

Goal Modification, Learning Styles, and Achievement in Mathematics

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Abstract

This study investigated whether mastery and competitive goals could be developed among students, while controlling for the possible effects of student learning styles. A pretest-posttest control group design was used in this 10-week experiment that employed three intact high school mathematics classes. Results showed that mastery and competitive goals could be separately modified among students. However, learning styles did not moderate the effects of these goal modifications. The study further investigated which of the three goals – mastery, competitive, and avoidance – predicts achievement in mathematics. The outcome showed that each of the three goals linearly predicts mathematics achievement. However, when the effects of all three goals were simultaneously considered, only avoidance goals remained as a predictor of achievement. It is recommended that further investigations be made on the possible classification of avoidance goals into projective, compliance, and work-avoidance goals. Moreover, the positive potential of projective goals should be explored.

Keywords: goals, goal modification, learning styles, mathematics achievement

Studies on motivation show that it is possible to modify student goals by making certain adjustments in the classroom. Mastery goals are generally believed to be most beneficial among student goals. Hence, educators are advised to make necessary classroom arrangements that could lead to the formation of mastery goals and to their eventual dominance over other types of goals. However, there are suggestions that modifying competitive goals among students may not be problematic after all. Though the role of competitive (or performance-approach) goals in learning has not been fully explored, and though they used to be considered detrimental to student performance, some theorists are now acknowledging that they may also have positive effects on students. In addition, the relation among student goals, student learning styles, and mathematics achievement has yet to be fully explored. Middleton and Spanias (1999) noted that “a primary goal for future researchers should be the testing and refinement of motivational theories so that their range of applicability can be delineated and exploited” (p. 84).

Student goals

The normative goal theory classifies student goals into two mastery and performance goals. Mastery goals lead students to excel and go deeper into the academic task. Students with these goals value learning. They strive to learn more and tend to compare their achievement to their past performance. They are also more inclined to seek challenge to satisfy their intellectual curiosity. Even when faced with difficulty these students persist in their work (Ames, 1992; Harackiewicz, Barron & Elliot, 1998).

Performance goals, on the other hand, are subdivided into performance-approach and performance-avoidance goals. Performance-approach or competitive goals differ from mastery goals in that they focus on demonstrating abilities. Students with these goals value social comparisons. They are motivated by a desire to outperform others. (Ames & Archer, 1988; Harackiewicz et al., 1998). In contrast, performance-avoidance (or simply *avoidance*) goals are grounded in fear of failure and focus on the impressions students send off to others. Students with these goals accomplish assigned work to avoid punishments. They only want to comply with the minimum requirements of a given task. Some easily withdraw effort or totally avoid work. Others perform in order to project a good image of themselves. They do tasks so as not to look stupid or incompetent (Church, Elliot & Gable, 2001; Harackiewicz et al., 1998; Meece & Holt, 1993).

In the normative theory, mastery goals are considered as most adaptive to students while both the performance-approach and performance-avoidance goals are deemed maladaptive in terms of academic achievement. However, recent findings show that performance-approach goals and performance-avoidance goals yield differential results in a number of motivational constructs (Harackiewicz, Barron, Pintrich, Elliot & Thrash, 2002). Many positive effects of performance-approach goals on measures of cognitive engagement, adoptive learning strategies, self-regulation, and academic performance were evident in a number of researches (Harackiewicz et al., 1998). Performance-approach goals were likewise found to be positive predictors of persistence, effort, and performance in examinations; while performance-avoidance goals were found to be negative predictors of deep processing and performance in examinations (Elliot, McGregor & Gable, 1999). Elliot and colleagues (1999) further emphasized that, “collapsing across the two types of goals would have produced an ambiguous pattern of results” (p. 559). Thus, many theorists are now supporting the move to revise the goal theory. In the proposed revised theory, the positive potential of performance-approach or competitive goals is acknowledged, leading to a trichotomous classification of goals, instead of only two. The proposal is not without opposition. Some theorists still firmly believe that the goal theory needs no revision since some researches reveal inconsistent results (Midgley, Kaplan & Middleton, 2001). The debate on whether or not the goal theory needs revision is still ongoing. Both the old and the proposed theories, however, endorse the multiple goals perspective asserting that students may adopt more than one goal at a time. In this study, the goals which were investigated are mastery goals, competitive (performance-approach) goals, and avoidance (performance-avoidance) goals.

Goal modification

Some research studies show that student goals can be modified through the use of different teaching strategies. *Goal modification* as a method of teaching was conceptualized in this study based on previous findings that goals can be emphasized and de-emphasized (Anderman & Maehr, 1994; Reeve, 1996), and that fostering a classroom atmosphere promoting specific student goals leads to the development of such goals among the students (Jalloul, 2003; Reeve, 1996). Goal modification comes in two types, mastery-goal and competitive-goal modifications. As the names imply, these two methods differ in the target goals that they intend to develop or enhance among students.

In the *mastery-goal modification method*, the focus is on the attainment of learning objectives through the presentation of tasks in the form of a puzzle, riddle, illusion, paradox, or experiment/ investigation. These challenging mathematical diversions can help promote the development of mastery goals especially when persistence and finishing the task are emphasized. In this method, errors are tolerated as suggested by Reeve (1996) and students are evaluated on the improvement of their scores based on their own previous scores (Linnenbrink, 2005). Furthermore, this particular goal modification method uses the suggested ways of developing mastery goals among students based on six classroom contexts by the acronym TARGET, which as originally created by Epstein (as cited in Linnenbrink, 2005) stands for Tasks, Autonomy, Recognition, Grouping, Evaluation, and Timing. Linnenbrink noted that some goal theorists observed that giving students varied and authentic tasks, allowing them a certain degree of autonomy on learning activities, recognizing their improvement, using heterogeneous small groups, evaluating them based on their improvement, and being flexible in time all help promote mastery goals in the classroom.

On the other hand, in the *competitive-goal modification method*, the focus is the attainment of learning objectives through games and contests. The use of competition in the classroom enables students to demonstrate their abilities, compare their work with that of others, and outperform their peers. These in turn foster the development of competitive goals among the students. Linnenbrink (2005) further notes that the performance-oriented or competitive context is produced when students are “not given varied tasks, the teacher maintains authority, students are recognized for their ability relative to others, homogeneous ability groups and tracking are used, evaluation is based on normative grading practices, and time is inflexible” (p. 199).

Goal modification does not include modification of avoidance goals since researches consistently identify these goals as disadvantageous to students in terms of academic performance.

Learning styles

Learning style is “the way in which each learner begins to concentrate on, process, and retain new and difficult information” (Dunn & Dunn, 1992, p. 2). Some persons with specific styles of learning perform better academically than others with a different learning style.

Matching learning styles of students and teaching styles of teachers has been the topic of interest of many research studies. Most of the research findings indicate that matching had positive effects on student learning performance (Yoon, 2000). However, the relationship between learning styles to student goals needs further investigation. Empirical observations show that students with a certain learning style tend to exhibit the qualities of those who are mastery-goal oriented; while those using another learning style are likely to have the characteristics of students who are competitive-goal oriented.

The Global-Analytic Learning Style Model (Dunn & Dunn, 1999) identifies two types of learners, namely, analytic and global. Students who prefer silence, bright light, and classic seating arrangement while studying are classified as analytic persons. In contrast, global persons are described as those who enjoy background music, low light, informal setting, and eating while studying. They are also observed to prefer working on varied tasks and move about during prolonged work. Students exhibiting competitive goals are more likely to be global in nature rather than analytic. Competitive-goal oriented persons enjoy displaying their abilities. Classroom games and contests offer a variety of alternative active setting. During these activities students often move around and generate noise brought about by their enthusiasm to win. The classroom atmosphere and structure likewise become less formal. Sometimes seating arrangements may have to be altered depending on the class activity. In some instances, snacking is allowed particularly when prizes for certain contests are food. Thus, a global classroom setting would likely suit students with competitive goals, while an analytic setting would be conducive to students with mastery goals.

Another aspect of the analytic-global continuum involves students' persistence at tasks. Analytic thinkers complete the things they have begun. They are persistent during learning. They have a "strong emotional urge to continue until task is done or until they come to a place where they feel they can stop" (Dunn & Dunn, 1992, p. 48). Students exhibiting mastery goals were also noted as such. They even seek challenging tasks (Pajares, 2001) and attribute academic success to the amount of effort they spend on the task (Ames, 1992; Elliot et al., 1999). They hold an incremental view of learning and seek to master a material regardless of the performance condition (Dweck, as cited in Yates, 1999).

In contrast, global persons "rarely stay on task for any extended period when engaged in difficult academic studies" (Dunn & Dunn, 1992, p. 51). They can, however, perform multiple tasks at a time. They can start many things and enjoy working on several tasks simultaneously. These characteristics are also observable among competitive students, who are mainly concerned with performing to exhibit competence. They are more inclined to be simultaneous rather than sequential learners. They are also "not likely to expend effort on tasks especially when they are difficult" (Yates, 1999, p. 2).

The sociological strand of the Dunn and Dunn Analytic-Global model represents elements related to how a person learns in association with other persons: alone, in pairs, with peers, as a team, with an authoritative adult, or in a variety of ways. Global students find it less threatening and more fun to solve problems with others (Dunn & Dunn, 1992). Analytic persons, on the other hand, prefer to work on tasks alone and should not be forced into groups

(Dunn & Dunn, 1999). An analytic learning style and mastery-goal orientation seem to be related. Butler and Newman (1995) noted that children in the mastery-focus condition avoid help from peers mainly in terms of strivings for independent mastery. Thus, they are likely to opt to work individually rather than in groups. However, those who are performance-approach or competitive-goal oriented want to establish the superiority of their ability relative to that of their peers (Skaalvik, 1997). Working closely with peers in a team gives them this opportunity.

Other global-analytic dimensions were not discussed in this paper because their associations with mastery and competitive goals were not mutually exclusive. However, Dunn and Dunn (1992) stressed that, "it is not necessary to have all five elements [sound, light, design, persistence, and intake] to be either a global or an analytic processor; the presence of three of the same group indicates tendencies in that direction" (p. 48).

The preceding discussion warrants further investigation on the relationship between the global-analytic learning styles and the goals of students. The possible moderating effects of learning styles on student goals when students are exposed to different goal modifications should further be explored. Thus, student learning style was taken as a moderating variable in this study.

Methodology

This is an experimental study that sought to find whether goal modification is effective in enhancing specific goals among students, while controlling for student learning styles. It also sought to find which student goals predict student achievement in mathematics.

This study employed the pretest–posttest research design. Three intact classes comprising 149 high school freshmen from a public school were randomly assigned to either mastery-goal modification, competitive-goal modification, or the no-modification (conventional) method of teaching. The same lessons were given to the three groups by the same teacher who was actually the researcher in this study. All sessions were held one hour daily in the morning for ten weeks.

In the mastery-goal modification group, daily activities in the form of seatwork exercises, puzzles, and riddles were given as individual tasks with focus on mastering the concepts and obtaining high scores. These activities were usually given after the discussion of the lessons unless they were used to introduce the lessons. The same activities were given to the competitive-goal modification group but these were always to be accomplished in terms of group or individual competitions/contests where winners were acknowledged. In the conventional group, the said activities were presented sometimes as individual tasks like that of the mastery group and sometimes in the form of games and contests like that of the competitive group. In the mastery group, students were encouraged to improve their scores on seatwork, homework, and tests based on their own previous scores, while those in the competitive group were asked to beat the scores of their peers or opponents in the games. No comparisons of scores were emphasized in the conventional group.

The instruments used in the study were a learning style checklist, a goal inventory, and a mathematics achievement test. The learning style checklist classifies the students into analytic or global learners. It asks the students to check which among the 27 statements regarding how they study are true of them. The goal inventory is a 32-item, 4-point rating scale that determines the goals exhibited by the students. It consists of subscales for mastery, competitive and avoidance goals, which have 13, 11 and 8 items, respectively. The mathematics achievement test determines how much the students learned during the experiment. It has two parts – objective (45 items) and problem solving (4 problems). The test covers topics on measurement and the real number system. An example of a question in the objective portion is “*What number comes next in the pattern -1, -2, 0, -1, 1, 0, ___?*” One of the problems given is as follows: “*Joella mailed letters and postcards to 15 people. She paid a total of ₦ 345. If it costs ₦ 19 to mail a postcard and ₦ 29 to mail a letter, how many postcards did she mail?*”

All instruments were researcher-made and were subjected to validity and reliability analyses. Necessary revisions on the instruments were done to ensure that they were valid and reliable. Some items, specifically on the goal inventory were discarded after factor analysis was done. All instruments were administered as pretest and posttest (except for the learning style checklist, which was given only at the start) to the three groups of students.

Results and discussion

Effectiveness of goal modification

Table 1 presents the descriptive statistics for the pretest administration of the goal inventory. Note that in terms of mastery goals, the group of students assigned to mastery-goal modification method scored the lowest ($\mu = 38.79$) compared to those who were assigned to the competitive-goal modification ($\mu = 40.47$) and conventional ($\mu = 40.14$) methods. In terms of competitive goals, the group assigned to competitive-goal modification method scored lower ($\mu = 31.27$) than that assigned to the conventional method ($\mu = 31.72$) but higher than that assigned to mastery-goal modification method ($\mu = 31.13$). As regards avoidance goals, it was the group assigned to competitive-goal modification that scored the highest ($\mu = 22.88$), followed by the group assigned to the conventional method ($\mu = 22.86$), then by the group assigned to mastery-goal modification ($\mu = 22.75$). An analysis of variance on the goal pretest scores, however, showed that the three groups of students did not differ significantly ($p > .05$) in all three goals. This implies that the students were initially comparable in terms of their mastery, competitive, and avoidance goals.

Table 1
Descriptive statistics for goals (pretest)

Goal	Group	N	Mean	Std. Dev	F	Sig
Mastery	Mastery	48	38.79	5.33	1.459	.236
	Competitive	51	40.47	5.09		
	Conventional	50	40.14	5.03		
	Total	149	39.82	5.17		
Competitive	Mastery	48	31.13	3.72	0.190	.827
	Competitive	51	31.27	5.89		
	Conventional	50	31.72	5.05		
	Total	149	31.38	4.96		
Avoidance	Mastery	48	22.75	4.26	0.018	.982
	Competitive	51	22.88	3.43		
	Conventional	50	22.86	3.35		
	Total	149	22.83	3.67		

After the experiment, the same goal inventory was administered to all groups of students to determine whether there were significant changes in the goals of the students after subjecting them to different goal modifications. In terms of mastery goals, the group of students assigned to mastery-goal modification method now scored the highest ($\mu = 42.85$). In terms of competitive goals, the group assigned to competitive-goal modification method also scored the highest ($\mu = 34.29$). As regards avoidance goals, the group assigned to the mastery-goal modification method scored the highest ($\mu = 24.54$). The posttest scores were likewise subjected to an analysis of variance (Table 2).

Table 2
Analysis of variance on goals (posttest)

Goal	Source of variation	Df	Mean Square	F	Sig.
Mastery	Between groups	2	122.86	4.940	.008
	Within groups	146	24.87		
	Total	148			
Competitive	Between groups	2	133.36	4.827	.009
	Within groups	146	27.63		
	Total	148			
Avoidance	Between groups	2	112.71	10.906	.000
	Within groups	146	10.33		
	Total	148			

Table 2 reveals that after the experiment, the three groups differed at the .01 level in terms of mastery, competitive, and avoidance goals. Hence, a post hoc analysis using Least Significant Difference (Table 3) was applied to the posttest scores.

Table 3
Multiple comparisons on goals (posttest)

Dependent Variable (Goal)	(I) Group/ Method	(J) Group/ Method	(I-J) Mean Difference	Std. Error	Sig.
Mastery	1 ^a	2	2.81	1.00	.006
	2 ^b	3	-0.14	0.99	.887
	3 ^c	1	-2.67	1.01	.009
Competitive	1	2	-2.41	1.06	.024
	2	3	3.09	1.05	.004
	3	1	-0.68	1.06	.524
Avoidance	1	2	2.42	0.65	.000
	2	3	0.38	0.64	.556
	3	1	-2.80	0.65	.000

Note. ^a1 - mastery-goal modification; ^b2- competitive- goal modification; ^c3- conventional

From Table 3, it is evident that Goal Modification was successful in enhancing the specific target goals among students. In terms of mastery goals, the group exposed to mastery-goal modification scored significantly ($p=.006$) higher than that exposed to competitive-goal modification, as well as to the conventional group ($p=.009$). Similarly, in terms of competitive goals, the group exposed to competitive-goal modification obtained significantly higher scores than the group exposed to mastery-goal modification ($p=.024$) and the group without goal modifications ($p=.004$).

Of interest is the result obtained for avoidance goals. The group exposed to mastery-modification scored also significantly higher ($p=.000$) than the other two groups in terms of these goals. This is not in consonance with what studies say since mastery and avoidance goals were believed to oppose each other. A closer look at the preparation of the goal inventory showed that originally there were 17 out of 50 items for avoidance goals but after factor analysis was applied, the final form contained only 8 items on avoidance goals out of the final 32 items for the whole inventory. The first two items which had the highest factor loadings were: *"I feel bad when my scores are lower than the scores of most of my classmates"* and *"I feel bad when I do not do as well as others."* Ironically, these two items belonged to the original set of items for competitive goals because comparisons with others were mentioned in these items. Nicholls and his colleagues (as cited in Middleton & Midgley, 1997) experienced the same dilemma when their 2-item scale to assess the goal of avoiding looking stupid (a performance-avoidance goal which they termed as "avoid inferiority") loaded with the items assessing the goal to demonstrate superiority (a performance-approach goal). On the other hand, Elliot and colleagues (1999) described performance-avoidance goals in terms of comparison of ability to others. They differentiated performance-avoidance goals

from performance-approach goals as goals “focused on the avoidance of incompetence relative to others” (p. 549).

The eight (8) avoidance goal items included in the final form of the inventory generally pertain to students performing tasks so they would not look *stupid*, *dumb*, or *poor in math*; or they feel bad when they cannot meet others’ expectations; or they do assigned tasks so they would not repeat the subject. All these items reflect one’s aim to project an image that is acceptable to others. They do not imply that a student with these goals actually avoids work. Middleton and Midgley (1997) differentiates work-avoidance goals from performance-avoidance goals thus: “work avoidance goals are aimed at effort reduction; whereas the goal to avoid the demonstration of lack of ability is conceptualized as striving to avoid incompetence” (p. 710).

It is therefore fitting to rename *avoidance goals* into *projective goals* in the study since the items included in the final form of the goal inventory pertain only to these goals. The items on work avoidance were discarded due to low loadings in the factor analysis of the instrument. Moreover, items on performing assigned tasks just to comply with the minimum requirements of the teacher (which could also be fittingly called *compliance goals*) were likewise excluded from the final form of the instrument.

Skaalvik (1997) however noted that, “the goal of avoiding negative judgments from others may also result in increased effort” (p. 72). In effect, one can be mastery-goal oriented, in the sense that he seeks challenge and tries to master or acquire the skills taught while at the same time be concerned about the image he projects in the classroom and therefore, doubly increases his efforts. This explains the results in Table 3, showing that students exposed to mastery-goal modification also registered significantly higher scores in their avoidance goals than those who belonged to the other two groups.

Moderating effects of learning styles on goal modification

The possible moderating effects of student learning style on student goals were also investigated in the study. It was previously mentioned that mastery-goal oriented students tend to exhibit analytic learning styles while competitive-goal oriented students are inclined to employ global learning styles. Thus, the scores of the students were subjected to a 2-way analysis of variance to determine whether student learning style and the goal modification method used had direct and interaction effects on each of the mastery and competitive goals of the students. Table 4 presents the information on the post-experiment mastery goals of the three groups of students with respect to their learning styles.

Table 4
Descriptive statistics for mastery goals (learning style by method)

Group/ Method	Learning style	Mean	Std. dev.	N
Mastery	Analytic	43.07	5.477	28
	Global	42.55	6.039	20
	Total	42.85	5.661	48
Competitive	Analytic	39.66	4.492	38
	Global	41.15	5.273	13
	Total	40.04	4.695	51
Conventional	Analytic	40.22	4.511	36
	Global	40.07	4.891	14
	Total	40.18	4.570	50
Total	Analytic	40.79	4.950	102
	Global	41.43	5.496	47
	Total	40.99	5.118	149

For the group of students exposed to the mastery-goal modification method, the mastery goal score was slightly higher for those who had analytic learning styles ($\mu = 43.07$) than those who had global learning styles ($\mu = 42.55$). However, the overall mean score in mastery goals of those with analytic learning styles in all three groups combined (40.79) was slightly lower than those students with global learning styles (41.43). This does not conform to the common observation mentioned earlier. Applying a 2-way analysis of variance led to results showing that the learning style did not have significant main effects ($p = .760$) on the mastery goals of the students. Moreover, no interaction effect ($p=.628$) is exhibited by learning style and type of goal modification on mastery goals. Only the grouping according to goal modification produced a significant ($p=.025$) main effect. Therefore, the learning style did not affect the mastery goals of the students in the study.

The observation that analytic learners tend to be mastery-goal oriented is not supported by the results of the experiment. Students may be analytic learners who prefer learning in quiet, formal settings and who have a strong emotional need to complete tasks they work on (Dunn & Dunn, 1992) but this does not necessarily lead them to mastery goal orientation, where students are observed to be persistent at tasks and even take on difficult tasks (Pajares, 2001). Dunn and Dunn note that global learners “begin a task, stay with it for a short amount of time, stop, do something else, and eventually return to the original assignment” (p.7). Hence, global learners could still be classified as persistent at tasks since they try to finish them and not totally avoid them. This implies that even global learners can possibly be mastery-goal oriented.

A similar result on learning styles was observed for competitive goals. Table 5 shows that the competitive goals of students who had a global learning style and who were exposed to competitive-goal modification had a higher mean (36.00) compared to those with an analytic learning style (33.84). However, in the overall scenario, the analytic students had a slightly higher mean (32.64) compared with the global students (32.46) in terms of competitive goals. This is also in contrast to the common observation that students with a global learning style tend to be competitive-goal oriented.

Table 5
Descriptive statistics for competitive goals (learning style by group)

Group/Method	LS	Mean	Std. dev.	N
Mastery	Analytic	32.25	5.183	28
	Global	31.60	5.491	20
	Total	31.98	5.265	48
Competitive	Analytic	33.84	5.450	38
	Global	36.00	5.017	13
	Total	34.39	5.378	51
Conventional	Analytic	31.67	4.916	36
	Global	30.36	5.692	14
	Total	31.30	5.120	50
Total	Analytic	32.64	5.231	102
	Global	32.45	5.778	47
	Total	32.58	5.390	149

A two-way analysis of variance showed that, as in the case of mastery goals, the significant effects ($p = .003$) are only found in the goal modification type. No significant main effects for learning style ($p = .994$) are observable in competitive goals. Similarly, there are no significant interaction effects between learning style and goal modification type ($p = .300$). Global students do not tend to be competitive goal-oriented and learning style does not affect students' competitive goals.

Global learners prefer informal seating arrangement, sound, and some form of intake while learning (Dunn & Dunn, 1992). The introduction of games and contests where the classroom atmosphere becomes less formal does not necessary lead them to endorsing competitive goals. Moreover, global learners can still possibly be mastery-goal oriented because students with mastery goals continually seek to increase their knowledge and understanding regardless of the conditions they are in (Yates, 2000).

Student goals and mathematics achievement

To determine which of the three student goals – mastery, competitive, and avoidance – predict achievement in mathematics, the student posttest scores in the mathematics achievement test were subjected to simple linear regressions with each of the three student goals as the independent variable. Results show that the R values for each of the models ($R=.214$ for mastery, $R=.195$ for competitive, and $R=.235$ for avoidance goals) are low but relatively close to each other. The amount of variation in the achievement test scores that can be accounted for individually by the three student goals ranges from only 3.8% to 5.5%. The analysis of variance showed that the regression model for each student goal significantly ($p < .05$) predicts mathematics achievement scores. The computed value of the regression coefficient for mastery goals significantly ($p=.009$) contributes to the prediction of the scores in mathematics achievement. The same results are obtained for competitive ($p=.017$) and avoidance ($p=.004$) goals. The corresponding linear regression equations for mathematics achievement (MA) scores are as follows:

$$\begin{aligned}\text{MA score} &= 7.644 + .445 \text{ mastery goal score} \\ \text{MA score} &= 13.323 + .391 \text{ competitive goal score} \\ \text{MA score} &= 9.225 + .732 \text{ avoidance goal score}\end{aligned}$$

The results for mastery and competitive goals were expected. Mastery goals have been consistently shown to be beneficial in different academic outcomes, including achievement. In the case of competitive goals, the ongoing revisions in the goal theory are now acknowledging the positive potential of these particular goals.

The unexpected result comes from the avoidance goals, which are hypothesized by theorists as detrimental to student success in school. It was previously pointed out that in the instrument for measuring student goals, only the items pertaining to doing tasks in order to project a good image were included in the final form. It was also mentioned that replacing *avoidance goals* by *projective goals* in the study would be most appropriate. Thus, the result still proves to be logical. Students who are conscious of how others, particularly their classmates, perceive them to be may be highly motivated to perform and succeed in school. If they focus on making their teachers and peers look at them as very competent and better than others, then this could be working to their advantage.

The application of multiple regressions (using forced entry) on the mathematics achievement test scores with each of the three student goals as independent variables led to another interesting result. The multiple correlation coefficient between all three predictors and the dependent variable (mathematics achievement) is $R = .300$. A minimal 9.0 % of the variance in the mathematics achievement test scores can be explained by all three predictor variables. The regression model obtained significantly predicts ($p < .01$) the mathematical achievement test scores of the students. Only the avoidance goal scores entered the regression equation. The multiple regression equation for mathematics achievement (MA) is given by:

$$\text{MA score} = -4.063 + .559 \text{ avoidance goal score.}$$

Apparently, when the effects of all three goals were simultaneously considered, only the avoidance goals (or more appropriately, *projective goals*) remained as a predictor variable. It is worth mentioning that the students in the sample came from different nearby schools and that the study was conducted during the first quarter of the academic year. The students in the sample could still be adjusting to a new environment (new school, new classmates, new curriculum) being high school freshmen during the experiment. Thus, these adolescents may have had a strong tendency to project a very good image of themselves, and their high projective goals may have worked to their advantage in terms of their scores in the achievement test. Students who aimed to give their teachers and peers the impression that they already knew the basics of mathematics; who felt bad when they could not meet the expectations of others; and who performed tasks so they would not look *stupid* or *dumb* could have exhibited the highest motivation to excel in all given tasks. The effects of these driving forces to perform well may have surpassed the effects of espousing goals to master skills and to demonstrate one's abilities. This result only proves Skaalvik's (1997) contention that students' goal of avoiding negative judgments from other people may also lead to positive outcomes such as increased effort on the part of the student.

Conclusions and recommendations

This experimental study strongly indicates that student goals can be modified by adapting certain classroom conditions. Students can be made to exhibit higher levels of mastery and competitive goals by exposing them to classes that focus on mastery and competitive goal modifications, respectively. Learning styles do not moderate the effects of any of these modifications. Each of the three student goals independently predicts the student scores in mathematics achievement. However, when all the effects of these three goals are simultaneously considered, only avoidance goals predict achievement in mathematics. It is recommended that the teachers use the two types of goal modifications as an alternative method of teaching to increase student achievement in mathematics. Further studies on avoidance goals should also be conducted, in as much as competitive goals are now being explored as having positive effects on student achievement. Finally, the possible reclassification of avoidance goals into projective, compliance, and work-avoidance goals should be investigated.

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Date received: June 2008

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