanos, 2015; Bazán, Castellanos, & López, 2010; Bean, Bush, McKenry, & Wilson, 2003; Carvallo, Caso, & Contreras, 2007; Chen, 2005; Kotte, Lietz, & Martínez, 2005).

Regarding parental participation or involvement in school activities, Jeynes (2005), based on a meta-analysis study, reported that in average the size of the effect that family involvement has on academic achievement is around 0.21, in different contexts. Similarly, Valdés and Yáñez (2013) found that schools whose students have higher performance in the test ENLACE, characteristically implement activities that promote strategies whereby parents participate in learning supervision and are involved in decision-making that affects students' learning.

On the other hand, the PISA study is intended to evaluate in different countries the skills acquired by 15-year-old students in three fundamental domains: Mathematics, Science, and Reading. The three academic domains are assessed every three years and in every occasion emphasis is placed in each one of them; in the 2012 application, emphasis was placed on the area of mathematics. Similarly, the PISA study also evaluates different context variables that, in theory, are associated with academic achievement, two of which are of interest to this investigation: 1) participation of parents in school activities and 2) support given by parents to children's learning at home. The information provided by these questionnaires are of help to learn whether questions are well formulated and whether they belong or not to the constructs that they supposedly are part of; similarly, they help to tell whether they relate with student academic achievement. Given that Mexico participated in PISA (2012) and chose to use the family questionnaire (Flores & Díaz, 2013; INEE, 2013; OECD, 2012), databases are available to research the matter.

Consequently, this investigation had two objectives, focused in the case of Mexico. The first was to find out what is the composition and structure of the two constructs of interest *(support given by parents to their children towards learning* and *participation or involvement of parents in school activities)*, and to analyze the validity of both constructs. A second objective was to know to what extent these family constructs are related to the results students obtain in mathematics.

Method

Mexico's database of the PISA study (2012) was analysed; the database contains both the scores of the students in mathematics (and the other domains), as well as the answers of the parents to context questionnaires (approximately, 33,800 cases). Specifically, two sections of this questionnaire were of interest to our analysis.

On the one hand, a section of the parents questionnaire that was of interest is question PA10, that refers to the "Participation of parents in the school," which includes eleven items (see table 1) where parents answer the generic question "During the last academic year, have you participated in any of the following school-related activities?" The eleven items were answered in dichotomous form (Yes = 1, No = 0).

Table 1. Items of construct: Parental participation in school

Identifier	Question: During the last academic year, have you participated in any of the following school-related activities?
PA10Q**01**	Discussed my child's behaviour with a teacher on my own initiative.
PA10Q**02**	Discussed my child's behaviour on the initiative of one of his/her teachers.
PA10Q**03**	Volunteered in physical activities, e.g. building maintenance, carpentry, gardening or yard work.
PA10Q**04**	Volunteered in extra-curricular activities, e.g. book club, school play, sports, field trip.
PA10Q**05**	Volunteered in the school library or media centre.
PA10Q**06**	Assisted a teacher in the school.
PA10Q**07**	Appeared as a guest speaker.
PA10Q**08**	Participated in local school government, e.g. parent council or school management committee.
PA10Q**09**	Discussed my child's progress with a teacher on my own initiative.
PA10Q**10**	Discussed my child's progress on the initiative of one of their teachers.
PA10Q**11**	Volunteered in the school canteen.

Question PA13 was of interest and refers to "parental support for learning in the home", which includes seven items (see table 2) that answer the question: How often do you or someone else in your home do the following things with your child? The seven items are answered by the following Likert scale: "Never or hardly ever", "Once or twice a year", "Once or twice a month", "Once or twice a week", and "Every day or almost every day". Every option is encoded with a numeric value where the first option has a value of 1 and the last a value of 5.

Tabla 2. Items of construct *Parents' support to learning at home*

Identifier	Question: How often do you or someone else in your home do the following things with your child?
PA13Q**01**	Discuss how well my child is doing at school
PA13Q**02**	Eat the main meal with my child around a table
PA13Q**03**	Spend time just talking to my child
PA13Q**04**	Help my child with his/her mathematics homework
PA13Q**05**	Discuss how my child is performing in mathematics class
PA13Q**06**	Obtain mathematics materials (e.g., applications, software, study guides etc) for my child
PA13Q**07**	Discuss with my child how mathematics can be applied in everyday life

Note: every item was answered based on the Likert scale: "never or almost never", "once or twice a year", "once or twice a month", "once or twice a week", "daily or almost daily"

Procedure

First, a semantic analysis of the contents of the items that form every construct was performed. From this analysis, we determined that the construct "parental participation in school" may be composed of three dimensions: the first dimension is called *Participates in school*, with items 3, 4, 5, 6, 7, and 11; the second, *Analyzes the child's behavior and progress by his/her own initiative and with the teacher,* with items 1 and 9, and the third dimension, *Analyzes the child's behavior and progress by the teacher's initiative* with items 2 and 11. Item 8 (participated in the local School Board) was excluded, given that in Mexico attendance to said board is perceived as compulsory.

The second construct, on "parental support for learning at home", is formed by two dimensions: *Communication with the child about learning in school*, with items 1, 2, and 3, and *Help with learning*, with items 4, 6, 7. Item 5 (I speak about the progress of my child in math class) is excluded, because it does not appropriately describe support for the student's learning at home.

To confirm these assumptions, eleven items of parental involvement were retained and organized in three dimensions and seven items of parental support were organized in two dimensions, and exploratory and confirmatory factor analysis was performed for each of these two constructs. The exploratory factorial analysis was performed in order to observe the factor structuring by main component and to obtain a first indicator of the validity of the construct with the proposed dimensions. The confirmatory factor analysis was performed in order to obtain convergent and divergent validity of the constructs, through structural equation models, using program EQS (version 6.2).

Once the dimensions of both constructs were validated, , the next step was to find out how they related to the students' results in the mathematics PISA test (2012). It should be remembered that under PISA, five plausible values are calculated for each student, and we worked only with the first one. To achieve this, several structural models of trajectory analysis were tested, where sub dimensions of the constructs *School Participation and Family support* were considered as predictor variables of students' achievement in mathematics.

Results

This section has three parts. The first two provide evidence of the validity of constructs relating to parental behavior with respect to their participation in school activities and home learning student support. In the third part, we present models showing the relationship between the two already mentioned family constructs and student learning results.

Evidence of construct validity "Parental participation in the school"

The results of the Exploratory Factor Analysis, using the analysis method of the main components and orthogonal rotation, shows that this construct is made up of three dimensions deduced from the item semantic analysis and that item 8 (I participate in the local school council) had the least factorial load (0.40) when compared to the rest of the items that make up the first dimension.

The confirmatory factor analysis was done considering the three dimensions already identified in the exploratory factor analysis: *Participates in school, Analyzes the child's behavior and progress by his/her own initiative and with the teacher, Analyzes the child's behavior and progress by the teacher's initiative.* This analysis resulted in the model shown in figure 1 that, for shortness sake, eliminates item 8. The model shows good indicators for goodness of fit with respect to the hypothetical models (CFI=0.98 and RMSEA=0.04).

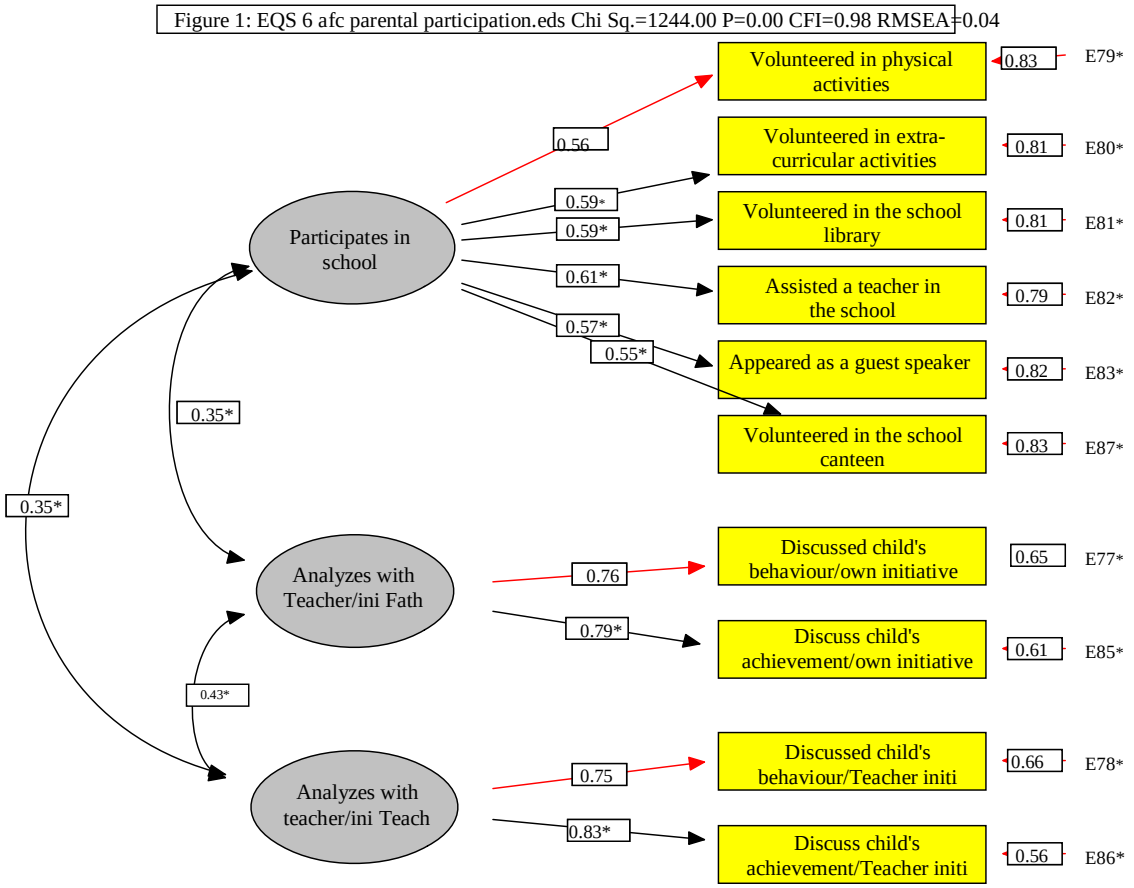

Figure 1. Confirmatory Factor Analysis Model of *Parental participation in School*, in the Family questionnaire (PA10), Pisa 2012

In this figure, constructs (or latent variables) are identified by oval figures and indicators (or manifest variables) are represented by items in the questionnaire, identified by shaded rectangles (Byrne 1994; Raykov & Marcoulides, 2000). The convergent validity of the construct is estimated by the size (and statistical significance) of factorial loads between its dimensions and its indicators, as well as by the size of the error related to the size of each indicator (or item), shown as small rectangles on the right hand side. As may be seen, factorial loads in all three dimensions together with their respective indicators are high, between 0.55 and 0.83, even though associated errors are also high (between 0.56 and 0.83).

On the other hand, the convergent validity of a construct entails that the dimensions that make it up should covariate in a moderate way (shown by curved bi-directional arrows). In this model, it is clear that this is the case for the construct *Parental participation in school* since covariances in its three dimensions ranged between 0.35 and 0.43.

Evidence of the validity of construct "Parental support for home learning"

Regarding the construct "Parental support for home learning" the Exploratory Factor Analysis shows a two dimensional structure: the first one includes three items that clearly refer to *Parental Communication with the child* and the second one to *Learning assistance at home.* Likewise, item 5 (I speak about my child's progress in mathematics class) loaded in two dimensions, with a higher load in the component referring to home help and smaller in communication.

Figure 2 shows the resulting model of the confirmatory factor analysis of "Parental support for home learning ", which includes two dimensions: *Communication on learning and Help for learning*. The resulting model has

a good goodness fit (CFI = 0.99 and RMSEA = 0.04) in relation to the hypothetical model being tested, in which, for shortness, item 5 is omitted.

As in the previous case, a convergent and divergent validity of construct was sought. Results in Figure 2 show evidence of the convergent validity of each of the two dimensions, whose indicators show relatively high factorial loads (between 0.58 and 0.80), as are the associated errors (between 0.60 and 0.82). As for the divergent validity of the two dimensions, the model shows that there is a covariance of 0.53, which means that the construct Parent home learning support can be validly measured with the two dimensions that make it: "Parental Communication with the child" and "Parental support for home learning".

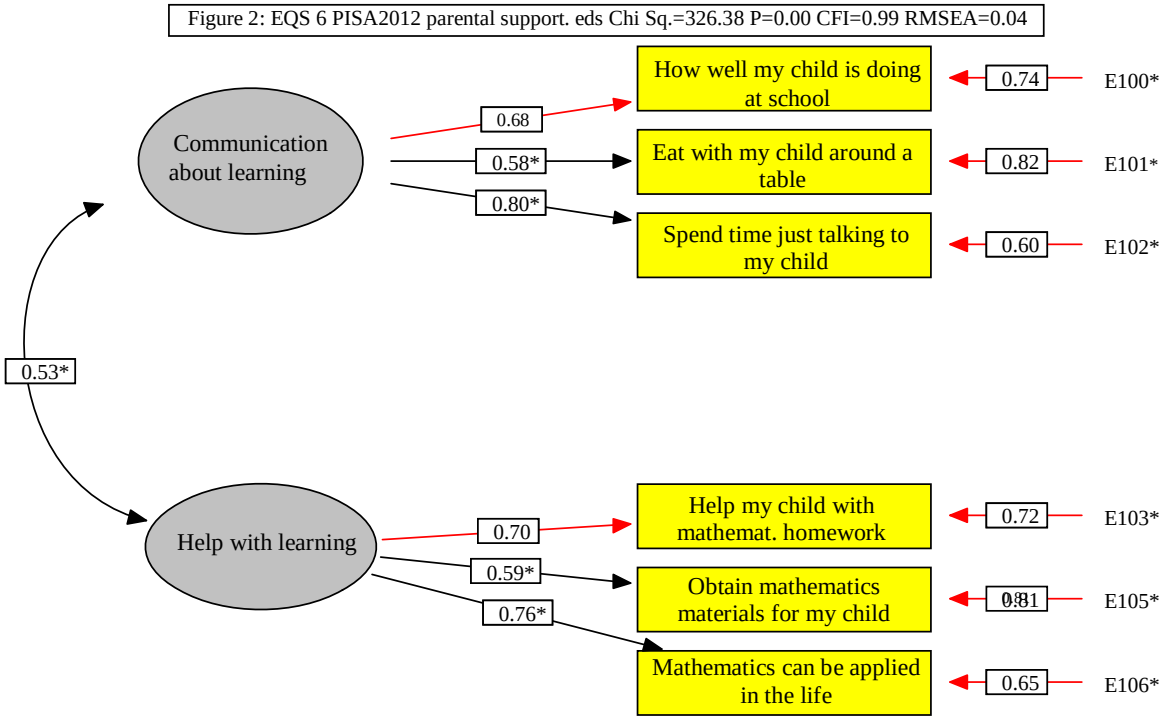

Figure 2. Model resulting from the confirmatory factor analysis for *Parental home learning support*, in the family questionnaire (PA13), PISA 2012

Predictive models of mathematics learning

In order to know what is the relationship that the two family variables - *Parental participation in school and Parental support for home learning* - have with student learning, several structural models of Path Analysis were tested, considering as dependent variable the student's scores in mathematics in the PISA test (2012). Since PISA provides five plausible values for each student, the analysis only took into account the first consideration (MAT1).

In the first model, shown in Figure 3, the independent effect that the two family constructs have on learning was tested. To this end, students' test scores were standardized, and so were the three dimensions of the construct "*Parental participation in school" participate in school* (PARTICIP), *Analyze by my own initiative the child's behavior and progress with the teacher* (ANALIPAD) *and Analyze by one teacher's iniciative the child's behavior and progress* (ANALIDOC), and the two dimensions of the construct "*Parental support for home learning* "P*arental communication with the child* (COMUNICA) and *Home learning support* (AYUDA). In this model dimensions that make each construct were made to have independent covariance.

Figure 3: EQS 6 AT with 5 manifest variables Chi Sq.=2864.10 P=0.00 CFI=1.00 RMSEA=0.13

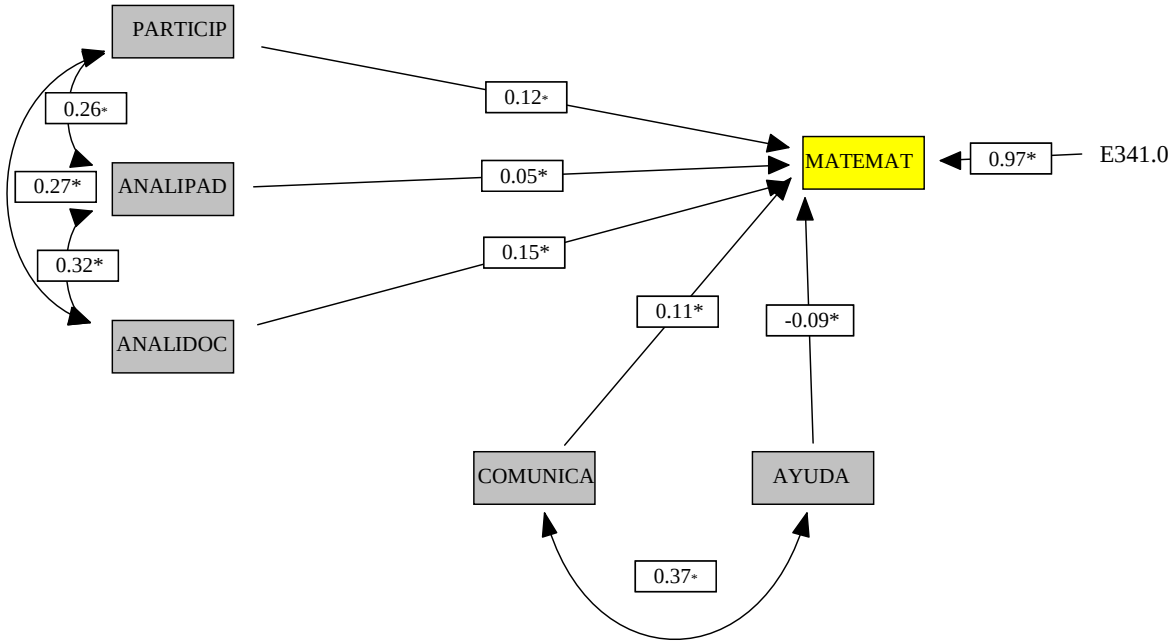

Figure 3. Structural model of the Trajectory Analysis of *Parental participation in school and Parental support for home learning,* with performance in mathematics: restricted co-variances

Figure 3 shows that the resulting model has a goodness of fit which is moderately acceptable, with respect to the hypothesized model (CFI = 1; RMSEA = 0.13). It clearly shows the size of the differential effect of the five dimensions (or variable predictors) on scores in mathematics, as well as the amount of covariance between predictor variables. The results of this analysis show that the variable ANALIDOC (teacher initiative) has greater explanatory weight on the score of Mathematics (0.15), followed by variables PARTICIP (participation in school) (0.12) and COMUNICA (communication) (0.11). On the other hand, it is important to note the low impact of variable ANALIPAD (parental iniciative) (0.05) and the negative relation of variable AYUDA (home support) (-0.09).

On the other hand, covariance between predictor variables that correspond to the same construct was relatively low (between 0.26 and 0.37), while the error associated to scores in mathematics was high (0.97). Similarly, after consulting the standardized solution generated by the EQS program, it was possible to see that this model only accounts for 7% of the variability in students' scores in mathematics.

To improve the adjustment indicators of this explanatory model, the five dimensions that make up the two family constructs were made to have joint covariance, based on the principle that both measure the behavior of parents regarding their children´s studies. The result of this model is shown in Figure 4, where it can be seen that although the goodness fit of the model improves (IFC = 1.0; RMSEA = 0.01), and the explained variance rises to 8%, coefficients between predictor variables and learning are identical, and the same is true for covariance between the dimensions of the same construct.

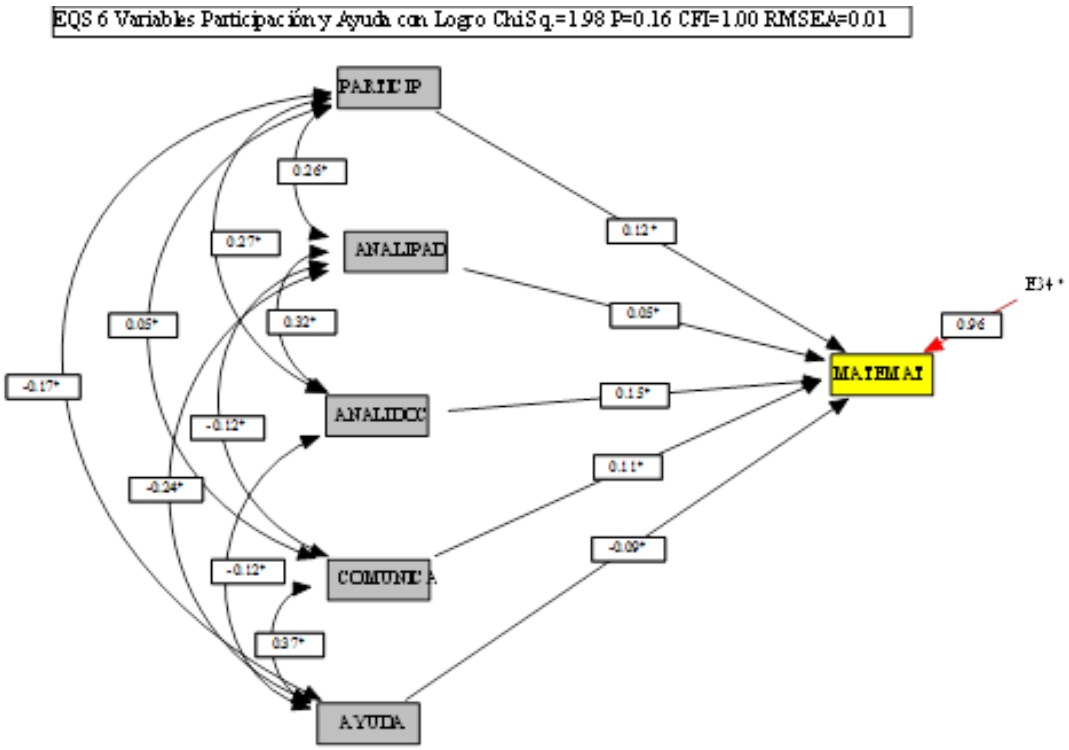

Figure 4. Structural model of the Trajectory Analysis of *Parental participation in school* and *Parental support for home learning*, with performance in mathematics: free co-variance

This model shows negative covariance between the dimension AYUDA (home support) and the three variables of the construct *Parental participation in school activities* (PARTICIP-participation, ANALIPAD-parental initiative and ANALIDOC-teacher initiative); however, variable COMUNICA (communicate) does not show covariance with ANALIDOC (teacher initiative), but has negative covariance with ANALIPAD (parental initiative) and marginal covariance with PARTICIP (participation).

Given that the behavior of parents regarding school activities and support for home learning may vary according to their socio-economic status, the first Path Analysis model (see Figure 3) was tested again with two groups of parents. To differentiate them, we used PISA's ESCS variable, that synthetizes their economic, social and cultural levels (OECD, 2014a); this variable divides student populations into three groups: high, medium and low. The high and low groups were the object of this analysis.

Figure 5 shows the resulting model for the ESCS-high group, which has a good fit level (CFI = 0 95 and RMSEA = 0.08) and explains the 10% variance in achievement. A remarkable aspect is that the model suggests that variable AYUDA (home support) acts as mediator of variables PARTICIP (participation), ANALIDOC (teacher initiative) and COMUNICA (communication) with the results of MATEMAT (mathematics). In all cases the relationship is negative and considerably strong (-0.34) with variable COMUNICA (communication). The results also show that variable PARTICIP decreased its explanatory power regarding performance in mathematics from 0.12 (without including the variable ESCS) to 0.05, while the other variables had similar coefficients (although slightly lower). It is worthy of notice that ANALIDOC (teacher initiative) (0.14) is the strongest learning predictor variable and that the AYUDA (home support) variable is no mediator with learning.

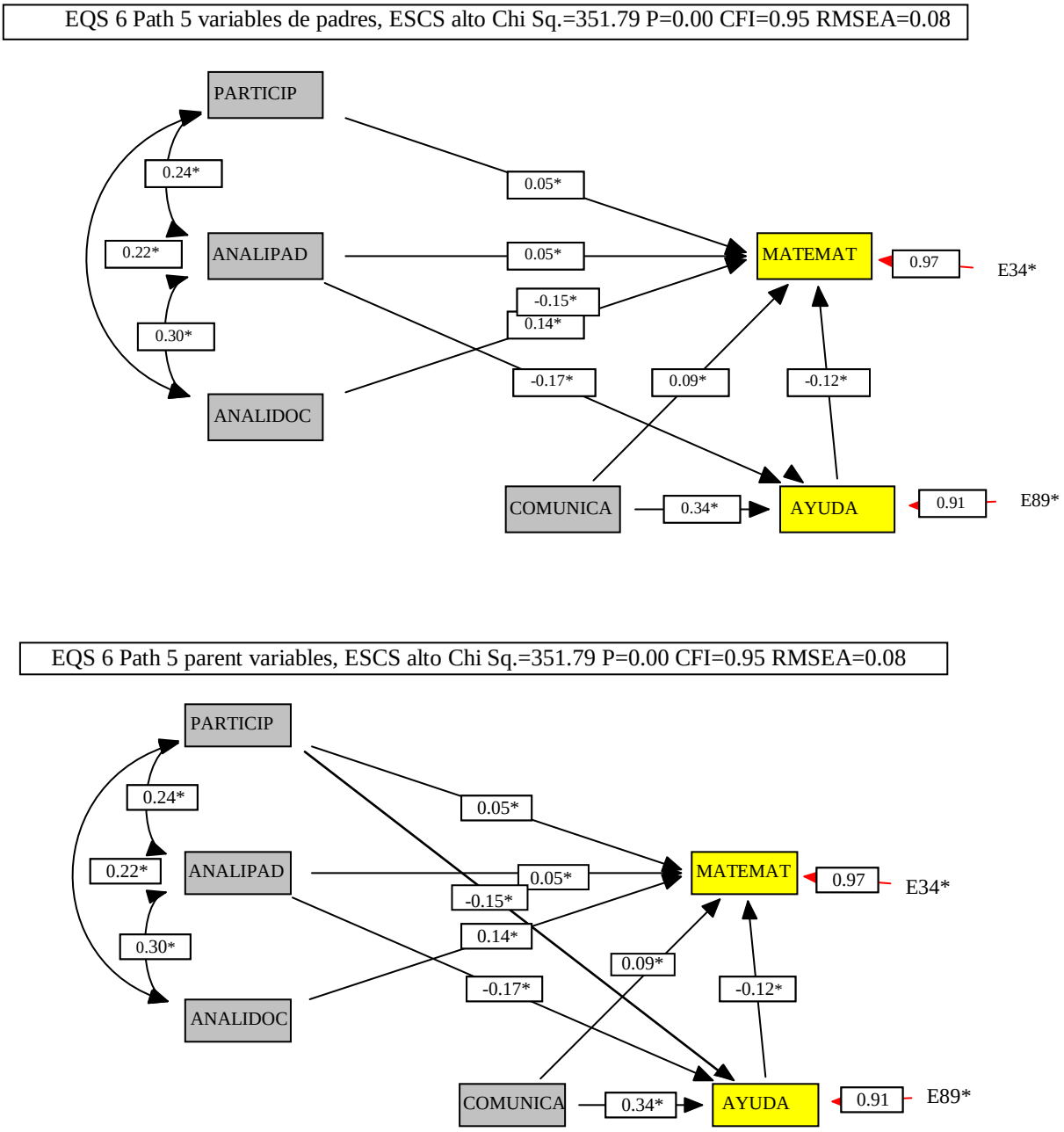

Figure 5. Structural model of Trajectory Analysis of *Parental participation in school* and *Parental support for home learning*, with performance in mathematics: Group ESCS-high

Figure 6 shows the resulting model for the ESCS-low group, which shows an acceptable goodness of fit (CFI = 0 91 and RMSEA = 0.10) and explains the 10% variance in mathematics achievement. In this model, variable AYUDA (home support) also appears as a mediator with learning, but only of variables PARTICIP (participation) and COMUNICA (communication). Its coefficients are equally negative. It calls our attention that contrary to the previous model (ESCS-high), variable PARTICIP (participation) has the best predictive power on scores in mathematics (0.14), followed by variable ANALIDOC (teacher initiative) (0.13).

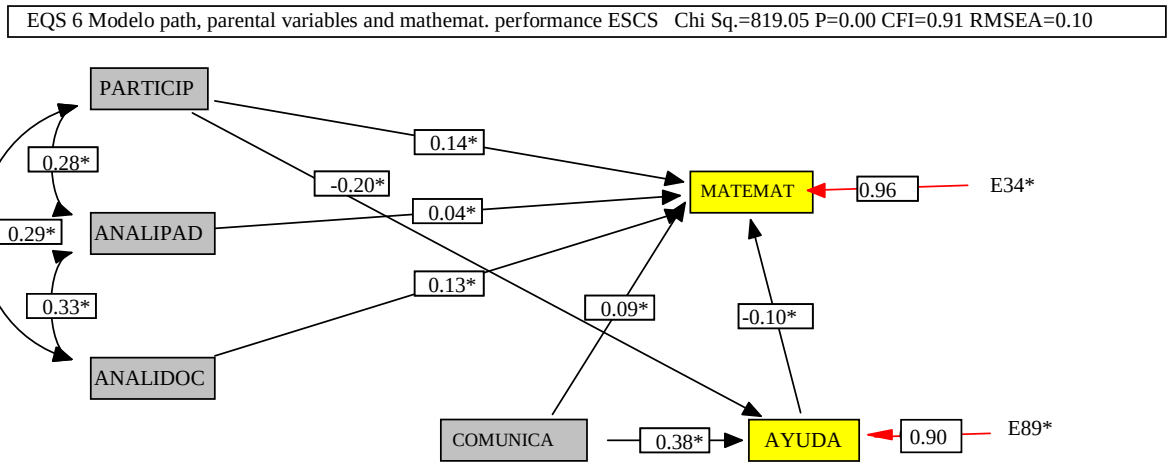

Figure 6. Structural model of Trajectory Analysis of *Parental participation in school* and *Parental support for home learning*, with performance in mathematics: Group ESCS-low

Discussion

This paper had two objectives. First, to learn about the factor structure of two family constructs: *Parental participation in school* and *Parental support for home learning.* Second, to know what is their relation with learning mathematics. To do this, two sections of databases from Mexico's PISA study (2012) were analyzed. On the one hand, the database of the family questionnaire and, on the other, the database related to the results that students obtained in mathematics. Exploratory and confirmatory factor analyses were conducted to learn about the structure of the two family constructs, while confirmatory trajectory models were used to learn about their relationship with learning mathematics.

Results show, on the one hand, that the construct "Parental participation in school" is made up of three dimensions: 1) *Participation in school*, comprised of six variables (or questions from the family questionnaire), 2) *Analyze by my own initiative and with a teacher the child's behavior and progress in school*, composed of two variables and 3) *Analyze by the teacher's initiative the child's behavior and progress in school* also composed of two variables. In turn, construct "Parental support for home learning" is composed of two dimensions and each dimension has three variables: 1) *Parental communication with the child* and 2) *Parental support for home learning*. Models for both constructs have acceptable fit levels, while evidences of convergent and divergent validity of their dimensions seriously question the one-dimensional structure of each.

On the other hand, the number of variables that make up the dimensions of each construct vary substantially (between two and six). It is important to point out that the structure of a dimension with only two variables is insufficient. This occurred, among other reasons, because two of the variables that were supposedly part of the constructs did not have a significant factorial load, therefore they had to be removed. In the construct "Parental participation in school", item *I participate in the local school council* had the lowest estimated scale parameter (Delta = 0.049). Similarly, in construct "Parental support for home learning", item I speak about my child´s progress in mathematics, had the lowest estimated parameter (Delta = 0.17).

Based on the above mentioned findings, data from this study raises the need to reconsider items in PISA's (2012) family questionnaire that make up the different dimensions of the constructs relating to the participation of parents in school and the support provided by

parents to their children at home, so as to validate their factorial structure and to include a sufficient number of variables (at least three) for each dimension. To do this, it is necessary to undertake a careful process of translation, adaptation and validation (Solano-Flores, Backhoff, & Contreras-Niño, 2009) of each item in Mexico, so that their meaning for the national context is adequate.

As already pointed out by several researchers, the construction of context questionnaires has not been subjected to the same technical rigor applied to measure cognitive domains (De la Orden & Jornet, 2012; Gonzalez & Backhoff, 2010; Jornet et al., 2012). Hence, it is important to use the underlying theory to represent the relevant psychological construct (pedagogical, sociological, etc.) and not rely only on statistical models (Béjar, 1993; Martínez & Moreno, 2002; Myslevi, 1993). In the case under examination, results point to the need to separate constructs related to parents' participation in school from parental support for home learning, since the latent trait measured with a test must be delimited at the theoretical level in a clear and excluding way vis-à-vis all others (Martínez & Moreno 2002).

The second objective of this work was to study the relationship between the two family constructs (participation in school and support for learning at home) and the achievement of students in mathematics. The results of the factorial trajectory analysis show that, out of the five dimensions studied, Analyze the child's behavior and progress in mathematics by the teacher's initiative, is the one that best predicts the mathematics score (coefficient of 0.15), followed by Participation in the school (0.12) and Parental communication with the child (0.11). The first two dimensions correspond to construct Participation, and their structural regression coefficient match the range of sizes of the effect on standard achievement (0.02 - 0.40) reported by Jeynes (2005), based on a meta-analysis of 41 specialist articles on involvement and learning results. Thus, participation in activities promoted by the school encourage greater parental involvement in the child´s learning process, which in turn can influence, associated with other context variables, student learning. The works of Akmal and Larsen (2004), Valdés and Yáñez (2013) confirm this finding; students in schools that foster family involvement in activities aimed at improving children's academic development, obtained better learning results or academic attainment.

It is interesting to learn that the teacher's initiative, to encourage parents to discuss the child's behavior and progress with hin/her makes an important difference in math scores; in contrast with the initiative being the family's, in which case the effect being that the results were considerably lower (0.05). This can be explained if we take into account that the teacher's initiative is a heads-up to parents, making them aware of any problems that the student may be showing at school. Parents who pay attention to this call show favorable characteristics for their child´s success in school, that are reflected in their learning progress.

The relationship found between the dimension Parental communication with the child in relation to mathematics learning and attainment (0.11), are the same as findings from a large scale assessment at the end of primary school in Mexico, and point to a significant relationship between mathematics achievement and the frequency with which students speak at home with their parents about what they learnt in school (Sánchez and Andrade 2013), and this supports the relevance and need to include communication with the child about difficulties and progress made in learning mathematics when measuring variables associated with learning and academic achievement, that PISA considers as important (OECD, 2013).

On the other hand, it is worth mentioning that in the different models analyzed, the dimension Help for learning at home related negatively with students' learning (close to a -0.10 coefficient). Similar results were found by Klieme and Stanat (2009), who reported a

negative relationship between "parental support in learning and homework", and achievement in mathematics in the countries that participated in the PISA 2000 study; and Kotte, Lietz and Martínez (2005) who also found negative and significant relationships in PISA 2000, between a construct that included indicators of parental support and the family learning environment, and educational attainment in mathematics, both in Spain and Germany. Also, several studies have reported that the indicators of family support provided to children, have a negative relationship with indicators of achievement (Bazan & Castellanos, 2015; Bean, Bush, McKenry, & Wilson, 2003; Carvallo et al., 2007; Chen, 2005).

These results imply that the dimension, Help for learning at home may be assessing both the parents' interest and willingness to help their children with their studies, and the need students have for help in overcoming problems when learning mathematics. Consequently, a careful analysis (both conceptual and empirical) of the variables that make up this dimension of family support is more than relevant. One analysis that might provide information about this would be to separate students according to their high or low academic performance, and see if this variable behaves differently.

Finally, we ascertained whether the two family constructs that were the object of this research are sensitive to the family's socio-economic level (ESCS). The factorial trajectory analysis results showed that in the ESCS-high student group, the dimension Analyze the child's behavior and progress by teacher's initiative is the best predictor (0.14) of scores in mathematics, followed by Parental communication with the child (0.09), whilst the dimension Participate in school activities has a significantly lower predictive power (0.05). In contrast, in the ESCS-low group of students, the two first dimensions showed similar coefficients, while the third (Participate in school activities) showed a relatively high coefficient (0.14).

From these results, we can conclude that certain family behaviors have the same effect on student learning, regardless of the family's socio-economic level. This was the case in four out of the five dimensions analyzed in this study. The exception was dimension, Participate in school activities, the only one that behaved differently according to the socioeconomic status of the student´s home. From these results, the question arises: why parental participation in school activities has a greater relationship with the learning of mathematics in a poor population rather than in one with a better socio-economic condition? One possible explanation is that the involvement of parents of low socio-economic levels in schools sends a message to their children about how important the school is for the family, which may, for instance, motivate them to be more interested in their studies. This may not be the case for families in higher socioeconomic levels, where school interest is related to the example of parents and relatives who have completed university, and less by parental participation in school activities. However, the reason for this is not clear, since this effect may be due to the characteristics of the family, the type of school or the interaction between family behavior and the school's functioning.

In summary we may say that: 1) the factor structure of the two family constructs should be revised and restructured using a substantive theoretical base, and that it should pass construct validation, under the same strict demands as those applied to the construction of cognitive variables 2) in their current structure and despite the limits to the construction of items and their correspondence with the construct in both sections (scales or questions) it is possible after factor regrouping and validation of constructs, to use them to explain achievement and their relationship with other context variables, and 3) the socio-economic and cultural level of the of families' background context , does differentially influence the relationship between parental participation and support on academic achievement.

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