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Intra-Group Motivational Analysis of Students with Learning Disabilities: A Goal Orientation Approach

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The purpose of the present study was to profile, using a K-means cluster analysis, the cognitive, motivational, affective, and goal orientation characteristics of elementary school students with and without learning disabilities (LD). Participants were 58 fifth and 6 sixth graders (29 typical and 29 LD) selected using stratified random procedures. Results indicated that there were statistically significant differences between the two groups of students across all variables with the exception of task avoidance and positive social experiences orientations. Within groups analyses suggested the presence of three reliable clusters: (a) Amotivated/Disengaged-Low Achievers, (b) Motivated-High Achievers, and (c) Avoidant/Uncommitted-Low Achievers, representing 100% of the participants. Subsequent discriminant analyses verified the presence of the three clusters producing correct classification rates for 97% of the participants who belonged to the three clusters. Results indicated that most of the LD students belonged to the third cluster and their lower achievement could be well attributed to their orientation toward avoidance and to their general lack of motivation. It is concluded that students with LD may have 'ill' motivational strategies, and they resemble the learned helpless type described by Seligman (Seligman, 1975) due possibly to exposure to repeated failure.

The practice of inclusion has been in existence since 1975 (i.e., P.L. 94-142). In an inclusive setting students with learning disabilities (LD) are faced with many more challenges than are their non learning disabled classmates, including those of academic, social, and emotional origin. According to the federal definition of learning disabilities, students with LD have difficulties in understanding or in using language, which may manifest themselves in an inability to listen, think, speak, read, write, spell, or do math computations. According to the present definition, at least two other important components remain unaddressed. One is heterogeneity, which, at times, inhibits attempts to generalize findings to the population of learning disabled students. The second is lack of motivation, which has long been advocated to be a significant factor contributing to low achievement, but rarely has systematically been studied (Sabatino, 1982). The purpose of the present study is to address both concerns.

More than 20 years ago, Schere, Richardson and Bialer (1980) stated that learning disabilities is the most confusing and disorganized area in child psychology because this population has been treated as a homogeneous group. Torgesen and Dice (1980) stated that although heterogeneity in the learning disabled is widely acknowledged, researchers are not designing interventions in response to this fact. In a review of 90 studies, Barclay and Hagen (1982) found none that systematically addressed the issue of heterogeneity. An important implication of heterogeneity is that it limits generalization and replicability of research findings (Kavale & Forness, 1987). Several theorists (e.g., Kavale & Forness, 1987) proposed that variability within the population of learning disabled students may reflect the existence of distinguishable subtypes. As Coplin and Morgan (1988) nicely stated: "Subtypes would include distinctive characteristics and antecedent conditions that consistently predict specific patterns of learning difficulties. A taxonomy of subgroups of learning disabled would provide a conceptual basis for intervention strategies and for research on the effectiveness of treatment" (p. 614). Pintrich, Anderman and Klobucar, (1994) added that the classification of students with learning disabilities into subgroups provides a richer description of learning disabilities particularly if it is based on the integration of both cognitive and motivational variables. Furthermore, the identification of subgroups would provide a qualitative (as well as a quantitative) description of student characteristics, and the essence of these subgroups can be validated using external criteria. Previous research on classifications most included cognitive (Borkowski, Carr, Rellinger, & Pressley, 1990), behavioral (Bender & Golden, 1990), personality (Fuerst, Fisk, Rourke, 1990) or neuropsychological (Williams, Gridley, & Fitzhugh-Bell, 1992) variables alone. Examination of the presence of subgroups in the learning disabled population will provide a better description of them and the variability within them, and may be more useful in the development of effective interventions, particularly if variables come from different theoretical orientations.

As mentioned above, heterogeneity may be one impediment to understanding and intervening in the academic deficits of students with LD; another may be narrow focus. For example, interventions that target behavior change at the molecular level of analysis fail to view the 'whole' person, and among other shortcomings they may fail to provide clues as to etiology or they may fail to generalize. Advocates of a wholistic/ multidimensional approach to learning (e.g., Adelman & Taylor, 1983; Coplin & Morgan, 1988; Pintrich et al., 1994) suggested that in order for researchers to understand the ori-

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gins of underachievement in the learning disabled, they need to incorporate in their studies factors that cross the boundaries of various theoretical schemata (e.g., proximal or distal, extra- or intra-individual.). One significant factor, that has been long advocated to be an enhancer of academic achievement for students with LD is student motivation (e.g., Adelman & Taylor, 1983; Kavale & Forness, 1987), although a relatively small portion of the empirical research literature on the learning disabled has been devoted to this topic (e.g., Grolnick & Ryan, 1990).

As early as 1971, Kubany and Sloggett suggested that procedures for the assessment of students with LD should incorporate measures of extrinsic motivation in order to differentiate students with LD from those who perform poorly because of low intrinsic motivation. They added that these latter students could be misplaced in low ability or learning disability classrooms. Thus, Kubany and Sloggett made a case for the powerful effects of motivation. Similarly, other researchers proposed that a learning disability is mainly a problem of motivation and strongly advocated in favor of motivation as an explanatory variable of the low achievement of students with LD (e.g., Adelman & Taylor, 1983). Adelman and Taylor (1983) proposed the development of interventions to enhance student motivation only (as one would attempt to enhance academic achievement). These latter researchers added that academic interventions should always incorporate in their implementation elements of motivation (Adelman, 1978). After 20 years of advocating for the importance of motivation in the field of LD, Taylor and Adelman (1999) concluded that it is ironic that although most teachers recognize the key role of motivation in accounting for poor instructional outcomes, they still cannot incorporate it into their teaching.

Empirical research has indicated that (a) students with disabilities are lacking the motivation necessary to achieve academically in comparison to typical peers (Carr, Borkowski, & Maxwell, 1991; Sideridis, in press; Sideridis, 2002; Sideridis & Padeliadu, 2001), and (b) students with and without disabilities would greatly benefit if motivation were incorporated into teaching (Borkowski et al., 1990). For example, Poonam (1998), in her meta analysis reported seven studies in which the positive effects of intrinsic motivation training on the achievement of students with LD were demonstrated. An important theory of motivation, which has recently proven to account significantly for students' academic outcomes, is achievement goal theory, and is described below as a framework for our understanding of underachievement in the learning disabled.

Achievement Goal Theory and Goal Orientations

Dweck and Legget (1988) proposed that the goals individuals pursue create the framework within which they interpret and react to events (p. 256). Specifically, they distinguished two types of goals: performance goals in which individuals are concerned with gaining favorable judgments of themselves, and learning goals in which individuals are concerned with increasing their skills and competencies. They added that the two different types of orientations are associated with different response patterns. Performance goals involve normative comparisons in which individuals seek to avoid task engagement; they select easy goals and exert minimum effort because they consider effort expenditure to reflect inability to master the material. In contrast, the learning-mastery oriented pattern, involves the seeking of challenges, employment of deep cognitive strategies and the use of motivation (e.g., through increasing effort) in order to master the material for the enjoyment of learning. Nicholls' (1984) presentation of task and ego goals (which are similar to the learning and performance goals described by Dweck and Legget, 1988) included the concept of task avoidance as a means of presenting the least effort with the academic task. Lethwaite and Piparo (1993) added the orientation toward positive social experiences to the tripartite model of mastery-performance-task avoidance orientation of Dweck and Legget (1988) and Nicholls (1984). They labeled this new orientation 'positive social experiences' and they defined it as one's orientation toward the development of social relationships, the importance of achieving those social skills, and the expansion of one's social horizon. They added that this orientation involved being socially accepted and being judged likeable by others.

Research findings on goal orientation have suggested that mastery and performance orientations may represent different approaches to learning and may be associated with different achievement outcomes. For example, a mastery orientation has been linked to high achievement (Meece & Holt, 1993), adaptive learning strategies (Pintrich & DeGroot, 1990), increases in motivation (Elliot, McGregor & Gable, 1999; Pintrich & Schrauben, 1992; Wentzel, 1996), increases in affect (Turner, Thorpe, & Meyer, 1998), and increases in cognitive strategies (Anderman, Griesinger, & Westerfield, 1998; Pintrich & Garcia, 1991). The picture on performance orientation is far from clear. From its conceptualization, a performance orientation has been linked to maladaptive patterns of behavior, learned helplessness, infrequent use of strategies, use of ineffective learning strategies, negative affectivity, and low academic achievement (Greene & Miller, 1996; Pintrich & Garcia, 1991). Recently however, a number of researchers suggested that the negative patterns observed in students having a performance orientation may be premature (Barron & Harackiewicz, 2001; Harackiewicz, Barron, & Ellliot, 1998; Harackiewicz & Elliot, 1993). Depending on the nature of the task, the age of participants and other variables, a performance orientation was associated with positive achievement outcomes and also acted as a positive mediator of other motivational variables (Elliot et al., 1999). Thus, re-examination of the potential role of performance orientations to academic achievement is needed, particularly for students with LD who, by definition, fit the profile of helpless individuals.

More recently, several researchers suggested that a multiple goal perspective may be associated with more positive outcomes compared to those of a mastery or performance orientation alone (Ainley, 1993; Elliot & Church, 1997; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Pintrich, 2000; Wentzel, 1993). The presence of a multiple goal perspective may be explained by Harackiewicz's et al. (1998) suggestions that performance and mastery goals are empirically independent of each other, and that the presence of one set of goals does not imply the absence (or the presence of the opposite effects) for the other type of orientation. Harackiewicz, Barron, Carter, Lehto, and Elliot, (1997) added that because each set of orientations was associated with different outcomes (e.g., performance goals with grades and mastery goals with interest), the presence of both orientations is necessary to attain both outcomes (interest and grades), Earlier, Meece and Holt (1993) reported that a combination of mastery and performance goals was associated with high achievement outcomes; however, those outcomes were inferior to those of a mastery orientation alone.

From the above, it is obviously important to examine how goal orientations, including a multiple goal perspective, and the addition of social goals would relate to the academic achievement of students with and without LD. Conceptually, goal orientations have been linked to a number of important variables, some of which are examined in the present study. For example, a mastery orientation has been linked to increases in self-efficacy and self-regulation, all important cognitions for the attainment of high academic achievement (Meece & Holt, 1993; Turner et al., 1998). From the motivation literature, effort, goal-commitment, and goals have been positively linked to a mastery orientation and negatively to a performance orientation, but both are important intervening variables of academic achievement (Elliot et al., 1999). From affective variables, expectations, valence and motivational force were selected because they were previously reported to be important correlates of achievement (Dachler & Mobley, 1973).

Student expectations were selected as a possible discriminatory variable of goal orientation and achievement. For example, mastery-oriented students may have higher expectations, compared to performance-oriented students, as the former seek difficult, challenging goals compared to performance-oriented students who often choose easy, safe goals/tasks. Thus, it will be of interest to examine how expectations relate to goal orientation and how they relate to the achievement of students with LD. Valence refers to one's desire to achieve the outcomes set by the person, and it has been associated with a mastery orientation (Hollenbeck, Williams, & Klein, 1989). Motivational force is a variable, used primarily in applied psychology. It is the multiplicative term of expectancy by valence, thus, reflecting one's affect toward an activity (Hollenbeck & Williams, 1987). All these sets of variables were examined in relation to goal orientation and for our better understanding of learner types (particularly for students with LD). However, in order to identify learner types, an analytic strategy was required that would allow the formation of groups based on students' intraindividual differences in cognition, motivation, affect, and goal orientation. Such an analytic strategy is cluster analysis.

Cluster Analysis and Past Research on Types of Students with LD

A number of researchers have suggested the use of data analytic strategies that aim at identifying subtypes of children with learning disabilities in order to address the issue of heterogeneity in the LD. Such a method is cluster analysis. For example, Kavale and Forness (1987) suggested that students with learning disabilities could be differentiated from typical students on a wide array of deficits, possibly including linguistic, perceptual, motor, cognitive, motivational factors and they could also be deficient in basic academic skills. D'Amato, Dean, and Rhodes, (1998) added that there is ample evidence that children with learning disabilities do not represent a homogenous group. Attempts to explain or understand learning disabilities from a single point of view have failed to account for the individual differences that are present in the population. According to Pintrich and DeGroot (1990) and Pintrich et al. (1994) the classification of students with learning disabilities into subgroups provides a richer description of learning disabilities, compared to the findings from correlational studies. Unfortunately, previous research that tended to classify students into subtypes of learning disabilities has mostly included cognitive (Borkowski et al. 1990; McKinney, Short, & Feagans, 1985; Ward, Ward, Glutting, & Hatt, 1999), behavioral (Bender & Golden, 1990; Morris et al., 1998; Rourke, 1988), personality (Durrant, Cunningham, & Voelker, 1990; Fuerst et al., 1990; Kline, Lachar, & Boersma, 1993) or neuropsychological variables (Joschko & Rourke, 1985; Williams et al., 1992), without giving consideration to the interaction among cognitions, motivation, affect, and behavior. Thus, one purpose of the present study was to examine differences between students with and without LD in cognition, motivation, affect, and goal orientation. A secondary purpose was to identify patterns of motivation, cognition, goal orientation, affect and achievement and relate these patterns to student membership (typical vs. learning disabled).

Method

Participants and Procedures

During the Fall semester of the 2000-2001 academic year, 58 (38 male and 20 female) elementary school students, completed a battery of self-report measures tapping motivation, cognitions, affect and goal orientation. There were 29 fifth graders, and 29 sixth graders selected from 10 elementary schools located in northern Greece. Each student identified as having learning disabilities using state criteria (i.e., normal IQ but a significant discrepancy between achievement and grade level), was matched with a typical peer from the same class. Students with LD were integrated into general education settings. The questionnaire was administered to the students by their teachers. Students were told that they should not spend too much time on any one item as first thoughts are usually the best and that their participation would have no effect on their term grades. They were also told that data would be used solely for research purposes and, as such, would be treated with confidentiality.

Measures

The questionnaire that was administered to students included the constructs that follow. Most items were rated on a 1-9 scale ranging from "not at all" to "very much so" unless otherwise indicated. The scaling included 9 options, compared to the traditional 1-5 Likert type scaling, in order to be more 'sensitive' to student responding (Marsh, 1993). This questionnaire was pilot-tested with 20 elementary school students, 10 from each grade. There were several modifications in mathematics, particularly for the younger grades to ensure that students would comprehend both the items and their scaling.

Mathematics achievement. Unlike previous studies that used GPA or term grades as the dependent variable, a composite index of mathematics performance (a Curriculum- Based Measure) was developed to provide for a more sensitive evaluation of student mathematics achievement. Ninety elementary school teachers who were attending an in-service training program at a public university provided a pool of mathematics skills that students should acquire during the elementary school grades (from fourth to sixth). Based on that pool the primary investigator developed a mathematics evaluation form that included the most important skills. This evaluation form was pilot-tested with 20 elementary school teachers, 10 from each grade (5 and 6); and, following minor modifications (mostly in the scaling), it was deemed appropriate (in terms of mathematics and content) to be used in the present research. The teachers of the participating students had to complete a mathematics evaluation form for each student. The skills that were included in the scale were for the fifth graders: (a) multiplication (four-digit with three-digit numbers), (b) division (with a two-digit number), (c) addition (with numbers having decimals), (d) subtraction (with numbers having decimals), (e) addition with compound numbers, (f) subtraction with compound numbers, (g) addition of fractions, (h) subtraction of fractions, (i) solving math problems with more than one operation, (j) finding the maximum common divisor, (k) finding the minimum common product, and (l) number transformations; and for the sixth graders: (a) solving all operations with numbers having decimals, (b) solving all operations with absolute numbers, (c) solving all operations with compound numbers, (d) operations with fractions, (e) solving arithmetic expressions, (f) finding the maximum common divisor, (g) finding the minimum common product, (h) finding power up to 10, (i) solving equations with one unknown, (j) finding the area of geometric shapes, and (k) knowing the properties of stereo-geometrical shapes. Teachers had to rate each student on a scale ranging from 1 = not at all good, to 9 = extremely good.

Self-efficacy. This construct was assessed with a nine-item scale, that was developed using Bandura's Guide for Constructing Self-Efficacy Scales. Sample items were: How well can you: "solve operations having numbers with decimals?", "solve equations?", "do operations with fractions?", etc. This unidimensional scale was subjected to exploratory factor analysis procedures. Results, using the Eigen value > 1 criterion and the Scree plot (Gorsuch, 1983), verified the existence of a one-factor solution (i.e., general self-efficacy), which accounted for 66.8 % of the variability of the self-efficacy items. Item loadings ranged between .670 and .905. The internal consistency of the items that comprised the self-efficacy scale was .94.

Self-regulation. This construct was assessed using the Zimmerman and Martinez-Pons (1986) Self-Regulated Interview Schedule (SRIS), which included 14 classes of self-regulatory strategies. In the present study, the first 13 out of the 14 SRIS strategies were used, as the last one (using information from tests) was inappropriate for the present study's elementary school students. These self-regulation strategies were: (a) self-evaluation: "Do you review your homework before handing it in?", (b) organizing and transforming: "Do you plan your homework before you start working on it?", (c) goal-setting-planning: "Do you leave your homework for the last minute?", (d) seeking information: "Do you use the library in order to do your homework?", (e) keeping records and monitoring: "Do you keep notes during lectures?", (f) environmental structuring: "How easy is it for you to find a quiet place to study?", (g) self-consequences: "Do you reward yourself when you do well at school?", (h) rehearsing and memorizing: "How well do you remember information from the lectures?", (i) seeking social assistance (3 items): "When you encounter difficulties, do you seek help from classmates, teachers, parents?, and (j) reviewing records (2 items): "How much do you use your notes, textbooks in order to write a paper?" Reliability and validity (e.g., discriminant, construct) have been reported elsewhere (see Zimmerman & Martinez-Pons, 1986; 1988). The internal consistency of the items that comprised the SRIS (Zimmerman & Martinez-Pons, 1986) scale was .73.

Goal-orientation. Four constructs of goal orientation were assessed: mastery, performance-approach, task avoidance, and positive social experiences using items from a number of scales with documented reliability and validity. Mastery orientation was assessed using eight items. Three were from Elliot and Church, (1997), three from Lethwaite and Piparo, (1993), and two from the PALS (Ablard & Lipschultz, 1998). Performance-approach orientation was assessed with ten items. Four were from Elliot and Church, (1997), two from Lethwaite and Piparo, (1993), two from Thorklidsen and Nicholls, (1998), and two from Eccles et al. (1983) and Wigfield and Guthrie (1997). Task avoidance was assessed with six items. Three were from Thorklidsen and Nicholls, (1998), and three from Lethwaite and Piparo, (1993). Positive social experiences were assessed with four items from Lethwaite and Piparo (1993). Sample items were: (a) for mastery: "How important is it to you to understand mathematics?" (b) for performance-approach: "How important is it to you to outperform your classmates in mathematics?" (c) for task avoidance: "How important is it to you to spend little time in mathematics?" and (d) for positive social experiences: "How important is it to you to have a good time with your classmates?" The goal-orientation scale was subjected to an exploratory factor analysis. Results, using the Eigen value > 1 criterion and the Scree plot (Gorsuch, 1983), verified the existence of a four-factor solution (i.e., mastery, performance-approach, task-avoidance, and positive social experiences), which accounted for 60.0 % of the variability of the goal orientation items. Item loadings ranged between .360 and .880. The internal consistency of the items (Cronbach alpha) that comprised the mastery subscale was .95, the performance-approach subscale .90, the task-avoidance subscale, .88, and the positive social experiences subscale, .86.

Valence. This construct was measured with two items, which have been widely used in previous studies (Erez & Arad, 1986; Hollenbeck et al., 1989; Latham & Steele, 1983; Tubbs & Dahl, 1991): a) "How pleased will you be if you achieve excellent grades in mathematics?", and b) "Do you desire to achieve excellent grades in mathematics?" The internal consistency of the items that comprised valence was .91.

Goal commitment. Three items were implemented to assess two types of goal commitment, direct and effort-based (Tubbs, 1993). These items have been extensively used as reported in the literature (Early, 1985; Erez & Arad, 1986; Hollenbeck et al., 1989; Latham & Steele, 1983; Mento, Cartledge, & Locke, 1980): (a) "How determined are you to achieve excellent grades in mathematics?" (b) "How hard do you intend to study in order to achieve excellent grades in mathematics?" and (c) "How much do you care about achieving excellence in mathematics?" The internal consistency of the items that comprised goal commitment was .83.

Effort, expectancies, and goal. These constructs were assessed with one item each: "How hard do you study for mathematics per day?" (effort), "What grade do you expect to receive in mathematics?" (expectancies) (Hollenbeck et al., 1989; Latham & Steele, 1983; Mento et al., 1980), and "What grade do you intend to receive in mathematics?" (goal).

Motivational force. It was the product of expectancy by valence.

Data Analysis

Internal consistency. Cronbach's alpha was computed for examining the internal consistency of the items comprising the constructs. Alpha was employed because it has been found to be robust to deviations from normality and small sample sizes (Bardo & Hughey 1978; Sideridis, 1999a).

Analysis of variance. A one-way analysis of variance (ANOVA) was employed to compare typical and learning disabled students across all cognitive and motivational variables. The level of significance was set at $p < .05$.

Effect size (gamma). Statistical significance was not the only means for evaluating effects in this study; all differences were also reported using effect size measures (Howell, 1999b; Sideridis, 1999b).

Cluster analysis. This analysis was employed as a heuristic approach to identify subtypes of student learners in mathematics based on cognitive and motivational variables. A cluster analysis generates a typology of people based on the patterns of the predictor variables. The variables were classified into four major categories: cognitive, motivational, affective, and goal orientation (see Table 3). There were no statistically significant differences between males and females on any variable; thus, both males and females were included in one analysis. Among the different cluster-analytic methods, the K-means analysis was employed because it is appropriate with small data sets (Norusis, 1992). Following a number of a priori decisions,[2] analyses indicated that a three-cluster solution produced well-defined and well-separated clusters. A four- and a five-cluster solution produced one and two clusters, respectively, with fewer than five participants. Thus, the analysis was terminated suggesting that a three cluster-solution may best describe these learners in mathematics.

Discriminant analysis. The discriminant function analysis was employed in order to validate the cluster solution and student allocation to these clusters. Thus, the grouping variable in the analysis was student cluster membership. All analyses were computed using SPSS/PC+ 11.0.

Power analysis. Power analysis was estimated mathematically using formulae found in Howell (1999). Mathematically it is desirable to estimate power for every type of analysis one is conducting. For the analysis of variance examining differences between children with and without LD, power was .71 at $p < .05$ for an [$F(1,56) = 5.0$]. For identifying differences across the three cluster groups, the power for the analysis of variance was .82 at $p < .05$ for an [$F(2, 56) = 5.0$]. For the discriminant function analysis, the Chi-square test associated with Wilk's lambda had power equal to 1.00.

RESULTS

Intercorrelations Between Measured Variables

Table 1 displays the intercorrelations between measured variables for each group of participants. An examination of the table indicates interesting patterns for each group. For example, although self-efficacy, expectations, goal commitment, and other variables have been found to be positive determinants of academic achievement for the typical students, the same did not hold for the students with LD. In fact, only performance-approach goals appear to correlate strongly with the mathematics achievement of students with LD. Given that these students perform at the lower end of the distribution, this finding indicates that a performance-approach orientation accounts for the upper part of the distribution of their mathematics achievement. Mastery orientation does not appear to correlate strongly with achievement in the typical group. Significant correlations were observed for students with LD suggesting that mastery orientation may be important to the academic achievement variable. The interrelationship among variables is better illustrated, however, through the cluster analysis.

Comparisons Between Groups Across Constructs

To answer the first research question (examine group differences across all cognitive-motivational-affective variables and academic achievement), a series of one-way analyzes of variance was conducted (Table 2). Results indicated that there were statistically significant differences between students with and without LD across all constructs, except avoidance orientation and positive social experiences. In particular, students with LD had significantly lower performance in mathematics [$F(1,53) = 57.93$, $p <.001$, ES = 2.05], were less self-regulatory [$F(1,58) = 4.56$, $p <.05$, ES = 0.56], were less self-efficacious [$F(1,57) = 49.67$, $p <.001$, ES = 1.84], had lower motivational force [$F(1,53) = 9.13$, $p <.01$, ES = 0.81], lower expectations [$F(1,53) = 8.33$, $p <.01$, ES = 0.78], lower desire to achieve (i.e., valence) [$F(1,54) = 4.68$, $p <.05$, ES = 0.63], lower goals [$F(1,54) = 5.50$, $p <.05$, ES = 0.63], were less committed to their goals [$F(1,55) = 12.21$, $p <.001$, ES = 0.98], exerted less effort [$F(1,55) = 5.47$, $p <.05$, ES = 0.63], were less mastery oriented [$F(1,57) = 16.55$, $p <.001$, ES = 1.23], and were less performance oriented [$F(1,56) = 4.41$, $p <.05$, ES = 0.56]. Although no significant differences were observed between

[2] In order for cluster analysis to run appropriately a number of decisions must be made. The first pertains to the algorithm used in the analysis. In this analysis, the 'nearest centroid sorting' method was used (Norusis, 1990) which assigns cases to clusters based on the smallest distance between the case and the center of the cluster (centroid). If cluster centers are known then one can provide these values. Otherwise one can use the iteration and classification procedure in SPSS to estimate the cluster centers from the data. This strategy was adopted in the present analysis. A second decision pertains to the choice of the similarity-dissimilarity coefficient. As Morris et al., (1998) suggested, the squared Euclidean distance may be more appropriate compared to the Pearson r coefficient, which has been found to produce inconsistent and unreliable clusters (Morris & Fletcher, 1988). Other critical decisions pertained to the number of clusters. This decision was based on (a) inspection of the squared Euclidean distances between clusters, which must have centers far apart from each other, (b) the number of participants allocated to clusters, which must be 'fairly' large, (c) parsimony, (d) significant differences in at least some of the predictor variables as tested using a one-way analysis of variance (Anova) (Aldenderfer & Blashfield, 1984), (e) theoretical considerations (see Turner et al., 1998), and (f) classification of at least 80% of the participants into clusters (Morris et al., 1998). All variables were expressed in standardized form (i.e., z-scores) to circumvent the problem that the squared Euclidean distance depends on the units of measurement of the variables (Norusis, 1990). In order to assess the between cluster to within cluster variability, one-way anovas were computed for each of the predictor variables to test the null hypothesis that their means are equal.

Table 1
Intercorrelations Between Constructs

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Typical Students (*N* = 29)														
1. Mathematics Achievement	--													
2. Self-regulation	.11	--												
3. Self-efficacy	.62**	.35	--											
4. Effort	.08	.07	.37*	--										
5. Goal commitment	.29	.35	.52**	.40*	--									
6. Goal	.50**	.27	.43*	.16	.33	--								
7. Expectations	.64**	.15	.67**	.34	.40*	.69**	--							
8. Valence	.55**	.30	.52**	-.09	.47**	.29	.35	--						
9. Motivational force	.73**	.25	.74**	.22	.49**	.66**	.92**	.68**	--					
10. Mastery Orientation	.07	.16	.44*	.04	.34	.00	.04	.28	.13	--				
11. Performance-approach orientation	-.30	.35	.14	.07	.21	.15	-.19	.02	-.14	.20	--			
12. Task avoidance orientation	-.15	.11	-.03	.06	.01	-.23	-.03	-.17	-.09	-.15	.02	--		
13. Positive social experiences	.33	.21	.39*	-.11	.44*	.07	.14	.75**	.41*	.38*	.16	-.04	--	
14. Multiple goal orientation	-.05	.38*	.35	.03	.41*	-.02	-.03	.34	.11	.45*	.62**	.51**	.63**	--
Students with Learning Disabilities (*N* = 29)														
1. Mathematics achievement	--													
2. Self-regulation	-.37	--												
3. Self-efficacy	-.13	.57**	--											
4. Effort	.01	.33	.48*	--										
5. Goal commitment	.12	.34	.45*	.69**	--									
6. Goal	-.19	-.12	.20	-.02	-.06	--								
7. Expectations	-.22	.00	.45*	.16	.22	.64**	--							
8. Valence	-.24	.14	.24	.54**	.84**	.17	.32	--						
9. Motivational force	-.30	.10	.21	.37	.60**	.50*	.79**	.83**	--					
10. Mastery orientation	.23	-.39*	.49**	.65**	.89**	-.10	.09	.77**	.43*	--				
11. Performance-approach orientation	.52**	.14	.30	.55**	.78**	.26	.16	.63**	.36	.83**	--			
12. Task Avoidance orientation	.18	.38*	.18	.51**	.58**	.29	-.01	.47*	.17	.57**	.65**	--		
13. Positive social experiences	.32	.41*	.56**	.66**	.90**	.14	.20	.82**	.51**	.89**	.79**	.62**	--	
14. Multiple goal orientation	.36	.36	.45*	.68*	.91**	-.21	.15	.83**	.49*	.94**	.91**	.75**	.96**	--

Note: *p < .05, **p < .01.

groups in avoidance orientation and positive social experiences, inspection of the means indicates that learning disabled students were task avoidant (more than typical students) and sought positive social experiences more than typical students.

Cognitive-Motivational Profiles

As mentioned above, the K-means cluster analysis procedure produced a reliable three-cluster solution (see Appendix A), which was intended to identify subtypes of students in mathematics based on their mathematics achievement, self-efficacy, self-regulation, effort, expectations, valence, motivational force, goal-commitment, goals, and goal orientations. Following the three-cluster solution, a series of one-way analyses of variance was conducted in order to understand the differences among clusters. Cluster membership comprised the independent variable and the cognitive and motivational attributes: the dependent variables. The cluster groups were significantly different in all variables, including mathematics achievement. Subsequent post hoc tests using Tukey's procedure were employed to identify which among the three groups differed in the cognitive and motivational variables. Tukey's procedure was employed because it has been recommended as the procedure that is least influenced by the number of comparisons (Greene, Salkind, & Akey, 2000). The results from this analysis are shown in Table 3 as subscript designations. On the basis of their attributes in mathematics achievement, self-efficacy, self-regulation, effort, expectations, valence, motivational force, goal commitment, goals, and goal orientation these clusters were labeled as *Amotivated/Disengaged-Low Achievers, Motivated-High Achievers,* and *Avoidant/Uncommitted-Low Achievers.* Figure 1 displays the profiles of the students for each cluster and allows direct comparisons among clusters.

Cluster 1: Amotivated/Disengaged-Low Achievers. The students in Cluster 1 (*n* = 9) resembled typical underachievers. They were the lowest achievers and least engaged (cognitively) with academic tasks. These students did not feel at all efficacious about their competence in achieving high performance in mathematics; they did not know how to regulate their performance, as reflected by their low score in self-regulation; and they did not want to exert any particular effort. They did not consider achieving good grades in mathematics a worthwhile goal; they had no desire to achieve it (as indicated by their low scores on valence), nor did they want to commit to the goal of achieving high grades in mathematics. This low motivation-affect-goal orientation pattern may explain the scores on the other variables as well. This group also had low scores in expectations, resembling a low achieving learned-helpless type, similar to the one revealed by Pintrich et al. (1994). These may be the students who need immediate intervention in both cognition and motivation. Twenty-six percent of the students with LD were classified in this low-achieving cluster.

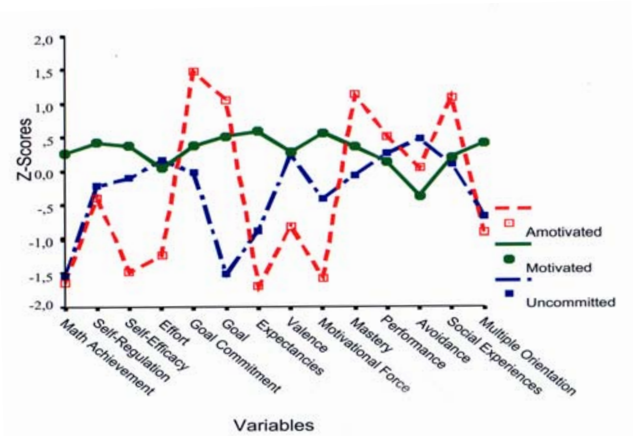

Figure 1. Cluster profiles based on student cognition, motivation. Cluster 1 = Amotivated/Disengaged-Low Achievers; Cluster 2 = Motivated-High Achievers; Cluster 3 = Avoidant/Uncommitted-Low Achievers.

Cluster 2: Motivated High Achievers. Contrary to Cluster 1 students, the students in this cluster (*n* = 28) were characterized as having optimal cognition and motivation. From the perspective of teachers and parents, they could be described as 'ideal' students. These students were the highest achievers; cognitively, they were highly engaged in academic tasks; they could regulate their knowledge and performance; they had a high sense of self-efficacy, which may have led them to have high expectations; in addition, these students were high in motivation as well. They had a strong desire to achieve high performance (as indicated by their high ratings in motivational force, and goal orientation) and were committed to go the 'extra mile' in order to achieve that performance (as indicated by their high ratings in goal commitment). This highly motivated group is similar to the one identified by Ainley (1993) and Turner et al., (1998) who also looked at cognition and motivation. Regarding goal orientation, a very interesting pattern emerges in this cluster. High achievement appears to be a function of the linear combination of both mastery and performance-approach goal orientations. The effects of performance goals have been ambiguous in the past; however recent evidence[3] suggests that they may be positively linked to academic achievement (Barron & Harackiewicz, 2001), especially when they are combined with mastery goals (Elliot et al., 1999; Meece & Holt, 1993). Thirteen percent of the students with LD were classified in this high-achieving cluster (n = 3).

Cluster 3: Avoidant/Uncommitted Low Achievers. Cluster 3 students (n = 20) perhaps represent the most interesting profile of students. Starting from the outcome variable, these students were low achievers, almost as low as Cluster 1 students. Interestingly, although they did not differ from Cluster 1 students in mathematics achievement, they did so in a number of other variables. They performed low although they seemed to report above average effort, and they expressed the desire to achieve high performance (as indicated by their high scores on valence), but they would like to achieve in the absence of any commitment and hard work. In fact, students in this group appeared to have a preference for task avoidance. For this reason this group was labeled 'avoidant/uncommitted.' Additionally, these students appeared to lack the cognitions necessary to achieve high performance (low self-efficacy and self-regulation). Lastly, in terms of goal orientation, these students were not mastery oriented but were highly task avoidant and moderately performance-approach oriented. By looking across clusters, it appears that a performance-approach orientation may be linked to differential academic achievement (maybe due to group membership, learning disabled vs. typical students). In Cluster 3, most students with LD, a performance-approach orientation appears to be associated with low achievement outcomes. In Cluster 2 students, a performance-approach orientation (associated with mastery) was related positively to academic achievement. Thus, *the same orientation may lead to different outcomes in different populations of students* (as well depending on its relationship with other variables). Thus, in this chunk (Cluster 3), students had the desire to outperform others but seemed to be lacking the necessary cognitions and motivation that would result in positive achievement outcomes. Most of the students with LD belonged to this cluster (61%). The apparent lack of motivation of the students in Cluster 3 which mainly included students with LD, is congruent with past literature which documented the avoidant-low expectations, helpless learning disabled student (e.g., Sabatino, 1982).

At a final step in the analysis, and in order to validate the findings from cluster analysis, a linear discriminant function analysis was employed. Self-regulation, self-efficacy, effort, goal commitment, goals, expectations, valence, motivational force, mastery orientation, performance-approach orientation, task avoidance orientation, and positive social experiences orientation and mathematics performance constituted the predictor variables. Two significant discriminant functions emerged. Function 1 explained 81.1% of the variability among clusters [X^2 (28) = 129.76, $p < .001$], and Function 2 18.9% of the variability [X^2 (13) = 39.82, $p < .001$]. The linear combination of the predictor variables produced high classification rates (96.5% overall clusters). The correct classification rates for each cluster were 88.9% for Cluster 1, 96.4% for Cluster 2,

Table 2
Mean Differences of Typical and LD Students Across Constructs

	Typical Students			Students with LD			
Constructs	*Mean*	*SD*	*n*	*Mean*	*SD*	*n*	E.S.*
Mathematics achievement	8.42	1.75	30	4.53	2.04	25	2.05**
Self-regulation	5.27	1.14	30	4.60	1.26	30	0.56**
Self-efficacy	7.27	1.17	30	4.86	1.45	29	1.84**
Effort	6.63	1.43	30	5.48	2.24	27	0.63**
Goal commitment	8.13	0.93	30	6.52	2.34	27	0.98**
Goal	9.27	1.20	30	8.50	1.24	26	0.63**
Expectations	9.30	1.15	30	8.40	1.15	25	0.78**
Valence	8.63	0.54	30	7.90	1.76	26	0.63**
Motivational force	80.50	12.29	30	68.84	16.31	25	0.81**
Mastery	8.55	0.59	30	6.76	2.33	29	1.23**
Performance approach	7.11	1.70	30	6.01	2.26	28	0.56**
Task avoidance	4.73	2.28	30	5.34	2.20	28	-0.27
Positive social experiences	8.05	1.08	30	7.39	2.14	27	0.43
Multiple goal orientation	7.26	0.88	30	6.17	1.37	29	0.97**

Note: *Effect size, **p < .05.

[3] Following Elliot's and Harackiewicz, (1996) dichotomization of performance approach and performance avoidance goals, the former have been found to be consistently associated with positive achievement outcomes.

Table 3
Means and Standard Deviations (SDs) of Scores on Measures for the Three Student Cluster Groups

	Cluster Groups					
	Amotivated/Disengaged-LA*		Motivated-HA*		Avoidant/Uncommitted-LA	
Variables	*M*	*SD*	*M*	*SD*	*M*	*SD*
Dependent						
Mathematics achievement	-1.642 a,b	0.779	0.261 b,a,c	1.089	-1.538 c,b	0.820
Cognitive						
Self-regulation	-0.393 a,b	0.936	0.421 b,a	0.971	-0.221 c	0.760
Self-efficacy	-1.480 a,b	0.616	0.373 b,a,c	0.643	-1.036 c,b	1.067
Motivational						
Effort	-1.236 a,b,c	0.859	0.041 b,a	0.875	0.163 c,a	0.760
Goal commitment	-1.469 a,b,c	0.974	0.372 b,a	0.602	-0.024 c,a	1.311
Goal	-1.052 a,b	1.320	0.515 b,a,c	0.488	-1.512 c,b	0.782
Affective						
Expectations	-1.694 a,b	1.669	0.583 a,b,c	0.595	-0.879 c,b	0.677
Valence	-0.821 a,b,c	1.049	0.281 b,a	0.427	0.233 c,a	1.464
Motivational force	-1.566 a,b,c	1.324	0.561 b,a,c	0.531	0.409 c,a,b	1.149
Goal Orientation						
Mastery	-1.124 a,b,c	1.109	0.355 b,a	0.487	-0.066 c,a	0.677
Performance-approach	-0.513 a	1.068	0.128 b	0.890	0.257 c	0.677
Task avoidance	-0.041 a	0.622	-0.370 b,c	1.199	0.471 c,b	0.677
Positive social experiences	-1.086 a,b,c	1.292	0.200 b,a	0.704	0.099 c,a	1.309
Multiple goal orientation**	-0.906 a,b,c	1.050	0.412 b,a	0.874	-0.067 c,a	0.743

Note: *LA = Low Achievers, HA = High Achievers. Amotivated/Disengaged-Low Achievers $n = 9$; Motivated-High Achievers $n = 28$ Avoidant/Uncommitted-Low Achievers $n = 20$. Means with different subscripts differ at $p < .05$. Tukey's post hoc procedure was employed in all multiple comparisons. Subscrips indicate significant group differences.
**A multiple goal orientation represents the multiplicative term of mastery and performance-approach goal orientations.

and 100.0% for cluster 3 students. Thus, the discriminant function analysis provided further evidence regarding the appropriateness of assigning participants to these three cluster groups. Lastly, a series of 'intensive' statistical analyzes was undertaken to verify the validity of the three cluster solution derived from the present data (see Appendix A).

Discussion

One purpose of the present study was to examine differences between students with and without LD in motivation, cognition, goal orientation and affect. A second purpose of the present study was to identify patterns of motivation, cognition, and achievement and relate these patterns to student membership (typical vs. learning disabled).

The first important finding was that students with LD scored lower in all cognitive and motivational variables with the exception of task avoidance and positive social experiences orientations compared to the typical students. These data suggest a profile for these students, frequently encountered with students with learning difficulties (Durrant, 1993). Students with learning problems often have low metacognition (Pintrich et al., 1994), lower and less elaborate use of cognitive strategies (Pintrich et al., 1994), external locus of control (Pintrich et al., 1994), low motivation (Deci, Hodges, Pierson, & Tomassone, 1992), and resemble the learned helpless learner (Sabatino, 1982).

One of the most interesting findings of the present study was the profile of Cluster 3 learners, which included mainly students with LD. In the Turner et al. (1998) study, the 'avoidant' cluster group was partly disengaged from cognitive tasks and displayed negative affectivity and low self-efficacy. Turner et al. (1998) attributed that disengagement to disinterest or to the absence of a mastery orientation. They added that students in this group showed the least adaptive motivational-affective profile as opposed to that of the 'mastery' oriented group. Their findings were replicated in the present study. However, in the current study, the low achievement of Cluster 3 students appears to be a function of low mastery, high performance-approach and high task avoidance orientation. Additionally, not only is the avoidance pattern of Turner et al. (1998) observed, but the current study suggests that this pattern appears to be the preferred pattern for students with LD.

Dweck and Leggett (1988) linked a performance orientation to learned helplessness and 'ill' motivation strategies for typical students. Although this pattern of behaviors may be the preferred one for students with LD, it does not appear to always be detrimental to the performance of typical students. For example, Harackiewicz and Sansone (1991) suggested that performance goals may enhance achievement because they orient an individual toward demonstrating competence. Several studies employing different populations have found positive associations between performance orientation and achievement outcomes (Bouffard Vezeau, & Bordeleau, 1998; Elliot et al., 1999; Harackiewicz et al., 1997; Harackiewicz & Elliot, 1993), particularly the performance-approach pattern developed by Elliot and Harackiewicz (1996). Although there are ample studies relating goal orientations to motivation, cognition, and achievement with typical students, very few such works have been conducted with LD students, and the findings of those that exist have been quite contradictory (e.g., Carlson, Booth, Shin, & Canu, 2002; Fulk, Brigham, & Lohman, 1998; Pintrich et al., 1994).

In linking the present study's findings with those of prior research in goal theory including the pioneering work of Meece and Holt (1993), Barron and Harackiewicz (2001), Harackiewicz, Barron, Elliot, Tauer, & Carter, (2000), Elliott et al., (1999), and Pintrich (2000), the present study's findings agree with the general premise that both mastery and performance-approach goals can accelerate achievement, at least for the typical student group. In the present study, however, an attempt was made to apply this model to the population of students with LD and examine their unique cognitive and motivational styles. An important finding that emerges is that, although both a mastery and performance-approach orientation have been linked to positive outcomes for typical students, students with LD do not hold a similar 'healthy' multiple goal orientation. They rather demonstrate the 'helpless' pattern described by Dweck and Leggett (1988) which is associated with challenge avoidance, less commitment, work avoidance and negative affectivity (Elliott & Dweck, 1988; Nolen, 1988). This finding, regarding the learning disabled, is in disagreement with previous findings in which the positive effects of affective variables orientation were more pronounced for students with LD, compared to those for typical peers (Sideridis in press).

Ainley (1993) stated that highly motivated students would show increased use of strategies, suggesting a positive link between mastery orientation and self-regulation. This hypothesis was partly verified in the present study in which the best achievement outcomes were a function of both mastery and a performance-approach orientation. Furthermore, Ainley (1993) predicted that students of similar ability would have different styles of engagement. This hypothesis was also verified in the present study in which low achievement may be attributed to two types of students: those of above average motivation and affect (but low mastery orientation) (Cluster 3) and an amotivated type (that is low across all motivational variables and orientation types). The present study's findings also agree with those of Meece and Holt (1993) who used the same analytic strategy and demonstrated that students who are high on both mastery and performance orientation had the most active academic engagement style and exerted the most effort.

In summary, the results from the cluster analysis suggest that there may be two pathways to low achievement, but only one to high achievement in mathematics. The high achievement path, which is the one heavily travelled, is one in which learners set up their goals, become emotional about them, plan their strategies, commit to these goals, work on them, and achieve them. The first path to low achievement involves low cognitions, low motivation, low affect, low goals, and a maladaptive goal orientation (low in mastery, performance-approach, positive social experiences, and high on avoidance). Although one would expect that students with LD would belong to this cluster, this was not the case. Students with LD follow the second path to low achievement; their low achievement is a function of low cognitions, average motivation (effort), above average affect (valence) to achieve the desired outcomes, and an emphasis on outperforming others through avoiding academic tasks. Thus, learning disabled students express a strong desire to achieve good academic outcomes, and they would like to outperform others but it is very likely that they already fit the helpless student type described earlier due to exposure to repeated failure. Learning disabled students seem to avoid being engaged in academic tasks and seem unable to regulate their cognitions, motivation, goals and emotions. In other words, students with LD did not put in place any cognitive or motivational mechanism in order to achieve high performance; neither were they particularly knowledgeable on how to become high achievers. This group of students may well be a subject of future investigations. As Alexander and Murphy (1998) stated, the road to high academic achievement requires knowledge, interest, and strategic ability. The present study adds that a combination of goal orientation patterns may well contribute to that effect; however things appear to be more complex for students with LD.

Practical Implications for Teaching and Learning Mathematics

So what are the practical implications of the present study's findings? Should teachers ignore student motivation, goal orientation and affect and intervene on cognitive variables only? Certainly not. The largest group (Cluster 2 students) demonstrated that high performance in mathematics requires high motivation, adaptive goal orientation patterns and high affect as well. As results from the Cluster 1 group suggest, lack of cognition, motivation, goals, affect, and employment of maladaptive goal orientations result in low achievement. Cluster 3 students resembled the helpless, task-avoidant type; they exhibited low performance in the presence of low cognitions. These students, most of whom were students with LD, partially confirmed the findings of Dweck and Leggett (1988) that students who are concerned with gaining favorable judgements of their competence are characterized by an avoidance of challenge and eventually, low achievement. Using information from the second cluster students, interventions could target enhancing student cognition, motivation and affect. Teaching students to set up their goals, monitor them, regulate them, review them, commit to them, engage in them and actually achieve them is a valuable lesson for all students. Teaching students to learn for the sake of learning and the joy of mastering new material that is useful in the future may be a fruitful approach as well. If one wanted to compare the contribution of cognition, motivation, and affect as sets, it appears that the former are more important contributors to mathematics achievement, but for optimal results, the interplay among all these variables is required. As Alexander and Murphy (1998) nicely stated "success in instructional settings entails the orchestration of cognitive and non-cognitive factors" (p.443). The present study was a successful attempt to integrate cognitive, motivational, and affective variables, which belong to different theoretical schemata. This integration proved particularly fruitful, and subsequent investigations may replicate or extend the present study's findings.

The present study also has certain limitations. First, the two samples were small and did not represent all grades and, thus, results could not be generalized to all elementary school students. Secondly, most variables were based on self-report, and this practice may have resulted in increased measurement error. As Petty and Krosnick (1995), however, suggested, it is inevitable that some variables could only be assessed through self-report. An advantage of this study has been the use of data analytic strategies, which reveal both inter- and intra-individual differences and preserve the multidimensional character of students' approach to learning.

Future studies could further examine student learning profiles across different ages, with other behaviors and in combination with other related constructs. Also, differences across academic subjects are of interest. Furthermore, it will be interesting to model the relationships among variables in order to ascertain not only the magnitude of the weights that link constructs with each other but their signs as well, particularly for students with LD.

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APPENDIX A

Aldenderfer and Blashfield (1984) described an innovative technique that allows evaluation of the validity of cluster derivation. It is based on the generation of random numbers using Monte Carlo procedures and it involves three steps. During step 1, the researcher needs to create the simulated data set; this set must match the characteristics of the original data. To achieve this objective, variable means and standard deviations were calculated across all variables and those elements were incorporated in the development of the simulated data. Step 2, requires that the identical cluster analytic procedures followed with the original data, need to be followed with the simulated data as well. Thus, the same K-means cluster analysis procedure (see Footnote 2) was also followed with simulated data. Lastly, step 3, requires comparisons of the two cluster solutions. This comparison was accomplished using two procedures.

The first procedure pertains to comparisons of *F*-ratios between actual and simulated data. From that comparison (see Table 4), it is apparent that there were significant differences in the *F*-ratios between the actual and simulated data, although the latter were developed using the same attributes as the real data. The *F* values of the simulated data were substantially lower compared to those of the real data and, in several instances they failed to reach significance. What is the purpose of this comparison? According to Aldenderfer and Blashfield (1984) it is an evaluation of cluster homogeneity. That is, if *F* values are sufficiently high, this suggests that the clusters have some degree of homogeneity. In comparison, the *F* values of the simulated data are highly variable and small, suggesting that the null hypothesis that no clusters are present, can be accepted.

The second procedure for evaluating the validity of the original three cluster solution requires the graphical analysis of the clusters in Euclidean space. Figures 2 and 3, portray the actual and simulated data respectively. Visual inspection of the figures suggests a totally different pattern of the distribution of clusters in Euclidean space as well as differences in the topography of the different clusters. For example, cluster 1 data occupied the lower bottom part of the figure using real data but the upper part of the figure of the simulated data. Differences in variability between identical clusters in real and simulated data were also apparent. These differences suggest that the obtained cluster solution from the real data was unique, as it was not replicated with simulated (but with similar properties data) and thus, cannot be attributed to chance. Nevertheless, a cluster analytic approach is still a heuristic approach and it is desirable to attempt to replicate the present results with future samples and multiple validation procedures (e.g., with derivation and replication samples).

Table 4
Differences in F-ratio Values Following a One-Way ANOVA Across Clusters with Real and Simulated Data Following Monte Carlo Simulation Procedures

Constructs	Real Data *F-Ratio*	Simulated Data *F-Ratio*
Mathematics achievement	22.00*	8.70*
Self-regulation	3.72*	3.61*
Self-efficacy	31.40*	1.24
Effort	9.13*	0.00
Goal commitment	22.52*	10.02*
Goal	23.41*	2.11
Expectations	23.63*	0.96
Valence	11.75*	7.28*
Motivational force	27.93*	1.65
Mastery	16.07*	14.05*
Performance-approach	2.40	4.36*
Task avoidance	4.14*	0.14
Positive social experiences	7.66*	25.91*
Multiple goal orientation	8.22*	0.12

Note: *$p < .05$.

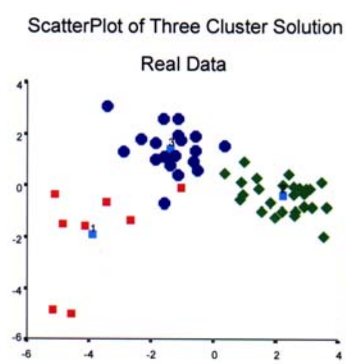

Figure 2. Plot of cluster groups in Euclidean space with real data.

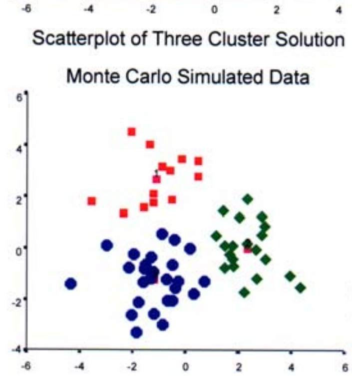

Figure 3. Plot of cluster groups in Euclidean space with simulated data.