

Achievement Goals and Mathematics Achievement of the Senior High School Students

Apolinaria Daquioag- Andres, Ph.D.

Assistant Professor IV, College of Teacher Education

Cagayan State University, Andrews Campus, Tuguegarao City 3500, Philippines

Abstract:

The study determined the students' level of Mathematics achievement goals and level of Achievement in Mathematics. It also tried to compare the level of achievement goals of the students according to sex and academic strands. Additionally, it determined the relationship between Mathematics achievement goals and Achievement in mathematics as well as looking into the relationship among the four different components of achievement goals. It made use of the comparative- correlational methods of research, and particularly employing t- test, ANOVA and Pearson- r to test the hypotheses in the study. Hypotheses were tested at 0.05 significance level and results of the study showed that the achievement goals of the students are comparable in terms of sex and academic strands. It also showed a negative but not significant correlation between achievement goals and Mathematics achievement of the students. However, highly positive significant correlations exist among the different components of achievement goals.

Keywords: Mathematics achievement goals, Mathematics achievement, Senior High School

INTRODUCTION

Students often see mathematics as difficult, burdensome, messy, complicated and complex subject. Because of its difficulty, students used to exert effort to understand it. Otherwise, it will be a burden for them to deal with topics related on mathematics. A great deal of attention has been found on the factors of achievement in mathematics. Mathematics education specialists have difficulty in trying to explain the poor performance of students in mathematics. As time goes by, learning mathematics and improving the level of students has been one of the factors that teachers and administrators are facing which proves that teaching and learning mathematics are difficult tasks. Many studies have been conducted on the effective teaching of mathematics but despite of many innovations and developments, there are still great numbers of students who fail in this endeavor. As a consequence, there is a need to study appropriate motivation (Botsas &Padeliadu 2003).

The importance of academic motivation in academic achievement especially in the adolescence period is to be expected because of the fact that motivation of the children begins to decline as they approach this period (Keys, 2011). Current research in the field of academic achievement has often focused on strategic learning but strategy used is not the only prerequisite for students' achievement so much as there is a need for students' appropriate motivational orientation (Lee, McInerney, Liem, & Ortega, 2010).

The 2010 NAT result showed that roughly 5,600 secondary schools, some 67.1 percent of schools scored within the "lower average" range (26 to 50 percent correct) in NAT for Second Year high school students. Some 0.35 percent of schools scored between 0 to 25 percent (DepEd,2010). SEAMEO Innotech and Melbourne findings would attribute this to the fact that most of the topics covered focused on literacy and less on numeracy and scientific and social knowledge. Aside from this, there are still other factors that affect students' performance in math and one of which is their motivation to learn the subject.

One of the most popular motivational variables in research is the achievement goal. Achievement goal theory believes that there is a pattern of beliefs known as goal orientation that leads students to approach, engage, and respond to achievement situations (Elliot & McGregor, 2001). Goal orientation is based on goal as motives which presume that all actions are given meaning, direction and purpose by the goals that individuals seek out, and that the quality and strength of actions will change as goals change (Covington, 2000).

Each person adopts and accepts goals that shape their future behavior which in turn will differentiate him or her from other individuals (Tolentino, 2009). Goals represent objects, events, states or experiences one seeks to attain whereas achievement goal refers to a decision that manifests itself in the individuals' natural tendency to select certain goals to obtain achievement situations that manifests itself in the individuals' natural tendency to select certain goals to obtain achievement situations (Soini, Aro, & Niemivirta, 2011). In time, people learn to value the consequences of certain outcomes.

Abid (2006) stated that the quality of a nation depends upon the quality of its citizen while quality of citizen depends on the quality of its education which in turn depends many factors. Several researches has been conducted trying to investigate on the factors that relate to the mathematics achievement of students. Hence, this study explores on one of these factors.

Generally, the purpose of this study is to determine the relationship between achievement goals and Mathematics achievement of Senior High School students. Specifically, it determined the profile of the respondents in terms of sex and academic strands. Second, it explored on the level of Mathematics achievement as well as the level of the Mathematics achievement goals of the students along mastery approach, mastery avoidance, performance approach, and performance avoidance. Third, the study compared the Mathematics achievement goals of the

students when grouped according to profile variables. Fourth, it determined if there is a significant relationship

between the achievement goals and Mathematics achievement of the students. Finally, the study determined if there is a significant relationship among the different components of mathematics achievement goals.

Review of Related Literatures

Achievement Goals in Mathematics

One of the most useful scales to measure the involvement of the students inside the classroom as well as their participation and motivation is the achievement goals. Elliot and Murayama (2008) describe the achievement goals as a cognitive dynamic wherein the primary focus is the competence of the students. However, in the study conducted by Cury, Da Fonseca, Elliot, and Moller (2006) they stated that the achievement goals are simply the “individuals’ representations of competence-based outcomes that they strive to attain or avoid” (as cited in Cury, Da Fonseca, Elliot, & Moller, 2006). Achievement goals are used to see how engaged the students are inside the classroom. How much attention they give in learning something new, or even to see if the students are willing or not through their competence level. The use of the achievement goals can also further address the relationship of the students with each other as well as its perseverance. There are two kinds of achievement goal structures, namely the mastery goal and the performance goal. The mastery goal structure focused on describing the students wherein they believe that there is importance in learning. In the study made by Wolters (2004), it mentioned about the mastery goal structure which stated that it is “an environment in which the instructional practices, policies, and norms convey to students that learning is important, that all students are valued, that trying hard is important, and that all students be successful if they work hard to learn” (Midgley et al., 1998). Mastery goal are shown by individuals who value learning something as well as understanding and their mastery of the task.

Certain points have been raised in the achievement goal orientation. As cited by Nicholls (1989, 1992) in the article of Kaplan et al, Nicholls pointed out that “success in a task is defined by deep understanding and that success in school can be achieved through strategies such as working hard, cooperating with others, helping others, and trying to understand” fall under the mastery goal. However, if the student “believed that success in a task is defined by demonstrating high ability and endorsed strategies for success such as trying to do better than others, impressing others, and behaving as if you like the teacher this shows that the student possesses the performance goal (Nicholls, 1989; 1992 as cited in Kaplan, Lichtinger & Gorodetsky, 2009).

There are two types of achievement goal orientation, the approach orientation and the avoidance orientation. The two types are used to classify the success and failure of an individual when it comes to achieving one's goal. The approach orientation refers to the "possibility of success while the avoidance orientation refers to the possibility of failure based on the performance being shown by the students" (Elliot, 1999 as cited in Kaplan, Lichtinger, & Gorodetsky, 2009).

Kaplan, Lichtinger, and Gorodetsky (2009) as well made use of the achievement goal orientation in line with student's engagement in the classroom. The achievement goal orientation showed the different scenarios in which the student's engagement can be measured. Kaplan et al used the mastery approach goal as "engagement with the orientation towards increasing competence" mastery avoidance goal as "engagement with the orientation towards avoiding deterioration of competence or of missing opportunities for learning" performance approach goals as "engagement with the orientation toward demonstration of high ability" performance avoidance goal as "engagement with the orientation to avoid demonstration of low ability" (as cited in Kaplan, Lichtinger, & Gorodetsky, 2009). In another study, Wolters (2008) explained the four achievement goals explicitly. Students who manifest the Mastery Approach are said to be focused on "learning as much as possible, overcoming a challenge, or increasing their level of competence" while students who manifest the Mastery Avoidance, are described as "students who work in order to avoid a lack of mastery or a failure to learn as much as possible" on the other hand, students who are said to manifest the Performance Approach, are said to be focused on students who "demonstrate their ability relative to others or want to prove their self-worth publicly" and lastly, students who manifest the Performance Avoidance, are described as "students who wish to avoid looking incompetent, lacking in ability, or less able than their peers" (as cited in Wolters, 2004).

Achievement Goal Theory

Achievement goal theory propose that students' motivation and achievement related behaviors can be understood by considering the reasons or purposes they adopt while engaged in academic work (Ames, 1992; Dweck & Legget, 1988; Urdan, 1997 as cited in Wolters, 2004). It talks about the different responses of the students or reasons whenever they are engaged in academic work. The achievement goal theory shows the relationship of the students' competence, participation and engagement whenever they are inside the classroom. The achievement goal theory "also proposes that the goal structure of an environment might affect students' motivation, cognitive engagement, and achievement within that setting" (Ames & Archer, 1988 as cited in Wolters, 2004).

Gender and Achievement

Alao and Adeleke (2000) investigations showed that girls exhibit more fear for mathematics activities than boys. Manger and Eikeland (2006) who worked on the effect of Mathematics self- concept on boys' and girls' mathematics achievement established several results concerning gender and achievement. First, they found out that there was no significant effect on gender on overall mathematical achievement. Second, although the gender difference in achievement favoring boys increased with increasing task difficulty, no significant effects on gender were found in sub- samples of difficult tasks.

METHODOLOGY

Research Design

Quantitative research design was used in the study, particularly the comparative-correlational design. The study compared the mathematics achievement goals of the students based on sex and academic strands. Also, it explored on the relationship between the achievement goals and the mathematics achievement of the students as well as the relationship among the four different components of achievement goals.

Sample and Sampling Procedure

Participants of the study were the Grade 12- Senior students in one of the public high schools in the city where the researcher is employed. A total of 310 students were involved as participants of the study and they were selected based on previous knowledge of a population and the specific purpose of the research; hence, the purposive sampling method was used (Fraenkel & Wallen, 2010).

Instrument

The survey questionnaire that was used for the achievement goals was designed using a four- point Likert scale. It was adopted from the Mathematics Achievement Goals Scale developed by Ma. Danielle Mae M. David of De La Salle University. It points out to four subscales namely: the mastery approach goal orientation, the mastery avoidance goal orientation, the performance approach goal orientation and the performance avoidance goal orientation.

The psychometric properties of the developed achievement test were established. The test items were reviewed by a professor and two students who were in their doctorate degree. There were comments and suggestions which were taken into consideration and revisions to the scale has been made. Significance of the factors as well as the goodness of fit were determined using

the Confirmatory Factor Analysis and the Cronbach's alpha was used to test the reliability of the scale. Convergent validity was also obtained by correlating the factor scores of the subscales.

The four components include the following: Mastery Approach are said to be focused on “learning as much as possible, overcoming a challenge, or increasing their level of competence” (Statements 1-10); Mastery Avoidance, are described as “students who work in order to avoid a lack of mastery or a failure to learn as much as possible” (Statements 11-20); Performance Approach, are said to be focused on students who “demonstrate their ability relative to others or want to prove their self-worth publicly” (Statements 21- 30); and Performance Avoidance, are described as “students who wish to avoid looking incompetent, lacking in ability, or less able than their peers” (Statements 31-40).

Academic performance in Mathematics was based on their GPA in the two general Mathematics subjects in the Senior High School (SHS).

Data Collection

Permission was sought to obtain the GPA of the students in Mathematics and to float the questionnaire for the achievement goals. Gathered data were organized for presentation.

Data Analysis

Data collected from the questionnaire were organized for presentation. Frequency and percentage were used to present the profile of the respondents based on sex and academic strands. The level of Mathematics achievement was described based on DepEd Order No. 7, s. 2016 (K- 12 Grading System).

The level of Mathematics achievement of the students was described in each item using the mode, following the 4- Point Scale. Mode represents the item response with the highest frequency. As such, 4 indicates **Very High** achievement goal, 3 indicates **High** achievement goal, 2 for **Low** achievement goal and 1 for **Very Low** achievement goal. However, taking all the 10 statements to describe the level of achievement goals of the students in each of the four components, the composite mean was used. This composite mean was also used to test if there is a significant difference in the mathematics achievement goals of the students when grouped according to profile variables. It was also used determine if there exists a significant relationship between the achievement goals and Mathematics achievement of the students as well as testing if there is a significant relationship among the different components of mathematics achievement goals.

Moreover, t- test for independent sample means was used to determine if there is a significant difference in the mathematics achievement goals of the students when grouped

according to sex. Analysis of variance (ANOVA), on the other hand was utilized to test if there is a significant difference in the mathematics achievement goals of the students when grouped according to academic strands. Finally, Pearson- r was employed to determine if there exists a significant relationship between the achievement goals and Mathematics achievement of the students as well as testing if there is a significant relationship among the different components of mathematics achievement goals. Significance level of 0.05 was utilized to test the hypotheses of the study.

Findings

This section presents the description, analysis and interpretation of data.

Table 1 presents the profile of the respondents based on sex and academic strand. It can be gleaned from the table that there are more female than male respondents. Also, the group from academic strand STEM comprised the highest frequency.

Table 1. Distribution of respondents based on profile variables.

Profile		Frequency (n= 310)	Percent
Sex	Female	190	61.3
	Male	120	38.7
Strand	STEM	82	26.5
	ABM	78	25.2
	HUMSS	72	23.2
	GAS	78	25.2

Table 2 reveals the distribution of respondents based on the level of their Mathematics achievement. It can be noted that more than half of the students have very satisfactory level of achievement in their senior high school Mathematics. This comprised their general mathematics subjects in grade 11, specifically, General Mathematics and Statistics and Probability. Apparently, a high percentage of students (41.9%) also have outstanding level of achievement in Mathematics while only 2 (0.7%) have fairly satisfactory level of achievement. This shows that generally, students have very satisfactory level of achievement in mathematics (Mean= 89.35, s.d= 12.32).

Table 2. Level of Mathematics achievement of the students.

Description	Grading Scale	Frequency (n= 310)	Percent
Outstanding	90- 100	130	41.9
Very Satisfactory	85- 89	156	50.3
Satisfactory	80- 84	22	7.1
Fairly Satisfactory	75- 79	2	0.7
Mean= 89.35; s.d = 12. 32			

On the other hand, Table 3.1 shows the level of Mathematics achievement goals of the students along mastery approach. Mastery Approach are said to be focused on “learning as much

as possible, overcoming a challenge, or increasing the level of competence”. It can be noted that generally, students have high level of achievement goals in terms of mastery approach. This is indicated in their responses on the 10 statements except for Item 5, I enjoy memorizing formulas, where students perceived themselves to have low level of mastery approach.

Table 3.1. Level of Mathematics achievement goals of the students in terms of Mastery Approach

Statement	Mode	Description
1. I try to memorize the formulas needed for problem solving.	3	High
2. I strive to understand the content of the whole lesson as carefully as possible.	3	High
3. I enjoy learning new topics.	3	High
4. I study hard for exams.	3	High
5. I enjoy memorizing formulas.	2	Low
6. I do not chat with my seatmate especially when there is a new topic being taught.	3	High
7. I listen attentively to my teacher whenever she discusses the lesson.	3	High
8. I copy notes during discussions.	3	High
9. I stay up all night to study for the test the next day.	3	High
10. I spend more time studying than watching television.	3	High

Levels:
 4- Very High
 3- High
 2- Low
 1- Very Low

Table 3.2 presents the level of Mathematics achievement goals of the students along mastery avoidance. Mastery Avoidance is described as “students who work in order to avoid a lack of mastery or a failure to learn as much as possible”. Overall, the students manifested a perception of high level of achievement goal along this component.

Table 3.2. Level of Mathematics achievement goals of the students in terms of mastery avoidance

Statement	Mode	Description
1. It makes me worry that I am not learning enough of the topic given.	3	High
2. I strive to avoid having an incomplete understanding of the lesson.	3	High
3. I am worried that I am the only one in class who does not have a full understanding of the lesson.	3	High
4. I strive to at least learn something rather than nothing.	3	High
5. I feel that I always have an incomplete understanding when it comes to computations.	3	High
6. I am satisfied even if I just have a little understanding of the lesson.	3	High
7. I feel worried whenever I cannot understand the steps in problem solving.	3	High
8. I am striving to avoid an insufficient memory of the formulas or steps needed for the tests.	3	High
9. During tests, I feel like I could not answer half of it.	3	High
10. It is hard for me to remember the step by step computations.	3	High

Levels: 4- Very High
 3- High
 2- Low
 1- Very Low

Table 3.3 shows the level of achievement goals of students based on performance approach. Performance Approach is said to be focused on students who “demonstrate their ability relative to others or want to prove their self-worth publicly”. As shown in the table, students generally have low level of achievement goals along this component. The students perceived this in all the statements except for Item 5, Item 6, and Item 10 that indicated *It is important for me to excel especially during periodical tests, During examinations, I make sure that I get the highest score, and I do my best to excel in class*, respectively. Although students strive to do their best in terms of their performance in Mathematics, they do not actually do this in comparison to the performance of others. This indicates that students’ achievement goals are more of a personal commitment and not competitive in nature.

Table 3.3. Level of Mathematics achievement goals of the students in terms of performance approach.

Statement	Mode	Description
1. My goal is to have higher grades than the other students.	2	Low
2. My goal is to make sure that I do better than the other students.	2	Low
3. I ask for bonus points to make my grade higher.	2	Low
4. I make sure that I get the highest grade in Math.	2	Low
5. It is important for me to excel especially during periodical tests.	3	High
6. During examinations, I make sure that I get the highest score.	3	High
7. I try my best in beating my classmates in by having the highest score especially in math.	2	Low
8. During recitations, I make sure that the teacher calls me more than my classmates.	2	Low
9. I do not help my classmates during problem solving activities in the classroom so that I’ll be the only one to get the highest grade.	2	Low
10. I do my best to excel in class	3	High

Levels: 4- Very High
3- High
2- Low
1- Very Low

As presented in Table 3.4, students showed high level of achievement goals in all the statements representing Performance Avoidance. This component is described as “students who wish to avoid looking incompetent, lacking in ability, or less able than their peers”. The responses of the students, in general, manifests that they strive to be competent and that they possess the ability required of a student in a Mathematics subject.

Table 3.4. Level of Mathematics achievement goals of the students in terms of performance avoidance.

Statement	Mode	Description
1. My aim is to at least have a passing grade rather than a failing mark.	3	High
2. I strive to avoid performing worse than my classmates during exams.	3	High
3. I try my best to avoid having the lowest score in seat works.	3	High
4. During exams, I make sure that I don’t get the lowest score.	3	High
5. I try to maintain an average grade.	3	High
6. During problems solving I try to not finish last.	3	High
7. During quizzes, I make sure that I am not the last person to pass my paper.	3	High
8. During group works, I make sure I don’t get the hardest part.	3	High
9. I avoid trying to do things I know I cannot do.	3	High
10. During graded recitations, I try to perform an equation that is not worse than the answer of my classmates.	3	High

As shown in Table 4.1, the achievement goals between the female and male respondents were compared. t- test comparing independent sample means indicates a result in which the achievement goals of both the male and female respondents are comparable. Their achievement goals are both high as shown in the mean scores of 2.78 and 2.81, respectively. This contradicts the findings of Wolters (2004) which indicated that females tend to be more focused in their academic activities and have higher level of achievement goal in Mathematics.

Table 4.1. Comparison in the achievement goals of the students when grouped according to sex

Sex	n	Mean	s.d	df	t	Sig.(2-tailed)	Decision
Female	190	2.78	0.08	298	-0.8891	0.3748	Not significant
Male	120	2.81	0.09				

Legend: 1.00- 1.49 Very Low
 1.55- 2.49 Low
 2.50- 3.49 High
 3.50- 4.00 Very High

Table 4. 2 shows the result of comparison of the students' achievement goals when grouped according to academic strand. It can be gleaned from the table that all their mean scores lie along high level of achievement goals and using the Analysis- of- Variance to compare means, it resulted to a not significant difference. This means that students belonging to the different academic strands have comparable achievement goals in mathematics. In the study of Daron et al, they stated that students that are more inclined in mathematics tend to have higher level of achievement goals (as cited in Daron, Pulfrey, Butera, Dompnier, and Delmas, 2009). This is not manifested in the result of the study since students belonging to STEM strand are expected to manifest a significantly higher level of achievement goals, however, not.

Table4.2. Comparison in the achievement goals of the students when grouped according to academic strands.

Strand	n	Mean	s.d	F	Sig.(2-tailed)	Decision
STEM	82	2.70	0.08	6.894225	0.166	Not significant
ABM	78	2.75	0.06			
HUMSS	72	2.84	0.09			
GAS	78	2.88	0.09			

Legend: 1.00- 1.49 Very Low
 1.55- 2.49 Low
 2.50- 3.49 High
 3.50- 4.00 Very High

Table 5 determined if there exists a significant relationship between the achievement goals and Mathematics achievement of the students. The correlation coefficient of -0.087 registered a negative relationship between the variables but it is not significant. The negative coefficient means that there are students with high mathematics achievement but with low achievement goals in math while there are those with low mathematics achievement but high level of achievement goals in Mathematics.

Table 5. Correlation between the achievement goals and Mathematics achievement of the students

		Mathematics Achievement	Achievement Goals
Mathematics Achievement	Pearson Correlation	1	-.087
	Sig. (2-tailed)		.127
	N	310	310
Achievement Goal	Pearson Correlation	-.087	1
	Sig. (2-tailed)	.127	
	N	310	310

Table 6 determined if there exists a significant relationship among the different components of achievement goals in Mathematics. The table displays a consistency in the responses of the students on the four components as shown in the correlation coefficients that are significant. This means that when a student manifests high level of achievement goal in one component, he/ she tends to manifest also a high level of achievement goals in the three other components. However, if the student has low level of achievement goal in one component, he/ she tends to manifest also a low level of achievement goals in the three other components.

Table 6. Correlation among the different components of achievement goals in Mathematics

		Mastery Approach	Mastery Avoidance	Performance Approach	Performance Avoidance
Mastery Approach	Pearson Correlation	1	.181**	.283**	.675**
	Sig. (2-tailed)		.001	.000	.000
	N	310	310	310	310
Mastery Avoidance	Pearson Correlation	.181**	1	.010	.512**
	Sig. (2-tailed)	.001		.863	.000
	N	310	310	310	310
Performance Approach	Pearson Correlation	.283**	.010	1	.694**
	Sig. (2-tailed)	.000	.863		.000
	N	310	310	310	310
Performance Avoidance	Pearson Correlation	.675**	.512**	.694**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	310	310	310	310

** . Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION

Based on the summary of findings, the following conclusions are arrived at:

At an average, students' perception on their level of Mathematics achievement goals is high while their Mathematics achievement is very satisfactory. Specifically, students manifested high achievement goals in the components mastery approach, mastery avoidance, and performance avoidance. However, the students manifested a low level of achievement goals along performance approach.

Second, achievement goals do not discriminate in terms of sex and academic strands. Either male or female, in whatever academic strand the students may belong their achievement goals are comparable.

Finally, there is a significant relationship among the different components of achievement goals in Mathematics. However, although achievement goals can be a factor that affects Mathematics achievement, these two variables do not necessarily establish highly significant relationships with each other.

Recommendations

In connection to the results of the study, the following recommendations are arrived at:

1. A similar study using another group of respondents be conducted to verify if there is no relationship that exists between Mathematics achievement goals and Mathematics achievement;
2. Conduct a study that will explore other variables that affect Mathematics achievement. Also, conduct a study that investigates on the factors affecting Mathematics achievement goals of the students; and
3. Consider other variables where achievement goals of the students may be correlated and compared such as study habits and Mathematics attitudes of the students to detect the areas where interventions may be done

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