The Journal of Experimental Education

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/vjxe20

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Published online: 01 Apr 2010.

To cite this article: Julio Antonio Gonzalez-pienda, Jose Carlos Nunez, Soledad Gonzalez-pumariega, Luis Alvarez, Cristina Roces & Marta Garcia (2002) A Structural Equation Model of Parental Involvement, Motivational and Aptitudinal Characteristics, and Academic Achievement, The Journal of Experimental Education, 70:3, 257-287

To link to this article: http://dx.doi.org/10.1080/00220970209599509

The Journal of Experimental Education, 2002, 70(3), 257–287

A Structural Equation Model of Parental Involvement, Motivational and Aptitudinal Characteristics, and Academic Achievement

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ABSTRACT. The authors used the structural equation model (SEM) approach to test a model hypothesizing the influence of parental involvement on students' academic aptitudes, self-concept, and causal attributions, as well as the influence of the 3 variables on academic achievement. The theoretical model was contrasted in a group of 12- to 18-year-old adolescents ($N = 261$) attending various educational centers. The results indicate that (a) parental involvement had a positive and significant influence on the participant's measured characteristics; (b) causal attribution was not causally related to self-concept or academic achievement when the task involved finding causes for success, but, self-concept and causal attributions were found to be significantly and reciprocally related when the task involved finding causes accounting for failure; (c) self-concept was statistically and predominantly causally related to academic achievement, but not vice versa; and (d) aptitude and self-concept accounted for academic achievement, although the effect of self-concept was predominant. These results suggest that in adolescence, cognitive–affective variables become crucial in accounting for academic behavior.

Key words: achievement, attributions, parental involvement, self-concept

EMERGING ECOLOGICAL–CULTURAL PROPOSALS clearly show that even the most integrative cognitive models, including integration of cognitive, affective, and motivational aspects (e.g., Boekaerts, 1996; Pressley, Harris, & Guthrie, 1992), can become obsolete if they do not consider cognition and motivation as situational (Paris & Turner, 1994; Pintrich, 1994). This contextual per-

spective has renewed interest in the influence of family involvement on school results (Brookhart, 1998; Caldas & Bankston, 1997; Ginsburg & Bronstein, 1993; Gottfried, Fleming, & Gottfried, 1994; Grolnick & Slowiaczek, 1994; Grolnick, Ryan, & Deci, 1991; Guay & Vallerand, 1997; Hokoda & Fincham, 1995; Miller & Brown, 1992; Patrikakou, 1996; Peng & Lee, 1993; Reay & Ball, 1998; Reynolds, 1994; Steinberg, Darling, & Fletcher, 1995; Steinberg, Dornbusch, & Brown, 1992; Tett & Crowther, 1998; Wentzel, 1998; West, Noden, & Edge, 1998), and, generally, in children's psychological development as adults (see Harris, 2000, and Vandell, 2000).

Although there is no question about the influence of family socialization patterns on children's cognitive characteristics, there seems to be a general belief that these habits are more relevant in shaping certain attitudes, self-concept, beliefs, competence, and causal attributions (Coleman, 1987; Dix, 1993; Eccles, 1993; García Bacete, 1998; Wentzel, 1999; Wigfield & Eccles, 1992). Therefore, the relationship between parents' involvement[1] and children's academic learning and achievement is indirect, rather than direct (Anderson & Keith, 1997; Reynolds & Walberg, 1992; Shumow, Vandell, & Kang, 1996).

In the following section, we review the results of research on the most important variables that make up these constructs and the specific relations that seem to exist between them.

Family Variables

The relationship between family variables and academic achievement has been recently studied from two different perspectives (Martínez-Pons, 1996): (a) the relationship between achievement and sociofamily factors (i.e., parents' expectations about children's achievement and future work, educational habits, economic and cultural characteristics, etc.) and (b) the relationship among achievement, learning processes, and how the family is involved in these learning processes (i.e., specific ways in which parents' behavior influences children's self-regulation, learning processes, and academic achievement).

Two kinds of research can be distinguished regarding parental involvement in children's education. First, some researchers attempt to show how parental behaviors affect children's motivation, self-concept, concentration, effort, attitude, and other characteristics. These researchers assume that parental variables will significantly affect their children's subsequent learning and achievement, once the children become aware of how they use their cognitive processes and

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We wish to thank the University of Oviedo for partially funding the research projects that provided the data for this article.

strategies (Castejón & Pérez, 1998; Hokoda & Fincham, 1995; Klebanov & Brooks-Gunn, 1992; Marjoribanks, 1975; Morvitz & Motta, 1992; Patrikakou, 1996; Reynolds & Walberg, 1992; Strage & Brandt, 1999). Second, some researchers explore how parents become involved, either favoring or hindering the learning process via their influence on self-regulation behaviors (Feldmann, Martínez-Pons, & Shaham, 1995; Martínez-Pons, 1996; Zimmerman, Bandura, & Martínez-Pons, 1992).

We omitted structural characteristics and focused on the analysis of parental involvement when examining family variables. Parental involvement criteria were developed according to six dimensions that are, in theory, closely related to students' motivation, attitude, and aptitude, as well as to the learning process itself. The six dimensions are (a) parents' expectations about their children's achievement, (b) parents' expectations about their children's capacity to achieve important goals, (c) parents' behaviors that reveal interest in their children's schoolwork, (d) parents' degree of satisfaction or dissatisfaction with their children's level of school achievement, (e) parents' level and type of help provided when their children do homework, and (f) parents' reinforcement behaviors of their children's achievements.

Personal Variables

Much of the research on predicting of academic achievement is correlational, although in the last few years there have been studies contrasting structural models that include causal relations among the variables (i.e., Castejón, Navas, & Sampascual, 1996; Castejón & Pérez, 1998; Martínez-Pons, 1996; Patrikakou, 1996; Reynolds & Walberg, 1992). In both kinds of studies, personal (i.e., student) variables, which are frequently considered predictors of academic learning and achievement, can be grouped into either cognitive or motivational dimensions. When relating these two dimensions, researchers have often included the three types of variable that we included in our work: students' aptitude, motivation (often from the point of view of the model of causal attribution processes, proposed by Weiner), and self-concept (in its academic dimension). We now more closely examine the relationship between these three types of variables and academic achievement.

All the reviewed studies report a significant and positive relationship between students' aptitudes and academic achievement, even if they do not always agree on the extent of the relationships. Results from correlational research have usually indicated the existence of a moderate relationship (about .50) between aptitude and achievement. The degree of relationship varied, depending on whether the measurement of aptitude and achievement was general or specific and depending on the age of the students. Research carried out in various cultural environments has confirmed that the correlation coefficients

were higher when both variables—aptitude and achievement—coincided in their degree of generality or specificity (Minton & Schneider, 1985), although there have been exceptions (i.e., Alonso, Machargo, Méndez, Pérez, & Socorro, 1996, who obtained higher correlation coefficients between general aptitude and specific achievement than when both variables were specific). Students' aptitude accounted for between 25% and 35% of the variance in academic achievement (Detterman, 1997; Neisser et al., 1996), even in research that took into account the level of generality and specificity of both variables. Correlational research results on the participant's age have usually indicated that the correlation between aptitude and achievement decreased as students advanced in their education (from .70 in elementary school to .35 near the end of the licentiate of a European university degree, intermediate between a bachelor's and doctorate degree).

Various researchers in motivation have agreed that two motives direct people's behavior: achieving success and avoiding failure. In Weiner's (1986) motivational theory, he stated that motivated behavior is a function of the individual's expectations of achieving a goal and the value of that goal, two components that are determined by causal attributions and express personal beliefs about what causes are responsible for a person's successes or failures. Weiner (1985) stated that attributions are the primary determinants of motivation, insofar as they influence expectations and affective reactions and, consequently, influence achievement behavior and its results. When we consider current cognitive theories and relevant research, we do not doubt the relationship between motivation and achievement. However, the conclusions of studies focusing on motivation in the context of causal attribution are not so clear. Some works have revealed significant and positive relationship between attribution to internal causes and academic achievement (i.e., Alonso et al., 1996; Shanahan & Walberg, 1985; Valle, Cabanach, Núñez, & González-Pienda, 1998), but no evidence of a direct relationship between causal attribution and achievement was observed in others (i.e., Castejón, Navas, & Sampascual, 1996; Platt, 1988). The discrepancy in these investigations may have resulted from differences between the samples, the methodology employed to analyze the data, the instruments used to gather information in the various investigations, or other, unknown factors. It may also be attributable to the absence of important variables that account for academic achievement, like self-concept (Covington, 1992).

Previous research that analyzed the relationship between causal attributions and self-concept was not conclusive. Whereas the findings of numerous studies (i.e., Harter & Connell, 1984; Núñez & González-Pienda, 1994; Platt, 1988; Weiner, 1985) are consistent, with the hypotheses implying that internal causal attribution has an effect on academic self-concept, various other researchers have found evidence of an effect of academic self-concept on causal attribution (i.e., Marsh, 1984). As we describe in the statistical analyses section, we hypothesize

a model of unidirectional relations in which causal attributions influence self-concept, which in turn affects academic achievement. We chose this option because researchers who have used samples of adolescents have found this pattern of relationship (i.e., Núñez & González-Pienda, 1994; Platt, 1988).

Most research carried out on self-concept has focused on its role in students' academic behavior. This was not only because of the relevance of school achievement but also because of the importance of school's context in child development (González-Pienda, Núñez, González-Pumariega, & García, 1997). In addition, most researchers have established a relationship between self-concept and students' school experience and goals. Once this relationship was established, further research focused on discovering whether the two constructs were unidirectionally or reciprocally related and what mechanisms or processes made the relationship possible. The results of such research are also inconclusive. Most studies (Helmke & van Aken, 1995; Marsh, 1988, 1990; Marsh & Yeung, 1997; Skaalvik & Hagtvet, 1990) have offered data supporting the hypothesis of reciprocal causality between self-concept and academic achievement, although the evidence is not equally robust in all studies.

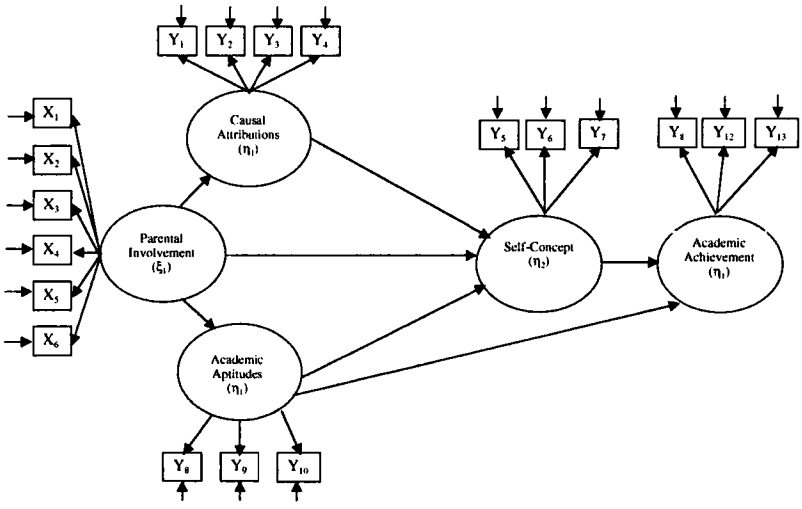
Other important studies have found a unidirectional relationship. For example, Chapman and Lambourne (1990) and Newman (1984) concluded that only students' achievement determines their self-concept. These results coincided with those obtained by Helmke and van Aken (1995), who concluded that reciprocal determination would be more realistic because of the insufficiently clear conditions.

Academic self-concept was not observed to have a significant causal relationship with achievement (Castejón & Pérez, 1998; Patrikakou, 1996), although ascertaining the relationship between self-concept and achievement was not the main goal of these authors. Shavelson and Bolus (1982), however, stated that self-concept clearly determines academic achievement. This result was also supported by Marsh (1990). Last, there are also studies in which no causal relationship between self-concept and academic achievement was found (i.e., Byrne, 1986).

Despite what is already known about the relationship between these two variables, more research is needed to analyze the various issues that are still unclear. For instance, how do the observed relationships between self-concept and achievement change as a function of the time lapse between the assessment of both variables? Or how do the relationships between self-concept and achievement vary when other significant variables are considered within the relationship? (Helmke & Van Aken, 1995; Marsh & Yeung, 1997). We believe that these issues become more relevant during adolescence because it is a period of change when students modify the relevance of variables that may be related to their academic achievement (Steinberg, 1990; Wentzel, 1998; Wigfield, Eccles, MacIver, Reuman, & Midgley, 1991).

The purpose of our investigation was to analyze both these issues. We also offer more data about the relationship between aptitude, causal attributions, self-concept, and academic achievement, specifically addressing the final two unresolved variables. We did this by contrasting structural equation models, which allowed us to consider the direct and indirect effects of aptitude and self-concept on achievement. We then compared how aptitude accounts for achievement, considering more motivational variables (i.e., causal attributions and self-concept) and including them in the causal relation model established for this investigation. Last, we included parental involvement in the structural equation model as an independent variable. We hypothesized that this variable would significantly affect the relationships between the three modulating variables (aptitude, causal attributions, and self-concept) and academic achievement. Thus, the relationship between parental involvement and children's academic achievement would be indirect, modulated by students' personal variables, which were also taken into account in the model (see Figure 1).

FIGURE 1. A priori model of causal paths among parental involvement, aptitudinal and motivational characteristics, and academic achievement.



Note. Family variables: X_1 = achievement expectations, X_2 = help, X_3 = interest, X_4 = capacity expectations, X_5 = satisfaction, X_6 = reinforcement. Personal variables: Y_1 = capacity as cause of success in mathematical tasks, Y_2 = effort as cause of success in mathematical tasks, Y_3 = capacity as cause of success in verbal tasks, Y_4 = effort as cause of success in verbal tasks, Y_5 = mathematical self-concept, Y_6 = verbal self-concept, Y_7 = self-concept in remaining areas, Y_8 = verbal aptitude, Y_9 = reasoning aptitude, Y_{10} = calculus aptitude. Achievement variables: Y_{11} = mathematical achievement, Y_{12} = verbal achievement, Y_{13} = global achievement in remaining areas.

Method

Participants

Students (N = 503) from various educational centers in the principality of Asturias (Spain) participated in this investigation. The schools (elementary and high schools) belonged either to semiurban areas (elementary schools) or to urban areas (high schools). The elementary school students were seventh and eighth graders (n = 163), and made up 32.4% of the total group (92 seventh graders and 71 eighth graders, 18.3% and 14.1%, respectively). There were 340 adolescents attending high schools (1st, 2nd, and 3rd year of Spanish high school) and making up 67.6% of the total sample (137 1st-year, 122 2nd-year, and 81 3rd-year, 27.2%, 24.3%, and 16.1%, respectively). The mean age of the group was 14.7 (SD = 1.53; min. = 12 years and max. = 18 years). The group was made up of 246 boys (48.9%) and 257 girls (51.1%).

Most of the participants' families had a low education level (about 60% of the parents had only an elementary level education), approximately 15% had an advanced level educational, and the remaining parents had an intermediate level education. Of the participants, 58.1% of the families had sufficient economic resources to send their children to university, 15.9% said their income was insufficient, and the remaining 26% did not know.

In the elementary school group, 2 students were excluded because of missing aptitude data after they were absent on the 1st assessment day. Therefore, when we contrasted the model, this group was made up of 160 participants. Unfortunately, the loss of participants in the high school group was much higher. Of the 341 students of the subgroup, only the data from 101 could be used in the structural equation analysis, making the total sample size 261, all of whom were White. The exclusion of the 240 high school students resulted from (a) a lack of parental-involvement data (i.e., students either did not have explicit parental permission to respond to the issues of the scale (n = 34), they did not respond to all the scale items (n = 25), or it was impossible to identify the individual (n = 12); (b) a lack of information about the academic achievement of the two groups of students (n = 115) because two of the teachers or tutors indicated that they did not have enough time to complete the scales; (c) an instance in which the information provided by the parents did not correspond with individual students (n = 30); or (d) a lack of information in one of the remaining variables of the model (n = 24). Nevertheless, the final group (N = 261) was large enough to allow the use of structural equation models.

Materials

Family involvement. Song and Hattie (1984) created a scale to assess family context. According to the theoretical model on which it was based, three important

family dimensions should be distinguished: structural variables, socioeconomic and cultural status, and family atmosphere. Song and Hattie used confirmatory factor analysis to obtain empirical evidence supporting this model. Whereas several items measured the first two dimensions, the authors divided family atmosphere into subdimensions with many items in each subdivision. In all, the scale consisted of more than 100 items. Song and Hattie reported reliability indexes ranging between .63 and .90. We used this scale in our study, although we reduced the number of original dimensions and the number of items for time savings, and also because of our specific goals.

Students completed our reduced version of the scale, which was made up of 45 items. Responses were answered on either a 4- or a 5-point Likert-type scale. For example, our scale ranged from 1 = *very true* to 4 = *very false,* or 1 = *very good* to 5 = *very bad.* Items were distributed in the six dimensions as follows: (a) Parents' Expectations About Children's Achievement (7 items, $\alpha = .75$), (b) Parents' Expectations About Children's Capacity to Achieve Important Goals (9 items, $\alpha = .83$), (c) Parents' Interest in the Way Children Do Their Schoolwork (10 items, $\alpha = .88$), (d) Parents' Degree of Satisfaction or Dissatisfaction With the Level of Schoolwork Achieved by Children (6 items, $\alpha = .81$), (e) Parents' Level and Type of Help or Stimulus Provided When Their Children Do School Homework (8 items, $\alpha = .82$), and (f) Parents' Reinforcement Behaviors of Their Children's Achievements (5 items, $\alpha = .77$).

Given the relatively small number of items in each subscale, the reliability coefficients were high, even those of the first and last dimension. The reliability of the total scale (45 items) was also high, $\alpha = .93$. Thus, we chose these six dimensions, which provide different information about parental involvement in children's education and can also be contrasted with the results of the previously mentioned studies.

School aptitudes. We used the Test de Aptitudes Escolares (TEA publishers), the Spanish adaptation of the School Aptitudes Test (Thurstone & Thurstone, 1975). This test provides basic aptitude information required for learning at school. There are three levels of difficulty (TEA1, TEA2, and TEA3) for this test; in this study, we used the TEA2 (for elementary school students) and the TEA3 (for high school students). At all difficulty levels, three kinds of aptitudes were assessed: verbal (language mastery), reasoning (capacity to discover the logical order in sets of figures, numbers, or letters), and calculus (speed and precision in performing operations with numbers and quantitative concepts). This instrument for measuring school aptitudes is frequently used in research in Spain to predict academic achievement.

Causal attributions. Cairns and Marsh (1982) created the Sydney Attribution Scale (SAS) to assess students' perceptions of the causes for their academic success or failure. This instrument is made up of a series of hypothetical situations

in which the students imagine themselves either succeeding or failing. The following is an example of a successful situation:

> Imagine that your teacher chooses you to be in the group of students that read best. This is probably because
>
> a) You are a very good reader (skill).
>
> b) You make a great effort to read well (effort).
>
> c) The teacher made a mistake (external cause).

The students assessed each of the three hypothetical causes on a 5-point Likert-type scale ranging from 1 = *false* to 5 = *true.* The scale resulted from combining three dimensions: Academic Content (mathematics, verbal material), Results (success, failure), and Perceived Cause (skill, effort, and external causes). The SAS is made up of 24 situations (6 success situations and 6 failure situations in both language and mathematics), that each contain three possible causes (skill, effort, external causes), for a total of 72 items.

Marsh et al. (1984) obtained reliability coefficients for the psychometric properties of success and failure, using scales that assess attributions of success, which ranged from .63 to .84 (M = .82), and of failure, which ranged from .57 to .75 (M = .66). When they repeated the scale (Marsh, 1984), the mean was .83 and ranged from .70 to .86. The results of both studies indicated that the construct validity of the scale was acceptable. Using the same scale in a different cultural context, Watkins and Gutierrez (1990) obtained a mean of .75, which ranged from .59 to .83. In this study, we obtained reliability coefficients similar to the previous results. The global coefficient was similar to those obtained in Marsh's (1984) investigations and higher than those obtained in the other investigations (α = .81). The positive scales, which included subscales of internal and external causes had coefficients that ranged from .53 to .87 (M = .74), whereas coefficients for the negative scales, ranged from .44 to .80 (M = .60). The scales that assessed internal-cause attribution, however, obtained higher coefficients (from .78 to .87) than those that assessed external-cause attribution (from .44 to .63). We believe that, the SAS is reasonably reliable, especially the scales that measure attribution to internal causes.

Academic self-concept. Marsh and her colleagues (Marsh, 1989; Marsh, Relich, & Smith, 1983) designed the Self-Description Questionnaire-II (SDQ-II) to assess adolescents' self-concept between the ages of 12 and 18 years old. Byrne (1996) stated that the SDQ-II is the self-concept assessment instrument that has been validated most often and with the best results. The initial scale was made up of 150 items, but we modified the current version with 102 items, with half of them in negative terms. The participants respond using a 6-point Likert-type scale, which ranged from 1 = *false to* 6 = *true.* These 102 items are distributed in 11 subscales (Marsh, 1992).

The SDQ-II is a very reliable and valid assessment scale (Byrne, 1996). Marsh (1989) reported internal consistency coefficients for the 11 subscales ranging from .83 (emotional stability) to .90 (physical appearance), with a mean alpha of .87. In a recent study with the SDQ-II, Pérez Villalobos (1997) reported reliability coefficients between .96 and .97 in various groups of adolescents. In our study, we found a global alpha of .95 and alpha coefficients for the subscales ranging from .73 (Honesty) to .91 (Mathematics). The alphas for the rest of the academic dimensions were .83 (Verbal) and .88 (General Academic Self-Concept). Therefore, based on the results from previous studies, we consider the SDQ-II to be a very reliable assessment instrument when analyzing different size samples in different contexts (i.e., cultural, social, etc.). The instrument is especially accurate for the academic subscales, which were used in the current investigation (Mathematics, Verbal, and General Academic Self-Concept).

Most validity research has focused on testing construct validity by exploratory and confirmatory factor analysis. A large number of studies, from very different contexts and cultures, have lent support to structure and predictive validity (i.e., Byrne & Gavin, 1996; Marsh, 1989, 1994; Marsh & Richards, 1988; Pérez Villalobos, Díaz, Núñez, & González-Pienda, 1998; Plucker, Taylor, Callahan, & Tomchin, 1997; Watkins & Akade, 1992; Watkins & Dong, 1994; Watkins & Mpofu, 1994; Watkins, Lam, & Regmi, 1991).

Academic achievement. We based the measurements of academic achievement on students' grades. Because the official grades were not expressed on the same scale in all the schools considered in this study, and in order to ensure that all the students would be graded using the same scale in all the subjects, we requested that the teachers or tutors grade each student's achievement in four areas (mathematics, verbal, the remaining subjects, and global achievement). For this purpose, we used a 5-point Likert-type scale, which ranged from 1 = *very deficient,* to 5 = *very good.* The researcher who assisted and coordinated the evaluation in each educational center explained the meaning of each of the points on the scale until he was sure that the teacher or tutor could carry out the task correctly.

Procedure

Data gathering was carried out by four postgraduate students, trained and accompanied by one of the researchers. The participants completed the tests in their classrooms on 2 different days, in two 2-hr sessions per day, with a rest period between the sessions. The teachers sent in their responses to the achievement evaluation scale a few weeks later. Specially trained postgraduate assistants administered the tests in February and March of 1993, and we received the students' achievement scores about 1 month later. The family atmosphere evaluation presented one important problem: Administration of the

test turned out to be too difficult, mainly because of the doubts expressed by some students about some of the scale items (the evaluators offered the appropriate explanations).

Statistical Analyses

We used structural equation modeling (LISREL 8; Jöreskog & Sörbom, 1996) to evaluate the general hypothesis of the relation between parental involvement, students' aptitudinal and motivational characteristics, and academic achievement. On the basis of the results of the aforementioned research, we developed a set of causal relationship hypotheses that connected family, personal, and academic achievement variables.

Model to be contrasted. We designed a model with latent variables (estimated by means of various indicators) that included a measurement model that allowed us to obtain the values of the latent variables and a model of causal relationship that allowed us to understand the relationship among the latent variables. The characteristics of this model can be seen in Figure 1.

We included 19 observed measurements or indicators in the measurement model, from which we inferred the five latent variables that made up the structural equation model. We used 13 of the 19 indicators to estimate the dependent latent variables of the model (causal attribution, aptitude, self-concept, and academic achievement), and the remaining 6 were indicators of the independent latent variable (parental involvement). Because we were mainly interested in examining causal relations among the latent variables, we assumed no restrictions about the invariance of their measuring indicators (i.e., factor loadings of the observed indicators were allowed to vary freely). In the initial model, no relationship was assumed between the measurement errors of the observed variables or indicators, but these correlations were included in the respecifications carried out on the model. We did this because the indicators of each of the latent variables were obtained from our using the same instrument (e.g., the total score of the subscales). In the respecifications of the model, an indicator could not be accounted for by more than one observed variable, like the pure measurement model.

We established that parental involvement (ξ_1) would significantly and positively influence the kind of causal attributions (η_1) that children make about their self-concept (η_2) and academic achievement (η_3) in our model of causal relations. We did not hypothesize a direct effect on academic achievement (η_4) among the latent variables, because, according to the reviewed research, this effect would be indirect via personal variables. However, in accordance with previous research, we assumed that the kind of causal attributions made by students (η_1) would directly and significantly influence their self-concept (η_2) and indirectly affect their academic achievement (η_4). Academic aptitudes (η_3) would have a direct and signif-

icant effect on causal attributions (η_1) about the students' self-concept (η_2) and their academic achievement (η_4). Last, we hypothesized that students' self-concept (η_2) would significantly affect their academic achievement.

Considering that some data support the hypothesis of causal relationship in directions opposite to those established in the model presented in Figure 1—and even reciprocal relations (e.g., between causal attributions and self-concept, or between self-concept and academic achievement)—we proceeded to contrast two alternative models involving these other possible causal relations after we contrasted the initial theoretical model.

We initially tried to include the results of attribution of success and failure to internal causes, like SAS situations that involve success or failure, as indicators of the causal attribution variable. However, this model was tested and fit poorly in the estimation of the corresponding latent variable (negative value), making it infeasible. Consequently, the model shown in Figure 1 includes the estimation of η_1, on the basis of four indicators related to causal attribution in successful academic situations (Table 1). To obtain information about the relation of causal attribution in academic situations involving failure, we contrasted a similar model that differed in the observed indicators of this variable (Table 2). We discuss this in the following section.

The evaluation of the theoretical and the alternative models was based on the analysis of the goodness of fit of the models (theoretical and empirical) and on the extent to which the hypotheses about causal relations among the variables were confirmed. To evaluate the goodness of fit of the models, besides presenting the goodness-of-fit index (GFI), the comparative fit index (CFI), and the root mean square residual (RMR), according to the work by Marsh and Balla (1994); Marsh, Balla, and Hau (1996); and Marsh, Balla, and McDonald (1988), among others, we also used the Tucker–Lewis index (TLI), which involves using null models. We used goodness-of-fit measurements that do take into account the number of estimated parameters, such as the adjusted goodness-of-fit index (AFGI) and the root mean square error of approximation (RMSEA) because the GFI and the RMR do not take into account the number of parameters estimated in the model and the model's goodness of fit improves as the number of estimated parameters increases. We used a standardized solution of the values of the parameters obtained.

Results

The model in Figure 1—using causal relations with latent variables—consisted of two parts: a measurement model and a causal relations model. We present the fundamental data, because the final fit of the global model depends on the precision of the measurement model even though analyzing the characteristics of the measurement model was not our main goal.

TABLE 1
Correlation Matrix, Means, and Standard Deviations for Model a

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	X1	X2	X3	X4	X5	X6
Y1	—																		
Y2	.60	—																	
Y3	.51	.38	—																
Y4	.27	.56	.48	—															
Y5	.58	.41	.15	.00	—														
Y6	.28	.26	.54	.30	.28	—													
Y7	.41	.36	.44	.23	.58	.63	—												
Y8	.24	.12	.10	.07	.37	.27	.32	—											
Y9	.29	.20	.10	.04	.39	.20	.38	.48	—										
Y10	.35	.27	.19	.13	.44	.22	.42	.47	.60	—									
Y11	.44	.31	.25	.05	.55	.34	.60	.41	.46	.46	—								
Y12	.38	.29	.37	.17	.48	.52	.67	.35	.48	.44	.77	—							
Y13	.39	.26	.26	.07	.52	.42	.64	.43	.52	.48	.82	.86	—						
X1	.32	.35	.30	.16	.43	.32	.57	.18	.30	.38	.50	.50	.47	—					
X2	.16	.30	.25	.32	.07	.19	.25	−.01	−.06	−.04	.10	.13	.05	.23	—				
X3	.15	.24	.25	.28	.12	.23	.31	.07	−.03	.06	.07	.15	.06	.27	.71	—			
X4	.40	.37	.37	.20	.53	.45	.73	.20	.30	.31	.54	.57	.56	.65	.43	.41	—		
X5	.30	.27	.24	.13	.42	.37	.65	.12	.31	.23	.49	.50	.51	.47	.41	.42	.75	—	
X6	−.01	−.01	−.00	.02	.02	.07	.08	−.12	−.11	−.12	−.05	.00	−.07	.14	.43	.44	.31	.40	—
M	2.93	3.38	3.42	3.74	3.45	3.89	4.25	27.92	19.61	18.27	2.82	3.05	3.15	4.32	3.93	4.02	3.59	3.92	3.21
SD	1.17	.95	.93	.87	1.33	.91	1.00	6.56	6.88	6.05	1.04	1.01	1.00	.48	.62	.61	.64	.62	.72

Note. Family variables: X1 = achievement expectations, X2 = help, X3 = interest, X4 = capacity expectations, X5 = satisfaction, X6 = reinforcement. Personal variables: Y1 = capacity as cause of success in mathematical tasks, Y2 = effort as cause of success in mathematical tasks, Y3 = capacity as cause of success in verbal tasks, Y4 = effort as cause of success in verbal tasks, Y5 = mathematical self-concept, Y6 = verbal self-concept, Y7 = self-concept in remaining areas, Y8 = verbal aptitude, Y9 = reasoning aptitude, Y10 = calculus aptitude. Achievement Variables: Y11 = mathematical achievement, Y12 = verbal achievement, Y13 = global achievement in remaining areas.

TABLE 2
Correlation Matrix, Means, and Standard Deviations for Model b

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	X1	X2	X3	X4	X5	X6
Y1	—																		
Y2	.39	—																	
Y3	.16	.27	—																
Y4	.18	.60	.31	—															
Y5	−.70	−.20	−.09	−.07	—														
Y6	−.25	−.13	−.41	−.23	−.28	—													
Y7	−.49	−.24	−.33	−.13	.58	.63	—												
Y8	−.30	−.03	−.04	.06	.37	.27	.32	—											
Y9	−.35	−.08	.02	.08	.39	.20	.38	.48	—										
Y10	−.41	−.06	−.10	.05	.44	.22	.42	.47	.60	—									
Y11	−.49	−.18	−.04	.01	.55	.34	.60	.41	.46	.46	—								
Y12	−.38	−.18	−.11	−.02	.48	.52	.67	.35	.48	.44	.77	—							
Y13	−.39	−.21	−.09	−.03	.52	.42	.64	.43	.52	.48	.82	.86	—						
X1	−.32	−.10	−.12	.02	.43	.32	.57	.18	.30	.38	.50	.50	.47	—					
X2	−.11	−.09	.06	−.09	.07	.19	.25	−.01	−.06	−.04	.10	.13	.05	.23	—				
X3	.08	−.07	−.11	−.02	.12	.23	.31	.07	−.03	.06	.07	.15	.06	.27	.71	—			
X4	−.49	−.26	−.15	−.13	.53	.45	.73	.20	.30	.31	.54	.57	.56	.65	.43	.41	—		
X5	−.40	−.27	−.17	−.14	.42	.37	.65	.12	.31	.23	.49	.50	.51	.47	.41	.42	.75	—	
X6	−.16	−.13	−.07	−.09	.02	.07	.08	−.12	−.11	−.12	−.05	.00	−.07	.14	.43	.44	.31	.40	—
M	3.02	2.95	2.48	3.30	3.45	3.89	4.25	27.92	19.61	18.27	2.82	3.05	3.15	4.32	3.93	4.02	3.59	3.92	3.21
SD	1.03	.75	.82	.76	1.33	.91	1.00	6.56	6.88	6.05	1.04	1.01	1.00	.48	.62	.61	.64	.62	.72

Note. Family variables: X1 = achievement expectations, X2 = help, X3 = interest, X4 = capacity expectations, X5 = satisfaction, X6 = reinforcement. Personal variables: Y1 = capacity as cause of success in mathematical tasks, Y2 = effort as cause of success in mathematical tasks, Y3 = capacity as cause of success in verbal tasks, Y4 = effort as cause of success in verbal tasks, Y5 = mathematical self-concept, Y6 = verbal self-concept, Y7 = self-concept in remaining areas, Y8 = verbal aptitude, Y9 = reasoning aptitude, Y10 = calculus aptitude. Achievement Variables: Y11 = mathematical achievement, Y12 = verbal achievement, Y13 = global achievement in remaining areas.

Adequacy of the Measurement Models

The first step when analyzing a measurement model is to examine the squared multiple correlation (R^2) for each observable variable, as well as the coefficient of determination for the set of observable variables. The measurement error (uniqueness) is shown in Table 3. R^2 is the difference between 1 and this value.

As seen in Table 3, two of the six measurement variables that made up the parental involvement construct were very reliable (PIN4–capacity expectations, and PIN5–satisfaction), one (PIN1–achievement expectations) was moderately reliable, and the three remaining variables (PIN6–rewards, PIN2–help, and PIN3–interest) were not reliable. This is perhaps due to some participants' difficulty in understanding some of the items of the parent involvement survey. Altogether, the six variables can be considered an adequate instrument to measure the latent variable of parental involvement, because the coefficients of determination were very high[2]; that is, the latent variable parent involvement accounted for 96.8% and 97.3% of Models a and b, respectively, of the total variability in the six measurements)[3]. Four aspects of the remaining variables of the model (dependent latent variables) were striking. First, the measurements of attribution of failures to lack of capacity or to lack of effort, in mathematics and in verbal material (CAT2, CAT3, and CAT4, with the exception of CAT1), revealed a significant percentage of measurement error. Second, the measurements of self-concept (ASC1, ASC2, and ASC3) were less reliable than expected, although their values were generally acceptable. Third, the measurements of academic aptitude (AAP1, AAP2, and AAP3) and of achievement (ACH1, ACH2, and ACH3) showed high reliability. Fourth, considered jointly, these 13 variables form an adequate instrument to measure the four constructs or latent variables, because the coefficients of determination revealed values of .999 in both models (a and b).

Factor loadings were high or acceptable in nearly all cases, except in those corresponding to causal attribution processes, particularly those regarding the estimation of Model b, and the PIN6 (paternal rewards) and PIN2 (paternal help) variables. In summary, the model of measurement can be considered adequate from the data displayed in Table 3, as well as the values of the coefficients of determination. Therefore, it is valid for estimating the values of the latent variables, which is the essential principle for subsequent estimation of relations among the previously mentioned constructs.

Goodness of Fit of Overall Models and Individual Parameters

Table 4 displays the data about the goodness of fit of the hypothesized model, according to the empirical data gathered from the two samples of students. This table displays the chi-squared measurements with the associated degrees of freedom and probability level, GFI, AGFI, CFI, RMR and RMSEA, together with

TABLE 3
Pattern of Estimated Parameters for Measurement Model of Hypothesized Model

Measure	Error/ Uniqueness		Parental involvement (ξ_1)	Causal attribution (η_1)		Self-concept (η_2)		Academic aptitudes (η_3)		Academic achievement (η_4)	
Lambda *X* (λx)											
PIN1	.51 (.51)	.70	(.70)								
PIN2	.84 (.85(	.40*	(.39*)								
PIN3	.81 (.82)	.43*	(.43*)								
PIN4	.16 (.15)	.92**	(.92**)								
PIN5	.33 (.34)	.82**	(.81**)								
PIN6	.98 (.98)	.15	(.15)								
Lambda *Y* (λy)											
CAT1	.24 (.22)			.87	(.86)	.000	(.000)	.000	(.000)	.000	(.000)
CAT2	.52 (.79)			.69**	(.45**)	.000	(.000)	.000	(.000)	.000	(.000)
CAT3	.63 (.94)			.61**	(.24**)	.000	(.000)	.000	(.000)	.000	(.000)
CAT4	.91 (.95)			.30**	(.22**)	.000	(.000)	.000	(.000)	.000	(.000)
ASC1	.53 (.55)			.000	(.000)	.69	(.67)	.000	(.000)	.000	(.000)
ASC2	.75 (.73)			.000	(.000)	.50**	(.52**)	.000	(.000)	.000	(.000)
ASC3	.23 (.24)			.000	(.000)	.87**	(.87**)	.000	(.000)	.000	(.000)
AAP1	.61 (.61)			.000	(.000)	.000	(.000)	.63	(.62)	.000	(.000)
AAP2	.40 (.40)			.000	(.000)	.000	(.000)	.77**	(.78**)	.000	(.000)
AAP3	.41 (.41)			.000	(.000)	.000	(.000)	.77**	(.77**)	.000	(.000)
ACH1	.25 (.25)			.000	(.000)	.000	(.000)	.000	(.000)	.87	(.87)
ACH2	.19 (.19)			.000	(.000)	.000	(.000)	.000	(.000)	.90**	(.90**)
ACH3	.11 (.10)			.000	(.000)	.000	(.000)	.000	(.000)	.95**	(.95**)

Note. Standardized solution. Values without parentheses correspond to the model of attribution of success. Values in parentheses correspond to the model of attribution of failure (see SAS). The first value of each factor is fixed as a reference variable (they were fixed at 1.00), which means that we were unable to estimate their significance (*t* values). The measurement errors of the observed variables (uniqueness) were all at the significance level of $p > .001$. Significant correlated uniqueness are not presented here because of lack of space. PIN = Parental Involvement. CAT = Causal Attributions. ASC = Academic Self-Concept. AAP = Academic Aptitudes. ACH = Academic Achievement (in Figure 2 the nature of the 19 observed variables is described).
*$p < .01$. **$p < .001$.

TABLE 4
Goodness-of-Fit Indexes for Latent Variable Models

Model	X^2	*df*	X^2/df	*p*	GFI	AGFI	CFI	TLI	RMR	RMSEA
				Model a (attributions in successful situations)						
Null model	3,204.87	171	18.70							
Initial theoretical model	849.07	143	5.93	.00	.74	.66	.79	.72	.11	.14
Final model	233.08	124	1.87	.00	.91	.87	.96	.95	.07	.05
Alternative model (a1)	233.08	124	1.87	.00	.91	.87	.96	.95	.07	.05
Alternative model (a2)	233.08	124	1.87	.00	.91	.87	.96	.95	.07	.05
				Model b (attributions in failure situations)						
Null model	5,738.62	171	33.50							
Initial theoretical model	789.74	143	5.52	.00	.76	.68	.78	.82	.13	.13
Final model	224.19	124	1.80	.00	.92	.87	.96	.97	.07	.05
Alternative model (b1)	233.28	124	1.87	.00	.91	.87	.96	.97	.07	.05
Alternative model (b2)	233.28	123	1.89	.00	.91	.87	.96	.97	.07	.05

Note. GFI = goodness-of-fit index. AGFI = adjusted goodness-of-fit index. CFI = comparative fit index. TLI = Tucker-Lewis index. RMR = root mean square residual. RMSEA = root mean square error of approximation.

other extensively used goodness-of-fit indexes (χ^2/df ratio and TLI)[4]. Because of the poor fit of the two initial models, we respecified and reestimated the goodness of fit of the alternative models (sensitivity analysis). An essential criterion at this point was that the critical hypotheses of the initial model not be affected[5]. Given that most of the respecifications carried out on the initial models referred to the estimation of the correlation between some measurement errors in the observed variables (measurement model), the final models did not differ significantly from the initial models.

At first glance, the results indicated that the correlation between some measurement errors of certain observed variables of the measurement model lead to a poor fit of the hypothesized model (see Figure 1) and the data obtained in the sample. After the respecifications, the final models (Models a and b with respecifications) were obtained. The models presented goodness-of-fit indexes that were very high (i.e., TLI = .95 for Model a and TLI = .97 for Model b) and residuals within acceptable limits, RMSEA of .058 in Model a and of .056 in Model b. Browne and Cudek (1993) stated that values in the range of 0 to 0.08 for RMSEA reflect acceptable error, whereas values greater than 1 suggest severe problems with the model). We achieved the fit of the hypothesized model to the data from the two groups without modifying any of the critical initial relations of the theoretical model. This was interpreted as providing substantial support to the initial theoretical model, which was based on data from previous research.

We now discuss the results relating to the specific hypotheses formulated when developing the theoretical research model. Figures 2 and 3 display the data required to examine these hypotheses.

FIGURE 2. Path coefficients of critical causal paths for latent variable model when the causal attributions are made about successful situations (in the SAS).

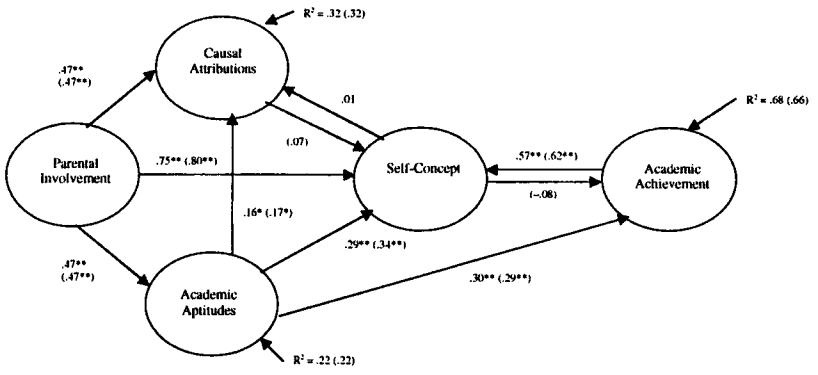
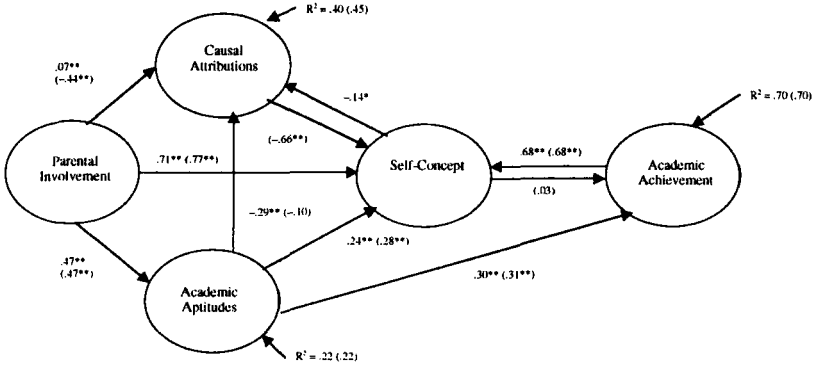


FIGURE 3. Path coefficients of critical causal paths for latent variable model when the causal attributions are made about failure situations (in the SAS).



The following are the results from the "model to be contrasted" subsection. First, we confirmed the hypothesis positing a significant positive and direct effect[6] of parental involvement on children's academic self-concept in Models a and b: The more parental involvement, the more positive was children's academic self-concept, and vice versa. We also confirmed the hypothesis positing a positive effect of parental involvement on causal attributions about academic results: The more parental involvement, the higher was children's tendency to internalize or accept responsibility for the results of their academic behavior, and vice versa. However, we confirmed that the relationship was negative in Model b: The more parental involvement, the lower was children's tendency to ascribe their results to external causes. Even the hypothesis positing a positive effect of parental involvement on children's academic aptitudes was confirmed: The more parental involvement, the better were children's academic aptitudes, and vice versa. We also confirmed the absence of a direct effect of these parental behaviors on academic achievement, which appeared clearly in the data from both models.

Second, the data we obtained when contrasting the theoretical model partially confirmed the hypothesis stating that children's academic aptitudes would significantly and positively affect their academic achievement directly and indirectly, via their significant, positive, and direct effect on academic self-concept. We considered this a partial confirmation because academic aptitudes also seemed to influence causal attribution processes significantly (the higher the aptitude level, the higher was the tendency to accept responsibility for academic results, and vice versa, as shown in Model a, or, the higher the academic aptitudes, the lower was children's tendency to ascribe academic results to external causes, as shown in Model b).

Third, the data we derived from contrasting Model a (successful situations, Figure 2) did not support the hypothesis positing that causal attribution processes would exert significant influence on academic self-concept ($\beta = .01$, $t = .22^{7}$), although this did occur in failure-situations, Model b ($\beta = -.14$, $t = -2.08$), as shown in Figure 3. Data from other studies indicate that self-concept can, in turn, influence causal attribution processes. Therefore, we proceeded to contrast alternative models (a1 and b1), in which we assumed a reciprocal relationship between these two variables. The results indicate that, in successful situations (Model a1), the influence of self-concept on causal attribution was not statistically significant ($\beta = .07$, $t = .23$), although it did reveal strong influence in failure-situations ($\beta = -.66$, $t = -7.51$).

Fourth, the data we obtained confirmed the hypothesis that posited that the students' academic self-concept would significantly account for their academic achievement. The relation was positive and statistically significant ($\beta = .57$ in Model a, shown in Figure 2, and $\beta = .68$ in Model b, shown in Figure 3), which means that the more positive the students' self-concept was, the higher their academic achievement was, and vice versa; the more negative it was, the lower their academic achievement was. In the case of the relation between self-concept and achievement, because some research supports the hypothesis of a reciprocal relationship between both variables, we proceeded to contrast this hypothesis (alternative Models a2 and b2) with the results obtained. Our findings indicate that achievement did not influence self-concept, either in Model a2 ($\beta = -.08$, $t = -.91$) or in Model b2 ($\beta = .03$, $t = .16$). Consequently, our data indicate that the influence is unidirectional—from academic self-concept to achievement.

Fifth, it is noteworthy that, in both models (a and b), the extent of the influence of academic self-concept on achievement ($\beta = .57$ and $\beta = .68$ in Models a and b) is considerably higher than that of aptitudes on achievement ($\beta = .30$ in both models).

Last, the variables included in the model accounted for a great part of academic achievement (68% and 70% in Models a and b). Parental involvement accounted for much of children's academic self-concept (it accounted for most of the 87% and 88% of the variance of self-concept in Models a and b).

Results and Discussion

We believe that the results derived from this investigation clearly support the thesis that parental involvement behaviors significantly affect children's academic achievement. Our results coincide with Patrikakou (1996). However, this influence is not direct, as would seem logical. On the contrary, it is indirect, via the influence of these behaviors on children's personal variables, such as their self-concept and self-esteem as students, their typical causal-attribution patterns in specific academic success and failure situations (i.e., exam results), and their

aptitudinal competence for academic learning. Our results are similar to those obtained by other researchers (i.e., Anderson & Keith, 1997; Bempechat, 1990; Castejón & Pérez, 1998; Fantuzzo, Davis, & Ginsburg, 1995; Hokoda & Fincham, 1995; Keith & Keith, 1993; Klebanov & Brooks-Gunn, 1992; Marjoribanks, 1975; Martínez-Pons, 1996; Morvitz & Motta, 1992; Patrikakou, 1996; Reynolds & Walberg, 1992; Veiga, 1997), although it is noteworthy that the effects observed in our work are larger than those found in most of the these studies.

The following are a few other interesting aspects of our findings: (a) Academic self-concept was the variable that was most positively affected by parental involvement; this is relevant because students' self-concept has a powerful effect on academic achievement and (b) the relationship between parental involvement and causal attribution coincides, to some extent, with that obtained by Hokoda and Fincham (1995). In both studies, parents' expectations about their children's capacity were congruent with the kind of causal attributions children make about their own achievements (i.e., the higher the capacity expectations are, the greater is the students' tendency to make internal attributions about success, and fewer internal ones about failure).

Our results, although apparently very consistent, should be accepted with caution, because the information about parental involvement was obtained from the students' responses to a questionnaire, and this kind of information may be different from that obtained directly from parents. Consequently, according to other investigators, we might be observing perceived parental involvement rather than real involvement (as in other works, i.e., Martinez-Pons, 1996). However, in some investigations, involvement reported by parents was distinguished from perception of parental involvement reported by children (i.e., Patrikakou, 1996), revealing that children's perceived parental involvement was significantly related to actual parental involvement, which seems logical to us. Therefore, the method used to obtain the information about parental involvement should be taken into account when others generalize our results. Further research about the validity of this kind of measuring strategy would be appropriate. More information, though, is required about this measuring strategy, as well as about other variables, using different instruments (i.e., self-reporting, observation techniques, interviewing, etc.), especially when using analyses that include variables inferred from observed measurements, such as those used in this investigation.

In this study, we obtained information only about the relevance of parental involvement to account for modifications observed in adolescents' personal variables (self-concept, causal attribution, aptitudes) and academic achievement. It would be interesting for future researchers to pay attention to socialization processes responsible for the relations found in this study (i.e., Wentzel, 1999). To have precise information about the way children become aware of, for example, the variables under study and which parent–child interaction pattern favors or limits the formation of these perceptions would promote the development of

programs to educate parents. These programs would improve the level of the family–school relationship through higher parental involvement (i.e., Steinberg, 1996). As expected, we observed that the level of academic aptitudes accounts for part of academic achievement. However, our main interest was to relate (within one model) this variable—clearly belonging to the capacity area—with other variables, related not to capacities but to the affective and motivational dimension (causal attributions and self-concept). Our results in both models reveal that, in learning and academic achievement, self-concept is at least as important as aptitudes, if not more so. This finding is noteworthy because it reveals how important motivational variables are in accounting for academic achievement in adolescence. In this vital stage, self-image and attribution processes, and the motivation that emerges from them, play a primary role in determining academic achievement, a much more powerful role than that of aptitude. However, future researchers should study the relationship between these variables by using capacity measurements that are in accordance with current intelligence theories, as well as from a longitudinal perspective.

The results regarding the relation between causal attribution processes and academic self-concept are quite interesting. Whereas no statistically significant relation was observed in success situations, we did find a statistically significant, negative, and reciprocal influence in failure situations. Our current data indicate that, when faceted with positive results, self-schema does not condition the search-for-causality process, nor does the perceived cause condition the immediate level and sign of self-concept. However, when accounting for failure, we observe that the result of the attribution process significantly influenced the self-schema ($\beta = -.14$, $t = -2.08$), indicating that the more responsibility for failures that a person accepts, the lower the individual's self-concept will be, and vice versa. Nevertheless, we observed in failure situations that the existing self-schema (the current self-concept) notably conditioned ($\beta = -.66$, $t = -7.51$) the causal attribution process, which indicates that the more positive the current self-concept, the less chance there is of assuming responsibility for failure, and vice versa.

These data are along the lines of Covington's self-worth theory (1992). In Spanish society, as in others, there is tendency to equate personal value with achievement. Covington and Teel (1996), described a good example of most classes in the educational centers of our country. In such a competitive context, one could assume that few of our students are successful, and therefore, "rather than striving for success, many children are forced to avoid failure, and if they do fail, they may feel compelled to avoid the implications of failure by giving excuses" (Covington & Teel, 1996, p. 27). These excuses, or motivational strategies (Boekaerts & Niemivirta, 2000; Garcia & Pintrich, 1994), emerge so that children can preserve self-worth and positive self-schemas. The motivational strategies that help regulate motivation by maintaining positive self-worth and influencing the amount of effort expended include self-handicapping, defensive

pessimism, self-affirmation, and attributional style, which regulate different motivational beliefs such as attributions, self-efficacy, and value (Garcia & Pintrich, 1994, p. 135).

However, the importance of our current results is only relative, because in our investigation model, other significant variables, which probably modulate the relationship observed between causal attribution processes and self-concept, were not included. One of these variables is the type of goal (goal orientation) that defines the student's motivation. Goals are cognitive representations of the various aims that students can adopt in different achievement situations. Consequently, the type of orientation assumed at the beginning of an activity creates a framework so that individuals can interpret, assess, and act on the relevant achievement information and experience achievement contexts (Elliot & Harackiewicz, 1996). As Pintrich (2000) suggested,

> Individuals can be positively motivated to try to outperform others and to demonstrate their competence and superiority, which reflects an approach orientation to the general performance goal. In contrast, individuals also can be negatively motivated to try to avoid failure and to avoid looking dumb, stupid, or incompetent, which reflects an avoidance orientation to the performance goal. (pp. 475–476)

Therefore, it is essential to investigate the relationship between self-concept and attribution processes in students oriented toward mastery and in students who are oriented toward performance (mainly in self-oriented students).

We found no statistically significant relationship between the supposed association between attribution of causality (motivation) and academic achievement. These results coincide with those obtained in some works (i.e., Castejón, Navas, & Sampascual, 1996; García, 1998; Platt, 1988) and differ from other authors' results (i.e., Shanahan & Walberg, 1985; Valle et al., 1998). A possible explanation for these differential findings is that only adolescents were studied, whereas university students were used in the investigations in which no direct effect of attribution processes on achievement was found (Valle et al., 1998). That study suggested that the relationship may vary with the participants' age. However, our results, although congruent with those of other investigations, should be treated cautiously because the measures used to assess causal attributions (Table 3: CAT1, CAT2, CAT3, and CAT4) showed low reliability. Therefore, additional research is required to address this issue. Nevertheless, even Weiner (1992) pointed out that, unfortunately, research based on achievement motivation does not offer conclusive proof to support the complete attribution theory.

Our results are similar to those from most studies as far as the relationship between academic self-concept and achievement is concerned, because a strong relationship was observed in both Model a and Model b. Considering the data from contrasting Models a and b, and the alternative Models a2 and b2, our results indicated a unidirectional model, in which the influence of academic self-concept on academic achievement was statistically very significant ($\beta = .62$ in

Model a2 and $\beta = .68$ in Model b2). These results apparently coincide with those from other investigations (i.e., Shavelson & Bolus, 1982; Valle et al., 1998; or those of Patrikakou, 1996—although the magnitude of the relationship in this latter study was very small). However, our results could be conditioned by the kind of design used. In all the aforementioned cases, data were gathered by a transversal strategy, which could have a striking influence on the kind of results obtained. In fact, investigations using a longitudinal design (i.e., Helmke & van Aken, 1995; Marsh, 1990; Marsh & Yeung, 1997; Skaalvik & Hagtvet, 1990) showed evidence of a model of reciprocal relations between self-concept and academic achievement.

At the International Conference on Motivation: 6th Workshop on Achievement and Task Motivation, held in Greece, the results of various investigations were presented (i.e., Núñez et al., 1998a), in which the relationship between self-concept and academic achievement as a function of a longitudinal strategy (two measurements of each variable, with a 1-year interval) was studied. In general, besides confirming a reciprocal relations model, the results seemed to indicate that self-concept is causally predominant over immediate academic achievement, whereas the relevance or influence of achievement would be on a long-term basis. In other words, the level of academic self-concept is a powerful motivational force that accounts for students' immediate achievement. However, this level of achievement does not immediately affect students' self-concept, but rather appears to be an important source of information that shapes self-concept on a long-term basis only (a 1-year interval in this study). This seems reasonable from the point of view of personal stability (González-Pienda et al., 1997).

Finally, what use is the contrasted model? What does this model recommend for educational practice at home, at school, for educational policy, or elsewhere? Of the 14 principles elaborated by the American Psychological Association Board of Educational Affairs in December 1995 to facilitate the educational reformation, the 6th principle is one of the most important: "Learning does not occur in a vacuum." The results of our research (and many others) reveal the need to create models of psychological performance in the classroom that incorporate the various contexts that affect performance. In this sense, the motivational–cognitive models that are currently guiding research on learning in the classroom should evolve toward contextual motivational–cognitive models. These models should include as significant variables the crucial dimensions of these contexts (like family, peers, and school; Bronfenbrenner, 1986). According to our results, the more involved parents are in their children's education, the better personal conditions (self-concept, expectancy of control, responsibility for successes and failures derived from causal attributions, etc.) these students' ability to cope with learning at school will be. Nevertheless, many fathers and mothers believe that only the school is responsible for teaching their children and that their children's education does not depend at all on them.

Common sense and the large amount of available data (including the data from this study) indicate that the family is one of the most important contexts in which a child forges his or her self, developing a system of attitudes toward various environments to relate to school and learning, enhancing motivation, interest (or lack thereof) in learning, among other things. Without the children's family support, it is hard for teachers to devise academic experiences to help students learn meaningful content. For example, the results of a recent study (González-Pienda et al., 2000) indicate that, in the same classroom, with the same classmates and the same teachers, the students whose parents were significantly involved in modeling the process of self-regulation of learning obtained much higher grades than the students whose parents showed very low levels of involvement. We agree with Fantuzzo, Tighe, and Childs (2000) that future researchers should focus on identifying the variables that characterize a dynamic, meaningful, and reciprocal relationship between the home and school.

Within the school setting, even when parents are positively involved in helping their children to develop the motivational, affective, and attitudinal conditions necessary for optimal learning, teachers should bear in mind that students' self-confidence will condition their involvement in learning situations. Our results show that self-confidence accounts for more than twice as much of the variability in achievement as student capacity. Therefore, a learner's contribution to a learning situation is not exclusively limited to his or her available skills, but also involves motivational, affective, and emotional aspects related to personal equilibrium capacities. Thus, as students develop meanings about the material that they are learning, they also create representations of their didactic situation, which can be seen as stimulating and interesting, or as overwhelming and unachievable. Students also build self-representations in which they can perceive themselves as competent persons, as interlocutors for their teachers and classmates, as capable of coping with whatever problems may arise, or, on the contrary, as unskilled, incompetent persons with few resources. Thus, as Solé (1993) stated, when students learn, they learn the curricular content, but they also learn that they are capable of learning; when they do not learn the content, they also learn something else: that they are incapable of learning.

In this sense, the practice of learning should be designed and planned with the aim of helping students become self-confident learners (self-perceived competence in academic learning) while they learn the curricular contents of the various academic courses. McCombs (1991) and Whisler (1991) each proposed a model of classroom intervention that focuses on the development of motivation and higher order thinking, on the basis of three components: will, skill, and social support. According to this model, three aspects should be developed in the classroom: (a) students' metacognitive awareness and predisposition to use higher order thinking processes, including comprehension of thinking and of the self as an agent in the learning process; (b) personal relevance and meaning of instruc-

tion materials, which should be similar to the students' own learning experiences and way of thinking; (c) instructional settings in an atmosphere of positive socioemotional support, taking into account students' and teachers' social relationships and reciprocal interaction factors. This means that teachers should consider their students' needs and interests and should help them define their personal goals. Teachers should plan the learning experience so their students will perceive themselves as efficient individuals, through their own effort and responsibility for the learning process. Teachers should also help their students to perceive themselves as being in control of the task, and they should administer a system of fair rewards oriented toward effort.

NOTES

1. In various studies about family and family involvement in children's education, we found different approaches to the term *parental involvement* (PI). Epstein (1987) identified five main types of PI: (a) parents who take care of children's basic needs (i.e., food, clothing, books, etc.), (b) parents who communicate with the school to receive basic information about programs; (c) parents who participate in school activities; (d) parents who participate in children's homework, also offering information about homework (i.e., feedback, rewards, etc.); and (e) parents who are involved in the management of the school. In our investigation, we worked with the fourth kind of PI, because it seems to be a type of involvement that is closely related to academic results (Miller & Kelley, 1991).

2. Byrne (1989) stated that "the coefficient of determination is an indication of how well the observed variables, in combination, serve as measuring instruments for all the latent variables jointly; it is a generalized indicator of reliability for the entire measurement model" (p. 54).

3. Models in which the "causal attribution" variable is inferred from four measurements of causality regarding tasks or situations (items from the Sydney Attribution Scale) involving success (Model a) or failure (Model b).

4. Marsh, Balla, and McDonald (1988) and Marsh and Yeung (1997) recommended using other goodness-of-fit indexes, such as the Tucker-Lewis index (TLI) although it is a similar alternative to the GFI or AGFI. Byrne (1989), as well as these authors, also frequently use the ratio χ^2/df, as another goodness-of-fit index. Data of the corresponding null models, required to calculate the TLI, are offered.

5. Although some authors criticize this procedure, other important researchers, such as Byrne, Shavelson, and Muthén (1989), stated that this strategy can be relevant if the investigator is aware that, from the first respecification, his or her analysis becomes exploratory and the results must be contrasted by testing the model in other independent samples. Anderson and Gerbing, (1988) pointed out that this type of sensitivity analysis is necessary in psychological research.

6. Although we realize that, even in structural equation analysis, to talk about causality or the effect of one variable on another is not quite correct (it is only possible when data are obtained using an experimental design), we use these terms to facilitate the comprehension of the models and the data included in them.

7. *t* values in LISREL output.

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